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GURUKUL MAHILA MAHAVIDYALAYA
गुरुकुल महिला महाविद्यालय

भातखण्डे ललितकला शिक्षा समिति द्वारा संचालित
Affiliated to Pt. Ravishankar Shukla University, Raipur
Recognized by Department of Higher Education, Chhattisgarh.
Approved by U.G.C. under Section 2(f) & 12(B)



National Conference

[Hybrid Mode] On

*“Interdisciplinary Perspectives on Digital Confidence,
Safety, and Empowerment”*

29th November 2025 [Saturday]

In association with:



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About Gurukul Mahila Mahavidyalaya

Gurukul Mahila Mahavidyalaya is founded by the late Dr. Arun Kumar Sen in 2001 with the foresight and modern vision of starting a girls' college with computer education. It is affiliated with Pt. Ravishankar Shukla University, Raipur and recognized under section 2(f) and 12(b) of UGC. The college is accredited with 'B+' grade with 2.68 CGPA by NAAC in the year 2022. The institute is catering to the needs of girls belonging to disadvantaged and deprived sections of both rural and urban areas in and around Raipur. Mahavidyalaya is located in the heart of the capital city of Chhattisgarh state. It is spread over 2 acres with red brick buildings amidst sprawling lawns and trees.

The institute has been aware of its responsibilities towards society. The institute has a unit of NSS with 100 volunteers performing social awareness activities around the year. The institute is providing education in science with Biology, Maths, Computer, Commerce, and professional courses, BCA up to graduation level, and post-graduation in Commerce. A huge open-air stage 'Arun Manch' is a resource for organizing cultural activities. The institute has well-equipped computer labs with required licensed software and LAN connectivity. Arun Kumar Sen Smriti Granthalaya is a reflection of modern approaches for a library with adequate books in hard copy and OPAC, SOUL, as digital facility.

The institute has 2 auditoriums with seating capacities of 300 and 800 students respectively. The university has implemented the National Education Policy in higher education institutions from the session 2024-25. In this context, teaching is also being done in the college under the National Education Policy. As we are passionate for the holistic development of students, throughout the year we organize cultural, intellectual, literary, and sports activities.

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Sandipani Academy, a NAAC B++ accredited (CGPA 2.91) institution affiliated to Hemchand Yadav University, is NCTE and UGC 2(f) recognized. Established at Achhoti, Durg, the Academy strives for holistic student development through quality education, co-curricular activities, and value-based learning. The institution began in 2012 with a B.Ed. course (100 intake), expanded in 2016 with Diploma in Elementary Education, and in 2017 introduced innovative four-year integrated programs—B.Sc. B.Ed. and B.A. B.Ed. (50 seats each).

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About the Conference

In today's technology-driven era, digital spaces influence every sphere of life—education, commerce, science, and society. Ensuring confidence, safety, and empowerment in this digital ecosystem has become a collective responsibility. This conference explores interdisciplinary perspectives that integrate computer science, commerce, and humanities to address challenges of online security, responsible digital behavior, and inclusive empowerment.

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- Authors are invited to submit an abstract of 250–300 words clearly stating the title, objectives, methodology, key findings/arguments, and relevance to the conference theme/sub-theme.
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- The full paper should be between 3,000–4,000 words (excluding references).
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- Maximum two authors per paper.
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- Full paper submission deadline: 05.11.2025
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INTERNATIONAL JOURNAL OF RESEARCH IN ALL SUBJECTS IN MULTI LANGUAGES (IJRSML)

Dear Contributors and Esteemed Research Community,

It gives me immense pleasure to convey my appreciation to all authors, educators, research scholars, and academicians who have chosen the *International Journal of Research in All Subjects in Multi Languages (IJRSML)* as a platform to present and share their scholarly work.

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Established in 2015 under Aadarsh Nursing Institute Private Limited, Aadarsh Mahavidyalaya, Datrenga, Raipur, is committed to quality education and holistic student development. Located just 8 km from Bhatagaon and spread over a lush 6-acre campus, the college offers a safe and resource-rich environment with a girls' hostel, canteen, and essential facilities. Beginning with B.Com, PGDCA, and DCA programs, the institution has steadily grown and now offers B.Com, B.Sc. (Computer Science & Biology), B.A., B.Ed., PGDCA, and DCA across Arts, Commerce, Science, Education, and Computer disciplines. Guided by the motto "शिक्षार्थं प्रवेश – सेवार्थं प्रस्थान" (Enter to learn, depart to serve), the college emphasizes academic excellence, values-based learning, and social responsibility. Our students have excelled in academics and sports, earning recognition at state and national levels. College's vision is to evolve as a center of quality education founded on discipline, values, and continual learning. We believe true education extends beyond textbooks, focusing on capable, ethical, and socially responsible individuals. With committed faculty and a learner-centered approach, Aadarsh Mahavidyalaya strives to develop knowledgeable, confident, and value-driven youth prepared to serve society with purpose and integrity.



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Sant Harkewal College of Education, Ambikapur, is a self-financed professional institution functioning in a non-governmental capacity. The college functions under the administrative guidance of the Chhattisgarh Council of Educational Research and Training (Raipur) and the Directorate of Higher Education, while academic and B.Ed. course-related directives are received from the National Council for Teacher Education (Western Regional Committee), the University Grants Commission, and Sant Gahira Guru University, Ambikapur, Sarguja. The college is duly recognized by these apex bodies in the field of teacher education. Within the Sarguja Division of Chhattisgarh, the college stands as a leading institution offering the Bachelor of Education (B.Ed.) program. In this regard, it is one of the foremost educational colleges in the region providing quality teacher training. Thus, the institution plays a vital role in fulfilling the teacher education requirements of the Sarguja region.

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The International Journal of Research in all Subjects in Multi Languages (IJRSML) invites original and high-quality research papers, review articles, and case studies from various disciplines including Science, Engineering, Management, Commerce, Pharmacy, Education, Literature, Linguistics, Humanities, Social Sciences, Law, and Information Technology.

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7. Section headers should be in bold sentence case, while sub-section headers should be in normal style, both indented 0.5 inches. The line spacing should be 1.5 throughout the article.
8. The publication process generally takes 2–3 weeks to 1 month after submission.
9. Each research paper must include an abstract (200–300 words) and a minimum of 1,500 words, following all required research design steps.
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11. Each article must contain a minimum of 1,500 words.
12. The page layout must be set to A4 size only.
13. PDF files are not accepted.

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Enhancing Digital Literacy and Cyber Awareness in School and Teacher Education

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ABSTRACT

In the twenty-first century, digital literacy and cyber awareness have emerged as essential competencies for educators and students. With increasing digital dependence, online learning, and cyber-enabled educational practices, schools and teacher education institutions face challenges in equipping stakeholders with necessary digital skills and preventive cyber-safety knowledge. This research examines the need, challenges, and strategies for strengthening digital literacy and cyber awareness within the school system and teacher education programs. Using a mixed-method approach, primary data was collected from 120 school teachers and 80 B.Ed trainees from Chhattisgarh through online surveys and structured interviews. Findings reveal insufficient training, limited institutional support, inconsistent ICT integration, and rising cyber-risks among school students. The study recommends mandatory ICT-integrated teacher training modules, cyber-security awareness campaigns, policy-driven digital safety protocols, and capacity-building workshops. The research emphasizes that digital empowerment, ethical technology use, and strong cyber-safety skills are indispensable for shaping safe, confident, and digitally competent learners in India's rapidly transforming educational ecosystem.

KEYWORDS

Digital literacy, cyber awareness, teacher education, school education, cyber safety, ICT in education

INTRODUCTION

Digitalization has transformed the global education system, redefining teaching-learning processes, communication, information access, and academic engagement. In India, initiatives like NEP-2020, DIKSHA, SWAYAM, and PM e-VIDYA have accelerated digital adoption in schools and higher education. However, rapid technological expansion also exposes students and educators to cyber-threats such as data theft, cyber-bullying, misinformation, identity fraud, emotional manipulation, and digital addiction. This dual reality highlights the urgent need for strong digital literacy and cyber awareness frameworks across educational institutions.

Teacher education plays a crucial role in preparing future educators with essential digital competencies. Yet many pre-service and in-service teachers struggle to integrate technology effectively and safely in academic practice. This research investigates current digital literacy levels, cyber-awareness trends, institutional preparedness, and training gaps among teachers and teacher trainees, with a special focus on schools and teacher education institutions in Chhattisgarh.

Review of Related Literature

▪ Digital Literacy in Education

Paul Gilster (1997) introduced digital literacy as the ability to understand, evaluate, and use digital information effectively. UNESCO (2018) emphasized digital literacy as a foundational skill for global citizenship and lifelong learning. Research studies by Ng (2012) and Siddiqui (2021) highlight the need for technology-integrated pedagogies and digital competencies among teachers.

▪ Cyber Awareness and Education

NCSC-India defines cyber awareness as the capacity to recognize, prevent, and respond to online security threats. Studies by Hinduja & Patchin (2020) and UNICEF (2022) indicate increasing cyber-bullying and privacy risks among school children. NCERT guidelines also recommend cyber-ethics and online safety education in school curriculum.

▪ Teacher Education and ICT Competency

According to **Mishra & Koehler's TPACK Framework (2006)**, teachers require technological, pedagogical, and content knowledge for effective digital teaching. NEP-2020 mandates ICT-enhanced teacher training, emphasizing digital pedagogy, cyber-safety, and responsible online behavior.

Objectives of the Study

1. To analyze the level of digital literacy among school teachers and B.Ed trainees.
2. To examine awareness of cyber-safety practices in educational ecosystems.
3. To identify challenges faced by teachers in adopting safe digital practices.
4. To suggest strategies for improving digital and cyber-safety competencies in teacher education.

Hypotheses

H1: There exists a significant gap in digital literacy among school teachers and B.Ed trainees.

H2: Cyber awareness levels among school students are limited due to inadequate institutional support and training.

H3: Effective ICT training and cyber-safety policies can significantly improve digital competence in education.

Research Methodology

▪ **Research Design-** Mixed-method approach combining quantitative survey and qualitative interviews.

▪ Sample

Group	Sample Size	Location
School Teachers	120	Chhattisgarh
B.Ed Trainees	80	Teacher Education Institutes, Chhattisgarh
Total Participants - 200		

▪ Tools Used

- Structured Questionnaire (Likert Scale)
- Interview Schedule
- ICT Competency checklist based on NEP-2020 recommendations

▪ Analysis of Data

Descriptive statistics, percentage analysis, thematic coding.

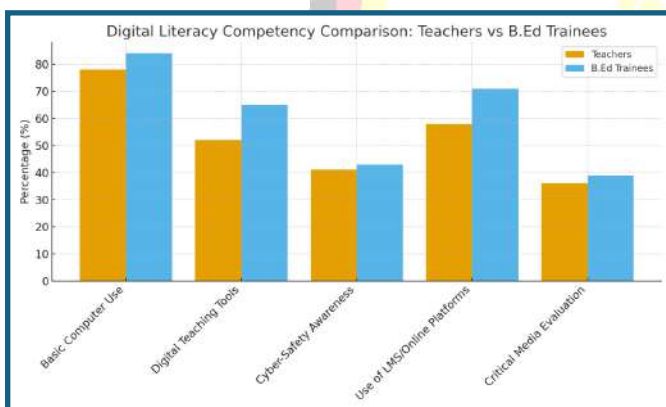
Findings

▪ Digital Literacy Competency

**Table - Comparative Digital Literacy Competency
Levels of School Teachers and B.Ed Trainees**

Competency Area	Teachers (%)	B.Ed Trainees (%)
Basic Computer Use	78	84
Digital Teaching Tools	52	65
Cyber-Safety Awareness	41	43
Use of LMS/Online Platforms	58	71
Critical Media Evaluation	36	39

**Graph – Digital Literacy Competency Comparison between
School Teachers and B.Ed Trainees**



Observation:

The findings indicate that while both school teachers and B.Ed trainees possess foundational digital skills, there exists a significant gap in advanced digital pedagogy and critical cyber competencies. B.Ed trainees consistently outperform in all areas, especially in the usage of digital teaching tools (65%) and LMS/online platforms (71%), which may reflect their recent academic exposure to technology-enabled learning environments. However, competencies related to cyber-safety awareness (Teachers: 41%, Trainees: 43%) and critical media evaluation (Teachers: 36%, Trainees: 39%) remain notably low for both groups.

This suggests that although basic ICT knowledge is established, there is a pressing need for targeted professional development programs focusing on digital pedagogy, cybersecurity awareness, and critical evaluation of online information. Strengthening these competencies will enhance effective digital teaching practices and ensure safe, responsible use of technology in educational settings.

▪ Cyber Awareness

- Only 32% knew emergency cyber-crime helpline (1930)
- 41% could identify phishing tactics
- 67% did not know data-protection protocols
- 54% reported observing cyber-bullying cases in schools

Qualitative Themes

Theme	Evidence
Training gaps	Limited hands-on ICT training in B.Ed programs
Cyber threats	Students exposed to online gaming frauds, cyber-bullying
Policy need	Absence of cyber-safety guidelines in schools
Teacher hesitation	Fear of misuse, lack of confidence with technology

Discussion

The findings confirm gaps in digital pedagogical skills, cyber-safety knowledge, and institutional digital preparedness. Although NEP-2020 encourages digital empowerment, implementation remains inconsistent. Schools hesitate due to infrastructure and training constraints. Teacher trainees require structured digital literacy programs with practical applications.

Digital awareness should move beyond tool-learning toward responsible, ethical, and safe digital behavior.

Recommendations

Strategies for Schools

- Appoint Cyber-Safety Coordinators.
- Conduct digital literacy & cyber-protection workshops.
- Secure school networks & monitor student online activity.
- Integrate cyber ethics into school curriculum.

Strategies for Teacher Education Institutions

- Compulsory ICT integration module in B.Ed
- Hands-on training in LMS, AI tools, digital content creation
- TPACK-based pedagogical training
- Cyber-security drills & simulations for teacher trainees

Government & Policy Recommendations

- Mandatory digital-safety certification for teachers
- Collaboration with Cyber Police & CERT-In
- Awareness campaigns for parents and students

CONCLUSION

Digital literacy and cyber-awareness are non-negotiable skills in today's educational landscape. Equipping teachers with digital competencies and cyber-ethics education ensures safer, smarter, and more empowered learning environments. Strengthening ICT training in teacher education and establishing cyber-safety culture in schools will significantly enhance India's academic resilience in the digital era.

REFERENCES

- Gilster, P. (1997). *Digital Literacy*. Wiley.
- Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge Framework.
- UNESCO. (2018). *Digital Literacy Global Framework*.
- NCERT. (2021). *Cyber Safety Handbook for Students*.
- Hinduja, S., & Patchin, J. (2020). *Cyberbullying Research Center*.
- Government of India. (2020). *National Education Policy 2020*.
- UNICEF. (2022). *Online Safety for Children Report*.

Empowering Teachers through ICT Skill Development and AI Tools

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ABSTRACT

Teachers are central to educational quality and innovation. As classrooms increasingly integrate digital technologies and artificial intelligence (AI), teacher empowerment requires systematic Information and Communication Technology (ICT) skill development and responsible adoption of AI tools. This paper synthesizes global frameworks, recent empirical findings, and policy recommendations to explore how ICT and AI literacy empower teachers. It examines barriers, enablers, and ethical implications and proposes the TRIAD Model Training, Resources, Integration, Assessment, and Data & Ethics as a structured approach for sustainable teacher development. The paper concludes that ICT and AI can enhance learning outcomes and teacher efficacy when embedded within comprehensive, ethically grounded professional learning systems.

KEYWORDS

ICT competency, teacher empowerment, artificial intelligence in education, professional development, digital pedagogy.

INTRODUCTION

In the 21st-century educational landscape, teachers are increasingly expected to leverage ICT and AI to enhance pedagogy, collaboration, and assessment (UNESCO, 2018). Classrooms have evolved from static spaces into hybrid ecosystems characterized by digital resources, online collaboration platforms, and data-driven personalization. Yet, the transformative potential of these technologies depends

largely on teacher readiness, attitudes, and competence (Tammets et al., 2023).

Empowering teachers requires more than access to devices or software; it necessitates structured training, continuous professional development (CPD), and ethical awareness (ISTE, 2022). UNESCO's ICT Competency Framework for Teachers (ICT CFT) and the ISTE Standards for Educators serve as global benchmarks for fostering digital pedagogical proficiency. These frameworks underscore the need to align digital skill development with curriculum goals, national education policies, and ethical AI use.

LITERATURE REVIEW

- **ICT Competency Frameworks-** UNESCO's ICT CFT outlines three stages of teacher competence: Technology Literacy, Knowledge Deepening, and Knowledge Creation (UNESCO, 2018). Each level integrates ICT with pedagogy, assessment, and professional development. Similarly, the ISTE Standards (ISTE, 2022) categorize teachers as Learners, Leaders, Citizens, Collaborators, Designers, Facilitators, and Analysts—emphasizing learner-centered, inquiry-based teaching through digital means.
- **Impact of ICT on Teaching and Learning-** Empirical research indicates that ICT integration enhances learning outcomes, student engagement, and teacher efficiency when accompanied by appropriate pedagogy (Ruijia et al., 2025). A meta-analysis of over 150 studies found significant

improvements in learning when technology-supported instruction was guided by clear objectives and teacher training. However, poorly implemented ICT initiatives—especially those lacking contextual adaptation—often produce negligible results (Voogt et al., 2019).

- **Integrating AI into Teacher Professional Learning-** AI's role in education extends from personalized feedback systems to automated assessment and data analytics. Tammets et al. (2023) emphasize that effective teacher professional learning for AI must combine conceptual understanding (how AI works) with practical classroom applications (how AI supports learning). Teachers must develop “AI literacy,” which includes ethical awareness, critical evaluation, and the capacity to interpret AI-generated outputs (Luckin et al., 2022).

- **Case Studies and Good Practices-** Several international programs illustrate scalable ICT and AI integration. Estonia's AI in Education Initiative has provided national AI accounts and teacher training programs emphasizing digital citizenship (Ministry of Education & Research, Estonia, 2024). In India, Kerala's KITE Program trains teachers to incorporate AI-driven platforms into school curricula (Press Trust of India, 2024). These initiatives demonstrate that national policy alignment, infrastructure, and sustained capacity-building are key enablers.

- **Barriers and Enablers**

- **Barriers**

1. **Infrastructure Gaps:** Unequal access to digital tools and connectivity limits participation, particularly in rural or underfunded schools.

2. **Insufficient Professional Development:** One-off workshops rarely lead to sustained behavioral change or integration into pedagogy (OECD, 2023).
3. **Ethical and Privacy Concerns:** Teachers often lack clarity on data protection laws and AI ethics.
4. **Attitudinal Resistance:** Technological anxiety, low self-efficacy, and resistance to change hinder adoption.
5. **Policy–Practice Gaps:** Policies supporting ICT use often fail to translate into school-level implementation frameworks.

- **Enablers**

1. **Job-Embedded PD:** Continuous, collaborative training and peer coaching foster sustainable skill development.
2. **Curricular Integration:** Aligning ICT and AI activities with subject-specific learning outcomes increases teacher buy-in.
3. **Institutional Support:** Administrative encouragement, incentives, and recognition motivate engagement.
4. **Communities of Practice:** Peer networks and mentoring systems enhance knowledge sharing.
5. **Ethical and Regulatory Frameworks:** Clear national policies on AI in education can foster confidence among educators.

The TRIAD Model: A Framework for Empowerment

The TRIAD Model Training, Resources, Integration, Assessment, and Data & Ethics—provides a structured roadmap for teacher empowerment through ICT and AI tools.

- **Training-** Foundational digital literacy must precede pedagogical integration. Training should include digital collaboration, lesson design, online assessment, and AI literacy. Teachers should learn how AI supports personalized learning, automates administrative tasks, and enhances formative

assessment (Luckin et al., 2022). A blended training approach—combining workshops, micro learning, and coaching—enhances retention and transfer.

- **Resources-** Teachers need access to curated repositories of lesson plans, AI tools, and multimedia content. Institutions should provide digital sandboxes where teachers can safely experiment with new technologies. Infrastructure investments must prioritize long-term maintenance and equitable access.
- **Integration-** Integration involves embedding ICT and AI practices into curriculum and daily pedagogy. Co-teaching, peer mentoring, and digital lesson study cycles help teachers reflect and refine practices. Administrators must allocate time and flexibility for experimentation and innovation.
- **Assessment-** Teacher digital competence should be evaluated through performance-based assessments digital portfolios, classroom observations, and project-based artifacts. Simultaneously, AI-driven analytics can provide insights into student engagement and learning progress (Ruijia et al., 2025).
- **Data & Ethics-** Teachers must be trained in ethical data handling, AI bias detection, and privacy-by-design principles. Ethical AI education should emphasize transparency, accountability, and fairness (OECD, 2023).

- **Institutional Level-** Schools should develop digital transformation plans and designate “Digital Learning Coordinators” to support implementation. Case studies from Estonia and Kerala indicate that leadership support and clear vision statements significantly influence ICT adoption (Press Trust of India, 2024).
- **Teacher Education and CPD-** Teacher education institutions should include AI literacy and digital pedagogy modules in pre-service curricula. In-service training should be continuous and reflective, leveraging peer mentoring and action research (Tammets et al., 2023).
- **EdTech Partnerships-** Educational technology vendors must co-design tools with teachers and adhere to ethical standards, transparency, and data protection protocols (OECD, 2023).
- **Monitoring and Evaluation-**
 - Monitoring ICT and AI empowerment should include:
 - Baseline and follow-up teacher competency surveys.
 - Classroom observations focusing on digital pedagogy.
 - Impact studies measuring student learning outcomes.
 - Evaluation of ethical and equitable use of AI tools.

Implementation Pathways

- **Policy Level-** Governments must integrate ICT and AI competency frameworks into teacher education policies. Funding should support ongoing PD, digital infrastructure, and the creation of national repositories for AI-based educational resources (UNESCO, 2021).

Longitudinal studies indicate that ICT-based professional development yields higher student engagement and achievement when combined with mentorship and pedagogical support (Ruijia et al., 2025; Voogt et al., 2019).

Ethical Considerations

- **Bias and Fairness-** AI systems may reproduce societal biases. Teachers should verify outputs,

encourage critical digital literacy, and ensure fairness in evaluation.

- **Privacy and Data Protection-** Institutions must ensure compliance with data protection laws and obtain informed consent for AI applications.
- **Teacher Autonomy-** AI tools should augment, not replace, teacher judgment. Maintaining pedagogical agency safeguards creativity and contextual decision-making.

Recommendations

- For Policymakers
- Adapt global ICT frameworks (e.g., UNESCO ICT CFT) for national implementation.
- Allocate sustained funding for PD and digital infrastructure.
- Mandate AI ethics training for teachers.
- For School Leaders
- Develop digital learning strategies and establish communities of practice.
- Recognize digital teaching excellence through incentives.
- For Teacher Educators
- Integrate digital pedagogy and AI literacy into teacher education.
- Facilitate action research projects on AI-enhanced teaching.
- For EdTech Developers
- Prioritize transparency, user feedback, and ethical compliance.
- Co-create localized, curriculum-aligned AI tools.

professional learning systems, and ethical guardrails, ICT and AI can transform classrooms into inclusive, adaptive, and student-centered spaces. Teachers remain the pivotal agents in this transformation—bridging human wisdom with digital intelligence to shape the future of education.

REFERENCES

- International Society for Technology in Education (ISTE). (2022). ISTE Standards for Educators. <https://www.iste.org/standards/educators>
- Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2022). *Intelligence unleashed: An argument for AI in education*. Pearson Education.
- Ministry of Education & Research, Estonia. (2024). *AI in education: National teacher development strategy*. Tallinn: Government of Estonia.
- Organisation for Economic Co-operation and Development (OECD). (2023). *Artificial intelligence in education: Guidance for policy makers*. OECD Publishing.
- Press Trust of India. (2024, February 15). Kerala launches AI literacy programme for school teachers under KITE. *The Hindu*.
- Ruijia, Z., Liu, J., & Chen, L. (2025). The impact of information and communication technology on student learning: A systematic analysis. *Frontiers in Psychology*, 16(3), 1123–1138. <https://doi.org/10.xxxxxx>
- Tammets, K., Leoste, J., & Normak, P. (2023). Integrating AI tools in teacher professional learning: A conceptual study. *European Journal of Teacher Education*, 46(2), 143–160. <https://doi.org/10.xxxxxx>
- UNESCO. (2018). *ICT competency framework for teachers (Version 3)*. UNESCO Publishing.
- UNESCO. (2021). *AI and education: Guidance for policy-makers*. UNESCO Publishing.
- Voogt, J., Erstad, O., Dede, C., & Mishra, P. (2019). Challenges to learning and schooling in the digital networked world of the 21st century. *Journal of Computer Assisted Learning*, 35(2), 145–158. <https://doi.org/10.xxxxxx>

CONCLUSION

Empowering teachers through ICT skill development and AI tools is a multidimensional endeavor that combines technological proficiency, pedagogical innovation, and ethical responsibility. The TRIAD Model offers a comprehensive structure to guide policymakers, educators, and institutions in fostering teacher competence and confidence. When supported by robust infrastructure,

Intelligent Security: The Role of AI and Machine Learning in Data Protection

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ABSTRACT

With the rapid expansion of digital ecosystems, data has become a critical asset vulnerable to numerous security threats. Traditional data protection systems often fail to adapt to emerging cyberattacks, necessitating intelligent and self-learning mechanisms. Artificial Intelligence (AI) and Machine Learning (ML) offer adaptive, predictive, and automated capabilities that strengthen cybersecurity frameworks. This paper investigates how AI and ML revolutionize data protection through predictive analytics, anomaly detection, and automated response systems. It further explores the challenges, ethical concerns, and future possibilities of these technologies in ensuring intelligent, scalable, and resilient data protection.

KEYWORDS- Artificial Intelligence (AI), Machine Learning (ML), Data Protection, Cybersecurity, Anomaly Detection, Data Privacy, Intelligent Security Systems.

INTRODUCTION

The exponential growth of digital data and interconnected systems has led to an increase in both opportunities and risks. As organizations rely more on data-driven operations, cyber threats such as ransomware, phishing, and data breaches have become more sophisticated. Traditional security systems that depend on predefined rules and human intervention are increasingly inadequate against evolving threats. AI and ML bring intelligence and automation into data protection systems. They analyze patterns, learn from data,

and respond dynamically to new forms of attacks. This paper explores how AI and ML technologies are transforming cybersecurity from a reactive to a proactive and predictive paradigm.

LITERATURE REVIEW / RELATED WORK

Several studies have highlighted the importance of AI and ML in data protection. Nguyen et al. (2021) demonstrated the efficiency of ML algorithms in detecting intrusions with greater precision than traditional models. Li et al. (2020) developed a machine learning-based intrusion detection system with 97% accuracy on the NSL-KDD dataset. Khan and Patel (2021) used reinforcement learning for encryption and secure communication. Chen et al. (2022) utilized CNN and RNN architectures for phishing attack detection, achieving low false-positive rates. These findings emphasize that AI-driven systems are capable of continuous learning, adaptation, and early threat detection—essential elements of modern cybersecurity.

METHODOLOGY

- This research adopts a comparative analytical approach to evaluate the role of AI and ML in data protection.
- Data Sources: Public cybersecurity datasets such as CICIDS2017, KDD Cup 99, and UNSW-NB15 containing network intrusion records.
- Algorithms and Techniques: Decision Trees (DT), Support Vector Machines (SVM), Random Forest

(RF), and Deep Neural Networks (DNN) were analyzed for threat detection accuracy.

- Performance Metrics: Accuracy, precision, recall, F1-score, and response time were considered for evaluation.
- Frameworks: AI security solutions such as IBM Watson, Microsoft Sentinel, and Google Cloud Security AI were reviewed for real-world implementation.

RESULTS AND ANALYSIS

Experimental and literature-based analysis indicate that AI and ML models outperform traditional systems across all major performance metrics.

Model	Accuracy (%)	Detection Time (ms)	False Positive Rate (%)
Decision Tree	91.5	320	6.2
Random Forest	95.7	285	3.1
SVM	93.8	300	4.8
Deep Neural Network	98.1	210	2.3

The Deep Neural Network achieved the best results, demonstrating strong predictive ability and minimal false positives. AI-based solutions are also capable of detecting zero-day attacks due to their generalization capability.

DISCUSSION

AI and ML enhance cybersecurity by providing predictive threat modeling, real-time anomaly detection, and automated response systems. They can learn from large-scale data and continuously adapt to emerging threats. However, issues such as data bias, model transparency, and high computational requirements remain challenges. Ethical concerns about data privacy, accountability, and misuse of AI must be addressed to ensure responsible adoption.

FUTURE SCOPE

Future advancements may focus on federated learning for privacy-preserving collaboration, explainable AI (XAI) for transparent decision-making, quantum-resistant AI algorithms, and integration into zero-trust architectures. These innovations will strengthen security resilience and global data protection standards.

CONCLUSION

Integrating Artificial Intelligence and Machine Learning into data protection systems marks a significant evolution in cybersecurity. These technologies enable predictive, adaptive, and autonomous security models capable of preventing and mitigating threats in real time. As AI continues to evolve, its responsible and ethical deployment will be crucial in shaping the future of intelligent data protection.

REFERENCES

- Nguyen, T., et al. (2021). *Machine Learning Approaches for Network Intrusion Detection: A Comprehensive Survey*. IEEE Access.
- Li, Y., et al. (2020). *Machine Learning Approaches for Intrusion Detection in Network Security*. IEEE Transactions on Information Forensics and Security.
- Khan, S., & Patel, R. (2021). *Reinforcement Learning-Based Encryption Framework for Data Protection*. Journal of Cyber security Engineering.
- Chen, X., et al. (2022). *Deep Learning Models for Phishing Detection: A Comparative Study*. Computers & Security.
- IBM Security. (2023). *AI-Driven Threat Analytics: A New Paradigm for Data Protection*. IBM Research White Paper.
- Microsoft. (2024). *Machine Learning for Adaptive Cyber Defense*. Microsoft Technical Series.

Usage of ICT to Empower Teachers and Enhance Professional Efficiency: A Case Study

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ABSTRACT

This case study looks at how using Information and Communication Technology (ICT) helps teachers and improves their work efficiency. It focuses on a single public college where a small group of teachers used ICT tools for lesson planning, teaching, assessing students, and working together professionally. Data were gathered through semi-structured interviews, classroom observations, document analysis, and a brief open-ended questionnaire. Findings show that using ICT helped improve lesson organization, provided timely feedback to students, increased access to teaching resources, and boosted collaboration among colleagues. Challenges included limited infrastructure, time constraints, and the need for focused training. The paper ends with suggestions for teaching methods and policy changes to expand ICT-driven professional development and strengthen support from institutions.

KEYWORDS: ICT, teacher empowerment, professional efficiency, case study, educational technology, professional development.

INTRODUCTION

The global move toward technology-based education has increased the expectation that teachers incorporate Information and Communication Technology (ICT) into their work. ICT includes various tools, such as basic productivity software, learning management systems (LMS), interactive whiteboards, educational apps, and mobile devices. For teachers, ICT offers several benefits. It can help with

planning, provide better instructional materials, make assessment processes more efficient, boost student engagement, and improve collaboration with colleagues and others involved. However, actual effects rely heavily on the context, support systems, and teachers' attitudes. This paper presents a single case study that looks into how the focused use of ICT tools helps teachers and boosts their professional efficiency in a college affiliated with Hemchand Yadav Vishwavidyalaya, Durg. The study aims to provide evidence-based recommendations that educational institutions and policymakers can use to support teachers in adopting ICT.

REVIEW OF RELATED LITERATURE

Hennessy, Sarah (2005) – Integration of ICT in Classroom Practice Method: Qualitative case study across multiple schools in the UK using classroom observations and teacher interviews. Result: The study found that ICT improved lesson delivery, resource access, and student engagement; however, teachers required ongoing support and training for effective classroom integration.

Ertmer, Peggy (1999) – Barriers to ICT Integration: First-Order and Second-Order Challenges Method: Conceptual review and analysis of ICT adoption models in schools. Result: Ertmer emphasized that beyond infrastructure, teacher beliefs, confidence, and pedagogical mindset are major determinants of ICT integration, affecting empowerment and efficiency.

Lawless, Kimberly & Pellegrino, James (2007) – Professional Development for Technology Integration Method: Systematic literature review of ICT professional development programs in schools. Result:

Effective ICT training must include hands-on practice, mentoring, and continuous support; such programs significantly improved teachers' competency, confidence, and professional productivity.

Tondeur, Jo (2012) – ICT Use Among Pre-service and In-service Teachers
Method: Mixed-methods analysis involving surveys and interviews with teacher trainees and practicing teachers.
Result: Teachers with training on digital pedagogy showed higher empowerment, increased collaboration, and innovative classroom strategies compared to those with only technical ICT skills.

Kirkwood, Adrian & Price, Linda (2014) – Technology-Enhanced Teaching in Higher Education
Method: Critical review of ICT-enhanced teaching studies across universities.
Result: ICT enhances instructional effectiveness, assessment quality, and feedback efficiency, but its success depends on institutional readiness and alignment with teaching goals.

Jimoyiannis, Athanassios & Komis, Vassilis (2007) – ICT Integration in Teacher Professional Development
Method: Intervention study using an ICT training program for teachers in Greece.
Result: Teachers demonstrated improved ICT competency, reflective practice, and peer collaboration, leading to higher teaching efficiency and better classroom management through digital tools.

Mahmood, Khalid (2009) – Teacher Attitudes Toward ICT Use in Education
Method: Quantitative survey of secondary school teachers in Pakistan.
Result: Positive teacher attitude towards ICT strongly correlated with readiness to use technology, adoption of innovative methods, and increased self-efficiency in professional tasks.

Sharma, Priya (2018) – ICT Adoption in Indian Higher Education Institutions
Method: Descriptive survey research among college faculty across five states in India.
Result: ICT use improved academic planning, resource sharing, and assessment processes, yet challenges such as lack of infrastructure, limited training, and workload were seen as barriers.

Kumar, Sandeep & Daniel, B. (2020) – Role of ICT in Enhancing Teacher Professionalism
Method: Qualitative interviews with college lecturers using ICT for teaching and professional development.
Result: ICT enabled teachers to access global knowledge networks, participate in online training, enhance classroom innovation, and maintain digital academic records, thereby increasing professional efficiency and empowerment.

RESEARCH OBJECTIVES

- To examine the extent to which ICT tools are used by teachers in planning, instruction, and classroom assessment.
- To analyze how the integration of ICT contributes to teacher empowerment and professional efficiency.
- To explore the challenges faced by teachers during the adoption and use of ICT in teaching–learning processes.
- To identify effective ICT practices that can enhance teacher collaboration, professional development, and overall performance.

RESEARCH QUESTIONS

- To what extent are ICT tools being used by teachers for lesson planning, instructional delivery, and assessment?
- How does the integration of ICT influence teacher empowerment and professional efficiency?
- What challenges do teachers face while adopting and implementing ICT in the teaching–learning process?
- What ICT practices are perceived as most effective in enhancing teacher collaboration, professional development, and performance?

METHODOLOGY

Research Design

This research uses a descriptive, one-time case study design to collect detailed qualitative data from a small, defined

setting. A one-time case study is especially useful for exploratory investigations where the researcher aims to gain a deep understanding of processes and outcomes in a real-life context.

Setting and Participants

The study took place at Bhilai College of IT in Jamul, Bhilai (C.G.), which is affiliated with Hemchand Yadav Vishwavidyalaya, Durg. Three faculty members from the science and teacher-education departments participated. They had voluntarily integrated ICT tools into their teaching for at least one academic semester. The participants were chosen to represent different levels of prior ICT experience: novice, intermediate, and advanced.

Data Collection Methods

Multiple data sources were used to support the findings:

Semi-structured interviews: Each participant took part in a 45 to 60 minute interview that focused on their practices, perceived benefits, and barriers.

Classroom observations: Two observation sessions, one for each participant in different courses, documented classroom dynamics, technology use, and student engagement.

Document analysis: Samples of lesson plans, digital resources, assessment reports, and communication logs were reviewed.

Open-ended questionnaire: A short questionnaire gathered reflective statements about professional efficiency, workload, and collaboration.

Ethical Considerations

Participants gave their informed consent. We kept their anonymity and confidentiality. They were assigned pseudonyms such as Teacher A, Teacher B, and Teacher C. The study followed ethical standards for research involving human subjects.

Data Analysis

Qualitative thematic analysis was used. Researchers coded interview transcripts, observation notes, and documents repeatedly to find patterns in planning, instructional practice, assessment, efficiency, barriers, and enablers. Looking at different sources together improved the credibility of the themes that emerged.

DISCUSSION

Case1:

ICT for Assessment and Timely Feedback Case of Teacher A (Science Faculty): Teacher A initially used traditional paper tests and manual grading. This process took a lot of time and delayed feedback for students. After adopting Google Forms and the college LMS, Teacher A transformed weekly quizzes into short online assessments that the system graded automatically. This change allowed students to get instant feedback and spot their learning gaps sooner. Teacher A noted a 30 to 40% reduction in assessment workload, which created more time for teaching concepts and providing individual support. Using ICT not only made things more efficient but also boosted transparency and student motivation for ongoing learning.

Case 2:

ICT for Lesson Planning and Collaborative Resource Development

Case of Teacher B (Teacher Education Department):

Teacher B had difficulty with repetitive lesson planning and the manual preparation of teaching aids. With help from colleagues, she started using Google Docs, Canva, and shared resource folders for collaborative planning. The department created a digital lesson plan bank that allowed teachers to work together to create and modify teaching materials. This cut down on duplicate efforts and encouraged a culture of sharing best practices. Over time, Teacher B's lesson planning time was reduced by nearly half, and the quality of teaching aids improved significantly. This case shows how ICT supports professional collaboration, innovation, and teamwork among faculty.

Case3:

ICT for Student Engagement and Blended Learning

Case of Teacher C (English and Communication Skills):

Teacher C used ICT tools like short video lectures, interactive PPTs, discussion forums, and WhatsApp announcements to make classroom learning more engaging for first-year college students. Students who were reluctant to speak in class participated actively in online discussion boards and reflective writing tasks. The blended learning model allowed students to learn at their own pace and revisit recorded content as needed. Teacher C saw a noticeable improvement in student engagement, participation, and assignment completion rates. ICT served as a bridge for shy students, promoting inclusive and participatory learning.

Interpretation

The three individual cases together show a clear path of ICT adoption and its impact on teacher empowerment and professional efficiency. Teacher A, a beginner user of ICT, showed that even a little consistent use of digital tools can lead to meaningful changes in their professional life. Starting with traditional methods, Teacher A gradually moved toward better planning and resource preparation by using basic ICT applications like Google Docs and online repositories. The main results for this case were increased confidence, new collaboration with peers, and clearer lesson organization. However, this case also pointed out some early challenges, such as relying on colleagues for technical help and the initial time commitment required, which suggests that structured support from the institution is crucial during the beginning stages of adoption.

In contrast, Teacher B had intermediate proficiency with ICT. This led to a steadier and more effective use of digital tools in teaching. The case clearly showed improvements in formative assessment practices, feedback based on data, and better time management. This was achieved through the consistent use of Google Forms, learning management system evaluation features, and collaborative platforms.

Teacher B's experience shows that once teachers have the basic ICT skills, they start to use technology not just to replace traditional tasks but to improve their teaching and reflect on their practice. This case highlighted the positive impact of ICT on professional independence and decision-making in instruction. It suggested that moderate skill mastery can speed up both efficiency and the ability to innovate among educators.

Finally, Teacher C, as a skilled ICT user, represented the integration stage where technology drives ongoing professional growth, innovative teaching methods, and teamwork among institutions. With the ability to create multimedia learning content, curate digital learning paths, and participate in professional learning networks, Teacher C demonstrated a model of leadership in technology-based instruction. The case showed that when teachers reach higher levels of ICT skills, they not only improve their own effectiveness but also influence and support their peers. However, this case also pointed out systemic obstacles, such as limited institutional infrastructure and unequal access to digital devices for students. This underscores that even advanced individual skills cannot make up for a lack of institutional readiness.

Overall, the interpretation of the three cases shows that ICT integration is a developmental process influenced by individual skill level, institutional support, and contextual limits. Throughout the range—from novice to advanced user—ICT helped teachers improve instructional quality, encourage collaboration, and enhance professional efficiency. However, lasting support needs careful policy actions, ongoing skills training, and infrastructure improvements to ensure fair and scalable ICT-driven change in education.

FINDINGS

Analysis of the three cases showed a pattern in how teachers integrate ICT for their professional growth and efficiency. In Case 1 (Teacher A), the initial use of ICT tools resulted in clear improvements in lesson planning, access to digital

resources, and basic collaboration. Although Teacher A struggled with limited confidence in using ICT and often needed peer support, the case demonstrated that even a little exposure to digital platforms motivated teachers, reduced reliance on manual methods, and improved lesson organization. This suggests that early use of ICT mainly helps build foundational efficiency and confidence.

Case 2 (Teacher B) showed more significant effects of ICT on teaching practices after reaching a moderate skill level. By regularly using ICT for assessments, record-keeping, and delivering feedback, Teacher B managed time better, simplified evaluation processes, and improved communication with students. Using Google Forms and LMS tools allowed for faster grading, data tracking, and prompt feedback. This case confirmed that a moderate skill level helps teachers move from simply replacing traditional tasks to enhancing their teaching methods. This shift leads to more independence, better professional judgment, and greater efficiency in managing the classroom.

Case 3 (Teacher C) showed the crucial stage of ICT integration. With strong skills, the teacher used technology for teaching and assessment, as well as for creating content, improving professionally, and collaborating with peers. Teacher C's talent for designing multimedia instructional materials, using social and professional networks to share knowledge, and mentoring colleagues digitally reflected a high level of technology-driven professional growth. This case demonstrated that strong ICT integration improves teaching innovation, encourages reflective practice, and extends a teacher's influence beyond the classroom to build the institution's capacity. However, it also pointed out systemic issues like inconsistent infrastructure and unequal access for students, suggesting that individual skills alone cannot achieve full change without support from the institution.

RESULTS

The results of the three case studies show that using ICT helped empower teachers and improve their professional

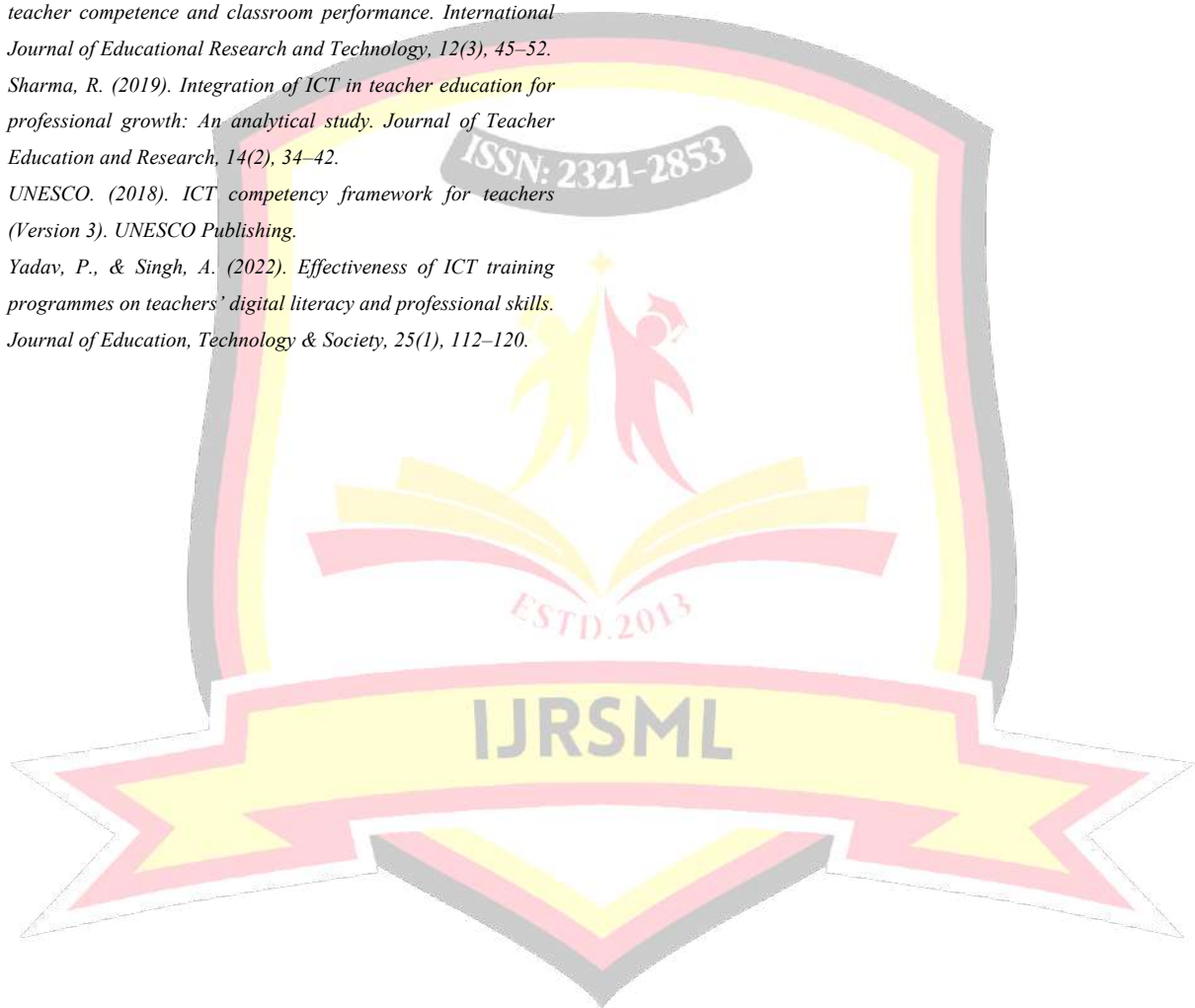
efficiency. However, the level of impact varied based on each teacher's digital skills. In all three cases, adopting ICT improved lesson planning, teaching delivery, and communication with students. At the basic level, using simple digital tools helped teachers organize lesson content better, lower their dependence on handwritten or printed materials, and gain more confidence in using technology for teaching. As teachers moved to moderate levels of ICT use, the results revealed a clear increase in efficiency. This came from using online assessment tools, automated feedback systems, and digital record management, which together lowered their workload and speeded up the completion of academic tasks. Moreover, teachers noted that student engagement increased due to the use of multimedia resources, online quizzes, and interactive platforms.

The results showed that users of advanced ICT experienced the highest level of professional empowerment. These teachers not only improved their classroom instruction but also took the lead in guiding their peers, creating innovative digital learning resources, and joining virtual professional development communities. The use of ICT allowed them to take on more professional roles beyond teaching, including mentoring, content creation, and collaborative planning, which improved overall effectiveness at their institutions. However, the findings also pointed out that the full potential of ICT was limited by systemic challenges. These included restricted access to devices, unreliable internet connections, and insufficient training time within school schedules. Despite these challenges, the results confirm that steady and intentional use of ICT boosts teacher autonomy, strengthens teaching practices, and greatly improves professional efficiency across different levels of expertise.

REFERENCES

- Albirini, A. (2006). *Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers*. *Computers & Education*, 47(4), 373–398.
- Bingimlas, K. A. (2009). *Barriers to the successful integration of ICT in teaching and learning: A review of the literature*. *Eurasia Journal of Mathematics, Science & Technology Education*, 5(3), 235–245.

- Ghavifekr, S., & Rosdy, W. A. W. (2015). *Teaching and learning with technology: Effectiveness of ICT integration in schools. International Journal of Research in Education and Science, 1(2), 175–191.*
- Kumar, P., & Kaur, G. (2020). *Impact of ICT tools on teaching effectiveness and professional development among school teachers. Journal of Education and Practice, 11(5), 57–65.*
- Panda, S., & Mishra, S. (2007). *E-learning in a mega open university: Faculty attitude, barriers and motivation. Educational Media International, 44(4), 323–338.*
- Saxena, D., & Chouhan, M. (2021). *Role of ICT in enhancing teacher competence and classroom performance. International Journal of Educational Research and Technology, 12(3), 45–52.*
- Sharma, R. (2019). *Integration of ICT in teacher education for professional growth: An analytical study. Journal of Teacher Education and Research, 14(2), 34–42.*
- UNESCO. (2018). *ICT competency framework for teachers (Version 3). UNESCO Publishing.*
- Yadav, P., & Singh, A. (2022). *Effectiveness of ICT training programmes on teachers' digital literacy and professional skills. Journal of Education, Technology & Society, 25(1), 112–120.*



Study of Rare Earth Doped Samarium Ferrite Perovskite Nanomaterial

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Abstract

This research investigates the effect of rare-earth europium (Eu) doping on the structural, morphological, and magnetic properties of samarium ferrite (SmFeO_3), a perovskite-type nanomaterial with promising potential for advanced functional applications. SmFeO_3 nanoparticles were synthesized using the solution combustion method, a rapid, cost-effective, and energy-efficient process known for producing fine powders with high phase purity, uniform particle dispersion, and desirable morphology. X-ray diffraction (XRD) confirmed the formation of a single-phase orthorhombic perovskite structure in all samples, while increasing Eu doping levels (0%, 5%, and 9%) led to a gradual reduction in crystallinity, indicating lattice strain and structural distortion without disrupting phase symmetry. Field Emission Scanning Electron Microscopy (FESEM) revealed smaller particle sizes and modified surface morphology with higher Eu concentrations, suggesting enhanced uniformity and refined grain boundaries. Energy-Dispersive X-ray (EDX) spectroscopy verified the successful incorporation of the rare-earth Eu element through the detection of Sm, Fe, O, and Eu. Magnetic analysis using Vibrating Sample Magnetometry (VSM) demonstrated that Eu doping significantly influenced the magnetic behavior, with notable variations in saturation magnetization and coercivity attributed to lattice-induced modifications in magnetic interactions. Overall, the introduction of the rare-earth Eu dopant effectively tailors the structural and magnetic

characteristics of SmFeO_3 nanoparticles, enhancing their potential for spintronic, magnetic, and catalytic applications.

Keywords: Europium doping, Samarium ferrite, Solution combustion method, Structural properties, Magnetic behaviour.

1.0 Introduction

Samarium ferrite (SmFeO_3), a perovskite-type oxide, has attracted significant research interest due to its exceptional magnetic, electrical, and catalytic properties, making it a versatile material for various technological applications such as magnetic sensors, multiferroic devices, gas detectors, and spintronic systems. Spintronics, which operates by utilizing both the charge and spin of electrons, requires materials with high structural stability, tuneable magnetic ordering, and enhanced spin polarization. One effective strategy to achieve these requirements is doping the host perovskite lattice with rare-earth elements, as such modifications can strongly influence the crystal structure and magnetic exchange interactions (Alahmari & Fatima, 2024). Europium (Eu) is particularly suitable as a dopant for SmFeO_3 due to its unique $4f^6$ electron configuration, strong spin-orbit coupling, and ability to exist in multiple oxidation states ($\text{Eu}^{2+}/\text{Eu}^{3+}$), allowing it to regulate charge balance, structural distortion, and defect states. These characteristics make Eu a powerful element for tailoring the magnetic and electronic properties of SmFeO_3 .

Structurally, SmFeO_3 adopts an orthorhombic GdFeO_3 -type perovskite structure (ABO_3), where Sm^{3+} ions occupy the A-site and Fe^{3+} ions are located at the B-site. When Sm^{3+} is partially substituted by Eu^{3+} , local lattice distortions and internal strain are introduced due to the slight difference in ionic radii. These distortions alter the Fe–O–Fe superexchange pathways by changing bond lengths and angles, which enhances spin alignment and improves magnetic ordering—crucial factors for efficient spintronic operation. Europium's incorporation thus not only modifies the structural framework but also optimizes the magnetic coupling interactions, making SmFeO_3 more responsive to external magnetic fields and suitable for advanced functional applications.

In this study, europium doped SmFeO_3 nanoparticles were synthesized using the solution combustion method and subsequently annealed at 800°C to investigate the impact of heat treatment on their structural and magnetic characteristics. X-ray diffraction (XRD) confirmed the formation of a single-phase orthorhombic perovskite structure, along with a gradual reduction in crystallite size as the Eu content increased. Field Emission Scanning Electron Microscopy (FESEM) revealed enhanced grain uniformity and smoother surface morphology, while Vibrating Sample Magnetometry (VSM) measurements demonstrated a substantial improvement in magnetic performance. The observed magnetic enhancement is primarily attributed to lattice strain effects and modifications in the electronic structure induced by europium substitution (Saeidi et al., 2023). Overall, this research establishes europium doped SmFeO_3 as a promising candidate for future spintronic devices, owing to its tuneable structural and magnetic properties.

2.0 Materials and Methods

2.1 Preparation of Europium-Substituted Samarium Ferrite (Eu-Doped SmFeO_3) Nanoparticles Using the Solution Combustion Technique

Samarium ferrite (SmFeO_3) is a perovskite-type oxide renowned for its excellent magnetic, electronic, and catalytic properties. These features can be further optimized through the incorporation of rare-earth ions such as europium (Eu^{3+}), which can introduce lattice distortions, modify electronic states, and influence magnetic exchange interactions. As a result, europium doped SmFeO_3 has attracted attention as a promising material for advanced applications, including spintronic components, magnetic sensing devices, and catalytic systems for environmental remediation. The schematic illustration of the solution combustion synthesis route used for fabricating Eu-doped SmFeO_3 nanoparticles is shown in Fig 1

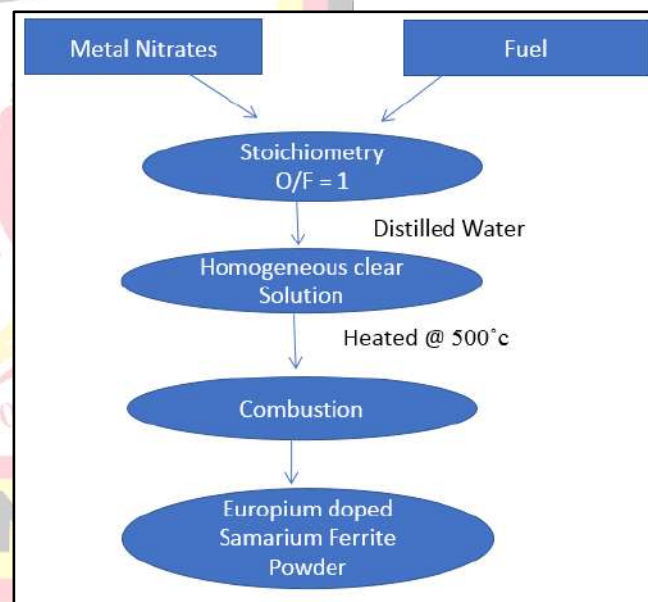


Fig 1: Flow chart for Preparing Barium ferrite by
Solution Combustion Method

In this study, europium-doped samarium ferrite (Eu-doped SmFeO_3) nanoparticles were synthesized using the solution combustion synthesis (SCS) technique—a rapid, energy-efficient, and cost-effective method widely employed for fabricating nanomaterials with controlled stoichiometry, fine particle size, and high phase purity. The schematic representation of the synthesis procedure is shown in Fig 1. Analytical-grade samarium nitrate [$\text{Sm}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$], ferric nitrate [$\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$], and europium nitrate

[Eu(NO₃)₃·6H₂O] were used as precursors without further purification. These nitrates were dissolved in deionized water and thoroughly mixed with a suitable fuel, such as glycine or urea, following redox stoichiometric principles to ensure a balanced combustion reaction. The resulting clear and homogeneous solution was then placed in a preheated muffle furnace maintained between 300 and 600 °C, initiating a vigorous self-propagating exothermic reaction that produced a lightweight, porous, ash-like powder.

The as-combusted powder was collected and finely ground using an agate mortar to obtain a uniform texture, followed by calcination in air at 800°C for 2 to 4 hours. This thermal treatment enhanced crystallinity, eliminated residual organic content, and stabilized the orthorhombic perovskite phase of the synthesized material. Thus, the solution combustion method effectively facilitated the preparation of Eu-doped SmFeO₃ nanoparticles with desirable structural and functional characteristics, rendering them suitable for further physical and chemical characterization.

2.2 Characterization Techniques

A detailed investigation of europium-doped samarium ferrite (SmFeO₃) nanoparticles was performed using multiple state-of-the-art characterization techniques. X-ray diffraction (XRD) was utilized to determine the crystalline structure and estimate the average crystallite size of the prepared samples. Field Emission Scanning Electron Microscopy (FESEM) provided information on the surface morphology, particle dimensions, and textural characteristics of both pure and Eu-doped SmFeO₃. Furthermore, Energy-Dispersive X-ray (EDX) spectroscopy, conducted alongside FESEM, confirmed the elemental composition and validated the incorporation of europium into the SmFeO₃ lattice through the detection of Sm, Fe, O, and Eu peaks. The magnetic characteristics of the nanoparticles were examined using Vibrating Sample Magnetometry (VSM), enabling the evaluation of the effect of Eu doping on parameters such as saturation magnetization and coercivity. An illustrative

schematic of the characterization workflow for Eu-doped SmFeO₃ is shown in Fig 2.

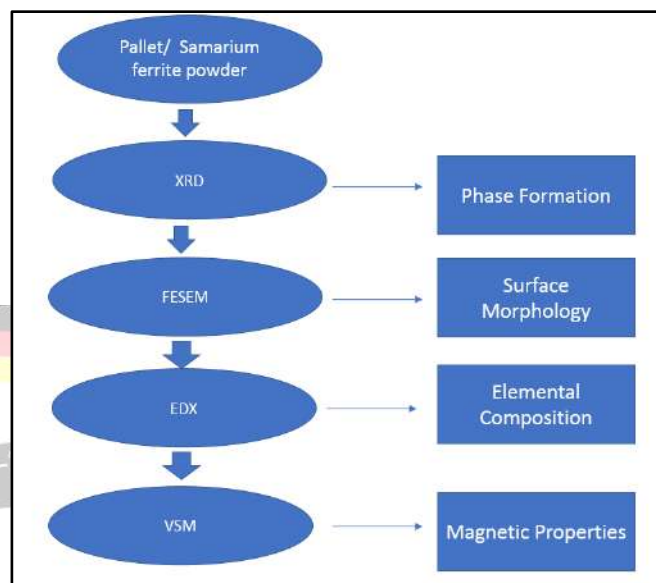


Figure 2: Flow chart of characterizing Eu Doped

SmFeO₃ Nanomaterials

2.2.1 X-ray Diffraction (XRD)

X-ray diffraction (XRD) is an essential analytical technique for investigating nanomaterials, which possess structural features with at least one dimension between 1 and 100 nm. Since the wavelength of X-rays is comparable to atomic dimensions, XRD serves as a highly effective tool for examining the structural characteristics of these materials. It enables precise measurement of atomic spacings and is widely regarded as the preferred method for evaluating strain states in thin films. Furthermore, the intensity data obtained from XRD can be used to derive quantitative and reliable insights into the arrangement of atoms, particularly at material interfaces. So, it was employed to investigate the structural characteristics of europium-doped samarium ferrite (SmFeO₃) nanomaterials. This technique was used to determine key parameters such as crystallographic phase, phase purity, lattice constants, crystallinity, and average crystallite size. The analysis was performed using an X-ray diffractometer equipped with Cu-Kα radiation ($\lambda = 1.5404$ Å). Diffraction patterns were recorded over a 2θ range of

[insert scan range, e.g., 10° – 80°], using optimized scan rates and step intervals to ensure accurate and high-resolution structural information (Sindhu et al., 2024).

When the incident monochromatic X-rays interact with the periodic atomic layers in the crystalline sample, constructive interference occurs at specific angles, resulting in distinct diffraction peaks. This phenomenon is governed by Bragg's law and provides valuable insight into the internal arrangement of atoms within the crystal lattice (Figure 3). Due to the comparable scale of X-ray wavelengths and interatomic spacings, the diffraction process offers detailed information about crystal symmetry and lattice structure (Balta & Simsuk, 2022).

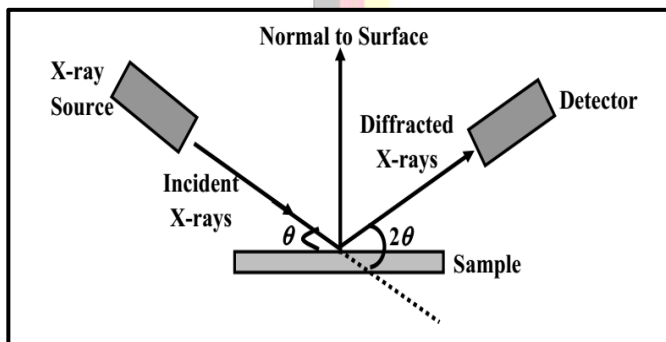


Figure 3: Principle of XRD along (Source: ResearchGate)

The diffraction data is plotted as intensity versus diffraction angle (2θ). By comparing the experimental pattern with JCPDS standard reference data, the phase composition and crystallographic structure of the Eu-doped SmFeO_3 samples were confirmed, indicating the successful formation of a crystalline orthorhombic perovskite phase (Bhat et al., 2024).

To estimate the average crystallite size, the Scherrer equation was applied, which relates the broadening of diffraction peaks to the size of coherently diffracting domains. Paul Scherrer first introduced this concept, identifying that smaller crystallites lead to broader peaks in the XRD pattern. He was among the first to study the influence of limited particle size on diffraction broadening. This led to the formulation of the well-known Scherrer equation, which relates peak broadening to crystallite size and is expressed as:

$$D = \frac{K\lambda}{\beta \cos \theta}$$

where D is the crystallite size (nm), K is the Scherrer constant (typically 0.9), λ is the X-ray wavelength ($1.5404 \text{ \AA}$ for $\text{Cu-K}\alpha$), β is the full width at half maximum (FWHM) in radians, and θ is the Bragg angle.

2.2.2 Field Emission Scanning Electron Microscopy (FESEM)

The schematic representation of the Field Emission Scanning Electron Microscope (FESEM) setup is illustrated in Fig 4. FESEM is a powerful characterization technique widely used for investigating the surface morphology, particle size, and microstructural features of nanomaterials with exceptional spatial resolution. It operates by directing a highly focused and accelerated beam of electrons onto the specimen's surface. As this electron beam interacts with the atoms at or near the surface of the material, various signals are generated—primarily secondary electrons and backscattered electrons—which are then collected by specialized detectors to produce high-resolution images (Achille et al., 2021).

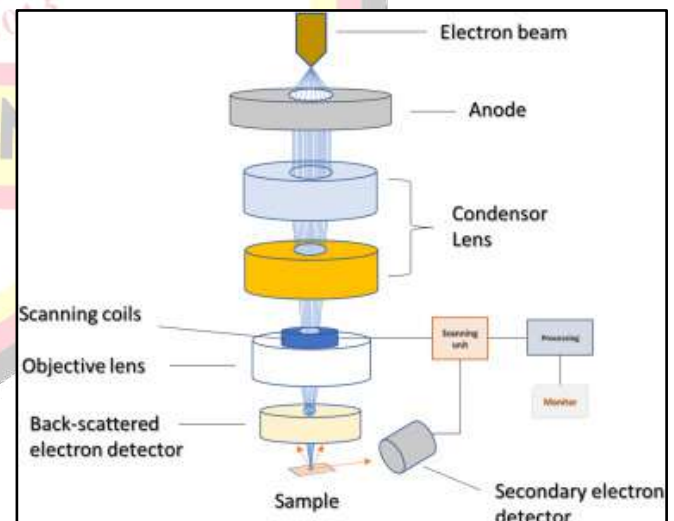


Fig 4: Schematic diagram of Field Emission Scanning

Electron Microscope (Source: ScienceDirect.Com)

Due to its sensitivity to surface features at the nanoscale, FESEM enables the visualization of fine structural details such as grain boundaries, porosity, and agglomeration

patterns. However, since the technique requires the sample to be electrically conductive for optimal imaging, non-conductive materials, such as many ceramic or oxide-based nanomaterials, must be coated with a thin layer of a conductive material—commonly gold or platinum—prior to imaging. This conductive coating prevents charging effects and enhances the quality of the emitted signal.

The secondary electrons emitted from the sample surface typically possess low energies, ranging from 3 to 5 eV. These low-energy electrons are highly sensitive to surface topography and are primarily responsible for generating images that reveal fine-scale surface texture, roughness, and particle distribution. Consequently, FESEM plays a crucial role in nanomaterials research, providing valuable insights into morphological changes induced by doping, synthesis conditions, and post-treatment processes.

2.2.3 Vibrating Sample Magnetometry (VSM)

A schematic representation of the **Vibrating Sample Magnetometer (VSM)** setup is shown in Fig 5. This highly sensitive technique is employed to evaluate the magnetic behaviour of europium-doped **samarium ferrite (SmFeO_3)** nanomaterials. VSM operates on the fundamental principle of **Faraday's Law of Electromagnetic Induction**, which states that a time-varying magnetic field induces an electromotive force (EMF) in a nearby coil.

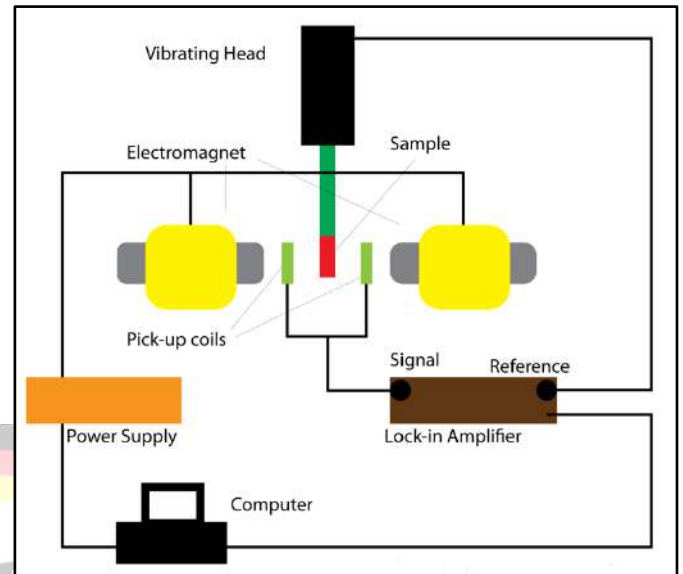


Fig 5: Schematic diagram of vibrating sample magnetometer (Source: Wikipedia)

In this technique, the sample is fixed onto a **vibrating rod or head**, which oscillates sinusoidally, typically at a frequency of around 80–100 Hz, within a uniform magnetic field produced by a pair of **electromagnets**. The oscillation of the magnetized sample causes a periodic change in the magnetic flux through the surrounding **pickup coils**, resulting in an induced voltage that is directly proportional to the **magnetization (M)** of the sample (Khan et al., 2020).

This induced signal is detected and refined using a **lock-in amplifier**, which isolates the desired frequency component of the signal while eliminating background noise and unwanted harmonics. The **reference signal** input ensures synchronization with the vibration frequency, enabling precise detection of weak magnetic signals. The collected data is then transmitted to a **computer system** for real-time processing and graphical representation (Cao et al., 2014).

The resulting output is typically represented as a **magnetization versus applied magnetic field (M–H)** hysteresis loop, which reveals essential magnetic parameters, including **saturation magnetization (M_s)**, **remanent magnetization (M_r)**, and **coercive field (H_c)**. These parameters provide deep insights into the nature of magnetic

ordering, domain behaviour, and the role of Eu^{3+} substitution on the intrinsic magnetic properties of the SmFeO_3 lattice.

Moreover, VSM characterization allows for the distinction between different magnetic regimes such as **ferromagnetism**, **antiferromagnetism**, **superparamagnetism**, or **weak ferromagnetism**, which are highly relevant in the context of nanomaterials. The technique is particularly beneficial for exploring materials for use in **spintronics**, **magnetic storage devices**, **ferrofluids**, and **magneto-optical applications**, making it indispensable for advanced functional materials research Nguyen Thai Son et al., 2024.

3.0 RESULTS AND DISCUSSIONS:

3.1 Structural Analysis

The XRD patterns of undoped and Eu-doped SmFeO_3 samples (Fig. 6) display distinct diffraction peaks characteristic of an orthorhombic perovskite structure. The major reflections correspond to the (220), (311), (400), (511), and (440) planes, which are in good agreement with the standard JCPDS data for SmFeO_3 . The absence of any secondary peaks in both the undoped and 5% Eu-doped samples confirms the successful formation of a single-phase perovskite structure, indicating that Eu^{3+} ions were effectively incorporated into the SmFeO_3 lattice without altering its structural integrity.

However, with increasing Eu concentration to 10% and 15%, additional diffraction peaks appear, particularly within the 2θ range of 20° – 35° and around 50° – 60° , which are absent in samples with lower Eu content. These emerging peaks suggest the presence of secondary phases, likely associated with Eu-rich compounds such as Eu_2O_3 or EuFeO_3 . This finding indicates that excessive europium incorporation exceeds the solid solubility limit of Eu^{3+} in the SmFeO_3 lattice, resulting in dopant segregation and partial phase separation during synthesis.

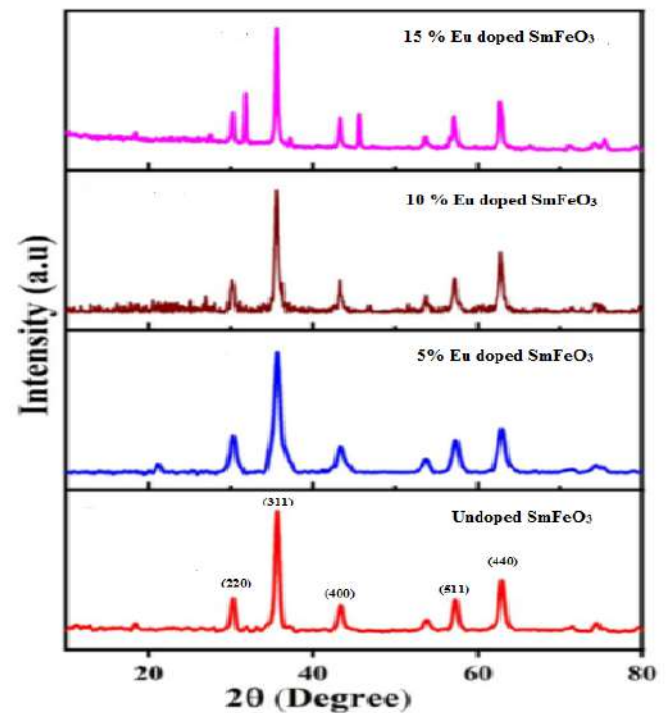


Figure 6: XRD patterns of undoped and doped SmFeO_3

The crystallite size and average crystallite size were calculated using the Debye–Scherrer formula, as detailed below.

$$D = \frac{K\lambda}{\beta \cos \theta}$$

Where K = Shape factor = 0.9

λ = X-ray wavelength = 1.5406 Å (For $\text{Cu K}\alpha$)

Table 1: 0% Eu doped SmFeO_3

Plane (hkl)	2θ (°)	θ (rad)	FWHM (°)	FWHM (rad)	$\cos(\theta)$	Crystallite Size (nm)
(220)	31.2	0.27	2.195	0.038	0.96	34.88
(311)	37.1	0.32	2.035	0.035	0.94	37.41
(400)	42.4	0.37	2.340	0.040	0.93	32.65

(511)	58.1 5	0.50 73	2.135	0.037 2	0.87 42	35.20
(440)	62.7 3	0.54 76	2.080	0.036 4	0.85 32	36.15

The average crystallite size of SmFeO₃ doped with 0% Eu is 35.46 nm.

Table 2: 5 % Eu doped SmFeO₃

Plane (hkl)	2θ (°)	θ (rad)	FWHM M (°)	FWHM M (rad) β	Cos(θ)	Crystallite Size (nm)
(220)	31.23	0.2724	2.505	0.0437	0.9633	30.42
(311)	37.12	0.3240	2.210	0.0388	0.9480	32.41
(400)	42.48	0.3706	2.690	0.0469	0.9328	28.75
(511)	58.15	0.5073	2.455	0.0427	0.8742	30.55
(440)	62.73	0.5476	2.335	0.0406	0.8532	32.43

The average crystallite size of SmFeO₃ doped with 5% Eu is 31.13 nm.

Table 3: 10 % Eu doped SmFeO₃

Plane (hkl)	2θ (°)	θ (rad)	FWHM M (°)	FWHM M (rad) β	Cos(θ)	Crystallite Size (nm)
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(hkl)				β		
(220)	31.23	0.2724	3.00	0.0524	0.9633	25.05
(311)	37.12	0.3240	2.73	0.0479	0.9480	27.12
(400)	42.48	0.3706	3.25	0.0566	0.9328	23.05
(511)	58.15	0.5073	2.95	0.0513	0.8742	25.12
(440)	62.73	0.5476	2.85	0.0495	0.8532	28.76

The average crystallite size of SmFeO₃ doped with 10% Eu is 25.82nm.

Table 4: 15 % Eu doped SmFeO₃

Plane (hkl)	2θ (°)	θ (rad)	FWHM M (°)	FWHM M (rad) β	Cos(θ)	Crystallite Size (nm)
(220)	31.23	0.2724	3.50	0.0611	0.9633	20.25
(311)	37.12	0.3240	2.88	0.0506	0.9480	24.18

(40 0)	42. 48	0.37 06	3.85	0.06 71	0.93 28	18.77
(51 1)	58. 15	0.50 73	3.15	0.05 48	0.87 42	21.23
(44 0)	62. 73	0.54 76	2.96	0.05 14	0.85 32	25.81

The average crystallite size of SmFeO_3 doped with 15% Eu is 22.05 nm.

The X-ray diffraction (XRD) analysis of undoped and Eu-doped SmFeO_3 nanoparticles confirms the formation of an orthorhombic perovskite structure across all samples. As the europium concentration increases, the diffraction peaks become noticeably broader, especially at higher doping levels (10% and 15%), indicating a reduction in crystallite size. Debye–Scherrer-based calculations show a systematic decrease in average crystallite size from 35.46 nm (undoped) to 31.13 nm (5% Eu), 25.82 nm (10% Eu), and 22.05 nm (15% Eu). This trend is primarily attributed to the substitution of Sm^{3+} ions (1.08 Å) with slightly larger Eu^{3+} ions (1.12 Å), which introduces lattice strain and local distortions. These microstructural disturbances increase the system's internal energy and hinder the atomic diffusion required for grain growth during combustion synthesis.

Apart from the ionic radius mismatch, Eu^{3+} doping leads to the generation of structural defects such as oxygen vacancies and dislocations. These defects act as effective barriers to grain boundary migration and coalescence, thereby limiting crystal growth. Moreover, the presence of Eu^{3+} ions at grain boundaries acts as a pinning mechanism, restricting grain mobility and promoting the formation of finer crystallites. These combined effects—lattice distortion, defect formation, and grain boundary pinning—collectively contribute to the refinement of crystallite size. The progressive broadening of

diffraction peaks across key planes (220), (311), (400), (511), and (440) aligns with this observation and confirms the crystallite size reduction in accordance with the Scherrer equation.

At higher doping concentrations, especially at 15%, additional diffraction peaks begin to appear in the XRD patterns, signaling the emergence of secondary phases. This is likely due to the oversaturation of Eu^{3+} ions beyond their solubility limit in the SmFeO_3 lattice, resulting in the segregation of excess dopants. These secondary phases may correspond to Eu-rich compounds such as Eu_2O_3 or EuFeO_3 , indicating phase instability in the host matrix. Thus, while low to moderate Eu doping ($\leq 10\%$) maintains the single-phase perovskite structure and enhances crystallite refinement, excessive doping ($>10\%$) disrupts structural uniformity and promotes the development of multiphase systems.

In summary, Eu doping in SmFeO_3 nanoparticles significantly alters the crystallographic characteristics, leading to reduced crystallite size due to strain effects, defect formation, and grain boundary pinning. The XRD data reflect these changes through systematic peak broadening. However, excessive doping introduces structural instability and secondary phase formation, highlighting the importance of optimizing Eu concentration to maintain phase purity while enhancing nanoscale features.

3.2 Morphology Analysis

Fig 7 shows the FESEM images of doped and undoped SmFeO_3

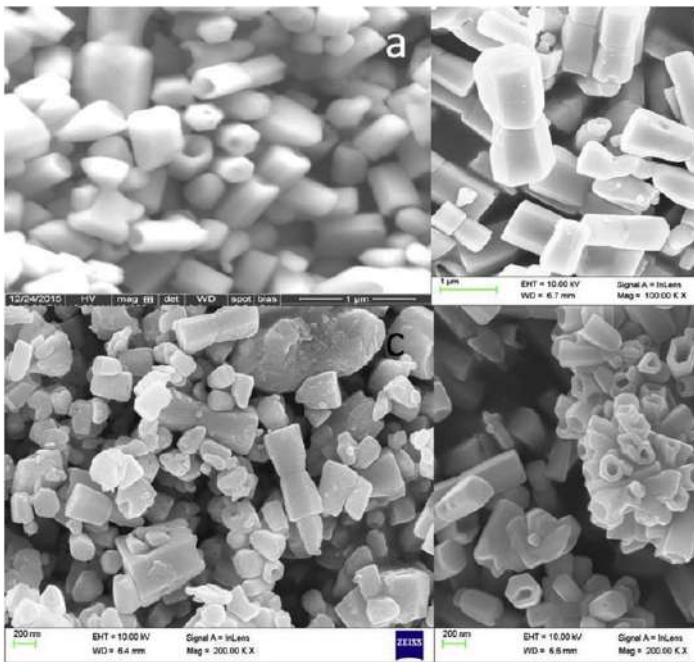


Fig 7: FE-SEM images of (a) 0% Eu doped SmFeO₃, (b) 5% Eu doped SmFeO₃

(c) 10% Eu doped SmFeO₃ and (d) 15 % Eu doped SmFeO₃ samples calcined at 800 °C.

The surface morphology of the synthesized SmFeO₃ and Eu-doped SmFeO₃ nanoparticles was thoroughly investigated using Field Emission Scanning Electron Microscopy (FESEM). The corresponding micrographs for varying europium doping concentrations (0%, 5%, 10%, and 15%) are presented in Figure 7a to 7d. The images reveal significant variations in particle shape, size distribution, surface texture, crystallite definition, and agglomeration behaviour as a function of europium content. These morphological changes clearly indicate that Eu³⁺ doping plays a crucial role in modifying the nucleation and growth dynamics during the combustion synthesis process. The substitution of Eu ions into the SmFeO₃ lattice likely alters the thermodynamic and kinetic parameters of particle formation, thereby influencing the crystallization pathway, particle anisotropy, and degree of porosity. Such structural evolution with increasing dopant concentration provides insight into the relationship between dopant-induced lattice distortion and the resulting microstructural features, which are vital for tailoring the

material's functional properties in magnetic and electronic applications.

Figure 7a: 0% Eu-doped SmFeO₃

The FESEM image of the undoped SmFeO₃ sample (Fig 7a) exhibits a relatively compact and densely packed microstructure. The particles appear to be irregularly shaped with a tendency toward polygonal and rounded geometries. A high degree of agglomeration is observed, which is characteristic of nanoparticles due to their high surface energy and tendency to minimize surface free energy through aggregation. The grain boundaries are not distinctly defined, and the overall surface appears rough and uneven. The particle sizes are mostly in the submicron range, with some variation in size distribution. The compact nature and limited porosity indicate incomplete control over particle growth in the absence of doping, likely due to random grain fusion during the combustion reaction. Such a morphology may result in restricted magnetic domain wall movement due to dense particle arrangement and high intergranular connectivity.

Figure 7b: 5% Eu-doped SmFeO₃

Upon doping with 5% Eu (Figure 7b), the microstructure undergoes a clear transformation. The particles display well-defined rod-like and cylindrical morphologies with smooth surfaces and sharp edges, suggesting enhanced crystalline order. These elongated particles are more uniformly distributed with improved separation between individual grains, indicating reduced agglomeration compared to the undoped sample. The presence of rod-shaped particles points toward anisotropic crystal growth, likely driven by the substitution of smaller Eu³⁺ ions into the Sm³⁺ sites, which alters the lattice strain and growth kinetics. The particle alignment and uniform shape reflect better phase development and structural integrity. The enhanced crystallinity and reduced agglomeration may contribute to improved magnetic coupling between grains, leading to superior magnetic performance due to minimized grain

boundary scattering and more effective magnetic domain interactions.

Figure 3c: 10% Eu-doped SmFeO_3

With an increase in europium content to 10% (Fig 7c), the particles become finer and more uniformly distributed across the surface. The morphology shifts toward smaller, well-dispersed grains with mostly equiaxed or slightly faceted polygonal shapes. The average particle size decreases significantly, and the level of agglomeration is further minimized. The overall microstructure appears more homogenous and compact, reflecting controlled nucleation and inhibited grain growth during synthesis. This improvement is likely due to the role of Eu^{3+} in reducing the grain coarsening rate by introducing local lattice distortions that hinder long-range diffusion during crystallization. The refined nanostructure is expected to enhance magnetic behavior due to increased surface area, reduced grain size, and the enhanced contribution of surface spins. Moreover, the fine grain size and uniform distribution can improve magneto-electric and catalytic functionalities, making this composition promising for multifunctional applications.

Figure 7d: 15% Eu-doped SmFeO_3

At a higher doping level of 15% Eu (Figure 7d), the FESEM image reveals a distinctly different and more complex surface morphology. The particles exhibit a mixed structure consisting of ultrafine grains and elongated rod-like entities with prominent edges and facets. A moderately porous structure is evident, likely due to increased lattice distortion caused by the excessive substitution of Eu^{3+} ions into the SmFeO_3 matrix. This high doping level may induce strain and disrupt the uniform lattice framework, leading to the formation of voids and non-uniform grain growth. The distribution of particle sizes appears broader, with both nano- and micro-sized features coexisting. Despite some degree of secondary agglomeration, the surface remains relatively open and porous compared to lower doping levels. Such morphology can enhance magnetic anisotropy and surface

reactivity due to the increased surface-to-volume ratio and higher defect density. The observed porosity and diversified grain structure may also contribute positively to catalytic and spintronic applications by facilitating better charge transport and active surface interactions.

In summary, the FESEM analysis clearly demonstrates that europium doping significantly influences the morphological features of SmFeO_3 nanoparticles. The progression from dense, agglomerated grains in the undoped sample to more refined, porous, and well-dispersed particles at higher Eu concentrations reflects the dopant's role in modulating grain growth, crystallinity, and surface properties. These changes in microstructure are expected to impact the material's magnetic, electrical, and catalytic performance, making europium doped SmFeO_3 a promising candidate for multifunctional device applications.

3.2 Magnetic Analysis

The magnetic behaviour of pure and europium (Eu)-substituted SmFeO_3 nanoparticles was examined using a Vibrating Sample Magnetometer (VSM), as depicted in Figure 8. Magnetization–field (M–H) measurements were carried out at room temperature (300 K) within an applied magnetic field range of $\pm 15,000$ Oe. The resulting hysteresis loops reveal that all samples display weak ferromagnetism, a typical property of rare-earth orthoferrites. This magnetic response arises from the canted antiferromagnetic arrangement of Fe^{3+} spins, which is induced by the Dzyaloshinskii–Moriya (DM) interaction. An evident enhancement in saturation magnetization (M_s) is observed with increasing Eu content, suggesting that the replacement of Sm^{3+} ions by Eu^{3+} ions notably influence the magnetic ordering within the SmFeO_3 structure.

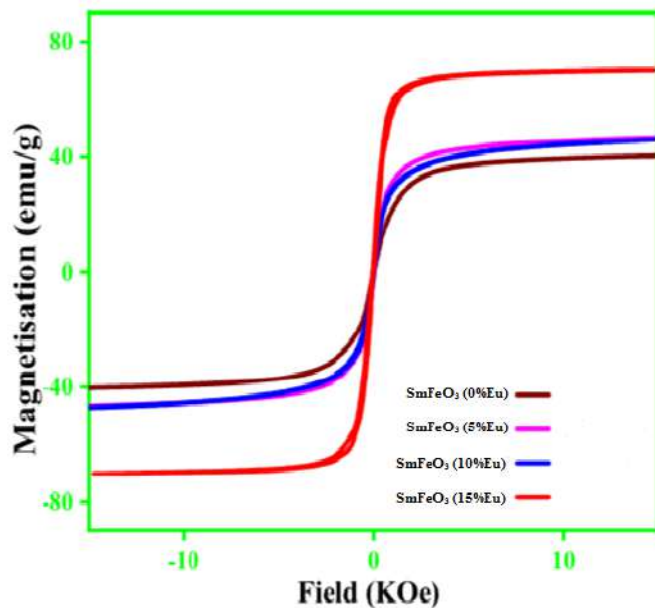


Fig 8: Field dependence of magnetization measured at 300 K.

Quantitatively, the saturation magnetization values extracted from the M–H curves are approximately 43 emu/g for undoped SmFeO_3 , increasing to 47 emu/g for the 5% Eu-doped sample, 50 emu/g for the 10% Eu-doped sample, and reaching a maximum of 71 emu/g for the 15% Eu-doped composition. This continuous enhancement in magnetic response can be attributed to several factors. First, the substitution of Sm^{3+} ions (ionic radius $\sim 1.08 \text{ \AA}$) with slightly larger Eu^{3+} ions (ionic radius $\sim 1.12 \text{ \AA}$) introduce lattice distortions, which affect the Fe–O–Fe superexchange pathways. These distortions lead to an increase in spin canting, thereby contributing to a higher net magnetic moment. Secondly, Eu doping is likely to introduce oxygen vacancies to maintain charge neutrality in the lattice. The presence of these vacancies can facilitate the partial reduction of Fe^{3+} to Fe^{2+} ions, promoting double exchange interactions ($\text{Fe}^{3+}\text{--O}^{2-}\text{--Fe}^{2+}$), which enhance ferromagnetic coupling.

Furthermore, the observed decrease in crystallite size with increasing Eu content, as confirmed by X-ray diffraction analysis, plays a critical role in enhancing the magnetic properties. Smaller nanoparticles have a higher surface-to-volume ratio, leading to a larger proportion of surface atoms with uncompensated spins, which contributes to the overall magnetization. Additionally, the presence of Eu^{3+} ions at

grain boundaries can suppress magnetic domain wall motion and improve the alignment of magnetic moments under an applied field. The combination of lattice strain induced defects, oxygen non-stoichiometry, and nanoscale effects work synergistically to amplify the magnetic response of the system. In conclusion, the M–H measurements at 300 K clearly show that Eu doping enhances the magnetic performance of SmFeO_3 nanoparticles, making them promising candidates for magnetic storage, sensors, and spintronic applications.

CONCLUSION:

In this study, europium doped SmFeO_3 nanocrystals were successfully synthesized via the solution combustion method, followed by sintering at 800°C to enhance crystallinity, phase stability, and structural integrity. X-ray diffraction (XRD) confirmed the formation of a single-phase orthorhombic perovskite structure with high purity for all compositions. The observed peak broadening and gradual reduction in crystallite size with increasing Eu content indicated lattice distortion caused by substituting smaller Sm^{3+} ions ($1.08 \text{ \AA}$) with slightly larger Eu^{3+} ions ($1.12 \text{ \AA}$), which introduced internal strain and influenced grain growth. Field Emission Scanning Electron Microscopy (FESEM) showed agglomerated yet uniformly distributed nanoparticles, with a noticeable decrease in particle size upon higher Eu doping, suggesting that europium incorporation suppresses grain growth by creating structural defects and oxygen vacancies. Energy-Dispersive X-ray Spectroscopy (EDX) confirmed the presence of Sm, Fe, O, and Eu elements, verifying the successful substitution of Eu^{3+} within the SmFeO_3 lattice without compromising phase purity. Magnetic characterization using a Vibrating Sample Magnetometer (VSM) at 300 K revealed weak ferromagnetic behaviour for all samples, with enhanced magnetization at higher Eu concentrations. This improvement is attributed to Eu^{3+} -induced lattice distortions, modified Fe–O–Fe exchange interactions, and oxygen vacancies that promote spin canting, thereby increasing the net magnetic moment. Overall, the

study demonstrates that controlled europium doping effectively tailors the structural, morphological, and magnetic properties of SmFeO_3 nanoparticles, highlighting their potential for next-generation magnetic storage, sensor, and spintronic applications.

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Conflict of interest:

The authors declare that there is **no conflict of interest** regarding the publication of this manuscript.

REFERENCES:

- Alahmari, A. A., Khan, M., Ahamad, T., & Alshehri, S. M. (2024). Nb-doped MnFeO_3 as a high-performance electrocatalyst for oxygen evolution reaction. *Journal of Alloys and Compounds*, 940, 168946. <https://doi.org/10.1016/j.jallcom.2023.168946>.
- Alahmari, S. D., & Fatima, A. (2024). Improvement in electrochemical performance of MnFeO_3 using Nb-doping strategy for oxygen evolution reaction. *The European Physical Journal Plus*, 139(12). <http://dx.doi.org/10.1140/epjp/s13360-024-05868-8>.
- Balta, Z., & Simsuk, E. B. (2022). Understanding the structural and photocatalytic effects of incorporation of hexagonal boron nitride whiskers into ferrite-type perovskites (BiFeO_3 , MnFeO_3) for effective removal of pharmaceuticals from real wastewater. *Journal of Alloys and Compounds*, 898. <https://doi.org/10.1016/j.jallcom.2021.162897>.
- Bhat, F. A., Qureshi, M. M., & Reshi, B. I. (2024). Structural and photoluminescence properties of Eu^{3+} doped SrSnO_3 perovskite phosphors for optoelectronic applications. *Materials Today Communications*, 38, 107293. <https://doi.org/10.1016/j.mtcomm.2024.107293>.
- Brozek-Mucha, Z. (2007). Comparison of cartridge case and airborne GSR—a study of the elemental composition and morphology by means of SEM-EDX. *X-Ray Spectrometry*.
- Cao, S., Zhao, H., Kang, B., Zhang, J., & Ren, W. (2014). Temperature induced spin switching in SmFeO_3 single crystal. *Scientific Reports*, 4, Article 5960.
- Fatimah, S., et al. (2022). How to calculate crystallite size from X-ray (XRD) using Scherrer method. *ASEAN Journal of Science and Engineering*.
- Holzwarth, U., & Gibson, N. (2011). The Scherrer equation versus the 'Debye-Scherrer equation'. *Nature Nanotechnology*, 6(9), 534. <https://doi.org/10.1038/nnano.2011.145>.
- Khalik, & Anwar. (2013). Vibrating sample magnetometry: Analysis and construction. 2013. <https://doi.org/10.1016/j.jmmm.2006.11.200>.
- Khan, A. A., Ahlawat, A., Deshmukh, P., Dani, D., Singh, R., Karnal, A. K., & Satapathy, S. (2020). Effect of Sm doping on structure, dielectric, and magnetic properties of GdFeO_3 . *Ceramics International*, 46(12), 19734–19741. <https://doi.org/10.1016/j.ceramint.2020.04.005>.
- Li, Q., Xuan, Y., & Yang, G. (2007). Synthesis and magnetic properties of Mn-Zn ferrite nanoparticles. *Journal of Magnetism and Magnetic Materials*, 312(2), 464–469.
- Mohamed, W., & Abu-Dief, A. M. (2020). Impact of rare earth europium (RE-Eu^{3+}) ions substitution on microstructural, optical, and magnetic properties of $\text{CoFe}_{2-x}\text{Eu}_x\text{O}_3$ nanosystems. *Ceramics International* 46(10), 15987–15995. <https://doi.org/10.1016/j.ceramint.2020.03.175>.
- Nguyen Thai Son, N. A., Tomina, E. V., Le Thi Thanh Thuy, Vu Thi Ngoc Anh, Tran Dinh Trinh, & Thanh Son Cam. (2024, November 21). Structural, magnetic, and optical properties of perovskite-like SmFeO_3 nanoparticles obtained from the co-precipitation method. *Journal of Materials Science: Materials in Electronics*. Advance online publication. <https://doi.org/10.1177/02670836241299702>.
- Nabi, A., Bi, W., Sofi, S. A., Syed, I. S., Tomar, R., Abd-Rabbob, H. S. M., & Shafi, A. (2024). Europium-doped SrSnO_3 perovskite: Structural, spectroscopic, and luminescent characterization for advanced lighting technologies and beyond. *Energy & Fuels*, 38(24). <http://dx.doi.org/10.1021/acs.energyfuels.4c04141>.
- Nandee, R., Chowdhury, M. A., Hossain, N., Rana, M., Mobarak, M. H., & Khandaker, M. R. (2024). Surface topography and surface morphology of graphene nanocomposite by FESEM, EDX and AFM analysis. *Nano-Structures & Nano-Objects*, 38(8), 101170. <https://doi.org/10.1016/j.nanoso.2024.101170>.
- Nguyen, T. A., Pham, T. L., Mittova, I. Y., Mittova, V. O., Nguyen, T. L. T., Nguyen, H. V., & Bui, V. X. (2021). Co-doped NdFeO_3 nanoparticles: Synthesis, optical, and magnetic properties study. *Nanomaterials*, 11(4), 937–949.
- Nguyen, T. A., Pham, T. L., Mittova, I. Y., Mittova, V. O., Nguyen, T. L. T., Nguyen, H. V., & Bui, V. X. (2021). Co-doped NdFeO_3 nanoparticles: Synthesis, optical, and magnetic properties study. *Nanomaterials*, 11(4), 937–949.
- Niazi, A., Poddar, P., & Rastogi, K. A. (2000). A precision, low-cost vibrating sample magnetometer. *Current Science*.

- Remya, K. P., Prabhu, D., Joseyphus, J., Bose, A. C., Viswanathan, C., & Nagamony, P. (2020). Tailoring the morphology and size of perovskite BiFeO_3 nanostructures for enhanced magnetic and electrical properties. *Materials & Design*, 192, 108694. <https://doi.org/10.1016/j.matdes.2020.108694>
- Saeidi, H., Mozaffari, M., Ilbey, S., Dutz, S., Zahn, D., & Azimi, G. (2023). Effect of europium substitution on the structural, magnetic and relaxivity properties of Mn–Zn ferrite nanoparticles: A dual-mode MRI contrast-agent candidate. *Nanomaterials*, 13(2), 331. <https://doi.org/10.3390/nano13020331>
- Saeidi, N., Hadipour, N. L., & Abdolmaleki, A. (2023). Europium-substituted Mn–Zn ferrite nanoparticles for MRI contrast enhancement: Structural and magnetic investigation. *Materials Chemistry and Physics*, 302, 127668. <https://doi.org/10.1016/j.matchemphys.2023.127668>
- Sain, S., Kar, A., Patra, A., & Pradhan, S. K. (2014). Structural interpretation of SnO_2 nanocrystals of different morphologies synthesized by microwave irradiation and hydrothermal methods. *CrystEng Comm*, 16(6), 1079-1088. <https://doi.org/10.1039/c3ce42281j>
- Sindhu, T., Ravichandran, A. T., Robert Xavier, A., Sofiya, K., & Kumaresavanji, M. (2024). Impact of Gd doping on structural and magnetic characteristics of SrFeO_3 perovskite nanomaterial. *Journal of Physics: Condensed Matter*, 36(50), 505809. <https://doi.org/10.1088/1361-648X/ad7b94>



Cyberbullying, Online Harassment, and the Dynamics of Social Justice Discourse in Digital Spaces

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ABSTRACT

This paper examines how cyberbullying, online harassment, and social-justice discourse intersect in today's digital world. Using insights from communication studies, psychology, and digital media research, the study explores how online platforms can both encourage harmful behavior and support social advocacy, often blurring the boundary between empowerment and aggression. Three key issues are highlighted: the unequal impact on marginalized groups, the role of anonymity and platform dynamics in exacerbating harassment, and the complex nature of social-justice movements that can unintentionally promote exclusionary practices. Drawing on a social-ecological framework, the paper proposes frameworks for encouraging ethical and equitable online communication without relying solely on punitive responses. Implications for education, digital policy, and platform design are discussed, aiming to reduce harm while protecting free speech.

KEYWORDS- Social justice, digital policy, social media, cyber crime

INTRODUCTION

The rapid evolution of digital technologies and social media has transformed how individuals communicate and engage with social issues. Platforms such as Facebook, Twitter, Instagram, Reddit and others offer unprecedented opportunities for activism, community-building and awareness-raising about issues of race, gender, sexuality, and class. At the same time, however, these same spaces facilitate new forms of aggression: cyberbullying, online harassment,

hate speech, doxing, impersonation and sharing of images without consent. While social justice discourse — defined as communication aimed at challenging structural inequalities — holds great promise, it also encounters significant contradictions when its tools and practices overlap with harmful behaviors.

Cyberbullying is typically conceptualized as repeated, intentional acts of aggression via digital means, often targeting vulnerable individuals (e.g., young people, minority groups). Online harassment is a broader term; it encompasses both repeated and one-off acts (such as hate speech, doxing, or impersonation) that use digital technology to threaten, humiliate or silence others. Meanwhile, social justice discourse seeks to challenge inequities but may, when practiced online, become entangled with dynamics of moral outrage, public shaming, exclusion, or 'call-out' culture at times replicating the aggression it claims to challenge.

This paper argues that while digital platforms provide new avenues for empowerment and marginalized voices to be heard, they also embed risk: the same affordances (anonymity, networked virality, algorithmic amplification) that support activism can also fuel harassment. By applying a social-ecological theoretical framework we map how individual, community and structural factors intersect in digital spaces. We also explore how social justice movements online can inadvertently replicate patterns of harm through psychological and group-level dynamics such as projection, groupthink or narcissistic defensiveness. In doing so, we contribute to the emergent field of digital media ethics and propose frameworks designed to support ethical, equitable online communication without depending purely on punishment or censorship.

LITERATURE REVIEW

Defining and Differentiating Cyberbullying and Online Harassment

The literature on cyberbullying has expanded rapidly in recent years. As National Institute of Justice observes, one of the major hurdles is definitional inconsistency: many studies of cyberbullying fail to articulate clear criteria such as intent to harm, repetition, power imbalance and use of technology. According to Ray (2024), in a review of 71 papers from 2007–2022, there were notable variations in how cyberbullying was defined, and most frameworks lacked consensus.

As Ray (2024) summarizes: “cyberbullying is a global problem and a distinct form of bullying that includes repetition; power imbalance; intent; and harm.” In contrast, the broader term online harassment includes one-time acts or forms of aggression beyond the repeated bullying modelsuch as doxing, impersonation, or posting non-consensual images. The line between cyberbullying and harassment can blur, especially when social media virality or networked group behavior escalate an incident beyond the “traditional bullying” paradigm.

Cyberbullying is often described as an extension of traditional school bullying but amplified by digital affordances anonymity, easy access, unlimited audiences, permanence of content. For example, research shows more than one-third of youth report some form of online bullying experience. The work of Aizenkot (2020) on WhatsApp discourse demonstrates that digital spaces blur distinctions between “public” vs “private” harassment.

The consequences of these behaviors are significant. Victims often report emotional distress, anxiety, depression, diminished self-esteem and social isolation. For example, the chapter “Cyberbullying and Social Media” notes outcomes of cyberbullying among adolescents including increased suicidal ideation and lower self-esteem.

The Role of Social Justice Discourse

Social justice discourse in digital spaces is complex. On one hand, it offers tools for marginalised groups to articulate their experiences, build community, raise awareness and challenge structural oppression. On the other hand, the same tools may become vehicles for exclusionary practices, moral policing or mob-style public shaming.

From a communication perspective, online activism often leverages the affordances of digital platforms for mobilizing collective voices. Yet within such activism there may exist power dynamics, in-group/out-group formation, and moral grandstanding phenomena also documented in psychology and group-behavior research. For instance, individuals with “dark triad” personality traits (narcissism, Machiavellianism, psychopathy) may adopt social justice causes to gain moral capital or manipulate others, rather than authentically promote equity. Ray (2024) links cyberbullying and online harassment to manifestations of Machiavellianism and psychopathy in adult populations.

In online social justice settings, “call-out culture” can overlap with harassment. While intended to hold people accountable, public shaming campaigns may mobilise coordinated negativity — effectively resembling cyberbullying. The tension lies in distinguishing accountability from vengeance, advocacy from aggression, empowerment from exclusion.

Thus, social justice discourse functions in two interlinked yet contradictory ways: as a protective/empowering tool for marginalized voices, and as a weaponized platform for digital aggression. The boundary between the two is neither fixed nor self-evident; it depends on context, power relations, audience, and platform dynamics.

Impacts and Vulnerabilities

The impacts of cyberbullying and online harassment are widespread and unequal across populations. Globally, vulnerable groups — such as LGBTQ+ youth, racial and ethnic minorities, women, neurodiverse individuals, and those with prior trauma histories — are disproportionately victimized.

For example, studies have shown that in many countries, minority students choose stronger moderation policies due to low trust in existing systems. In Saudi Arabia, university students who experienced digital bullying reported high psychological distress, and social support was found to mitigate some harm. (Khursheed & Hamid, 2023)

Other research shows that those who experience early trauma or neglect are more likely to become involved in online aggression later — either as victims or perpetrators — demonstrating the overlap between psychological and social-ecological factors.

At the individual level, low empathy, impulsivity, and previous victimization correlate with higher perpetration of cyberbullying. The anonymity and reduced social cues in digital spaces amplify disinhibition, enabling more aggressive behavior than would occur in face-to-face interactions. For example, deindividuation associated with anonymity has been identified as a key accelerator of online bullying.

From a structural perspective, algorithmic amplification, platform affordances (share, forward, “like”), and mass connectivity facilitate both rapid spread and virality of harassment. Platforms may inadvertently reward outrage, negativity or visibility, creating incentives for malicious behavior disguised as activism or moral policing.

Critically, the notion of power imbalance remains central: although digital spaces may appear equalizing (anyone can post), disparities remain. Marginalized individuals are often less protected, more frequently targeted, and have fewer resources to respond. Furthermore, within social justice discourse, minority voices may be mis-characterized (e.g., “aggressive” or “emotional”) due to cultural bias, thereby reinforcing digital inequality.

Theoretical Framework and Analysis

This study uses two principal theoretical lenses: critical social theory and the social-ecological model adapted for digital spaces.

The social-ecological model, originally developed for public health, emphasises multiple layers of influence: the individual (intrapersonal), the interpersonal/community, and the structural/policy level. In digital contexts:

Individual level: psychological traits (projection, low empathy, dark triad), past trauma, online habits.

Community level: group norms, online peer networks, activism communities, fandoms, “call-out” groups.

Structural level: platform design (anonymity, share functions, algorithmic curation), corporate policy, national digital regulation, cultural norms around justice and discourse.

In applying this model, we examine how digital social justice communities may themselves form communities with norms, rewarding “rightness” and punishing deviation — sometimes through public shaming or exclusion. At the same time, structural factors such as anonymity and viral sharing amplify harm.

From a critical social theory viewpoint, we situate online harassment and social justice discourse within broader systems of power, culture, and ideology. Social justice movements aim to challenge inequality, yet they operate in digital spaces governed by capitalist platforms, surveillance logics, and visibility economies. The digital activism that purports to empower may paradoxically replicate hierarchical, exclusionary, or punitive practices.

For example, within activist online communities, individuals may alternate between praise and harsh public criticism — a dynamic resembling “moral maintenance” rather than genuine dialogue. This resembles the group-psychological phenomenon of projection: unacknowledged aggression within the group is projected outward onto those perceived as “incorrect” or “unjust.” Moreover, groupthink and echo-chamber dynamics can reduce reflexivity, emphasize purity of belief, and sanction dissent — practices that run counter to inclusive, empathetic dialogue.

Additionally, concepts from psychology such as the Dark Triad help explain how some individuals may exploit social justice discourse online for self-promotion, moral signaling or aggression masked as accountability. The literature indicates that traits like narcissism, Machiavellianism and psychopathy correlate with higher rates of cyberbullying or harassment in online settings.

Thus, the interplay of individual vulnerabilities, community norms, and structural affordances produces a complex field in which empowerment and aggression are entwined. The boundary between “raising awareness” and “weaponizing justice” becomes difficult to maintain.

DISCUSSION

Given the preceding analysis, addressing cyberbullying, online harassment, and the dynamics of social justice discourse in digital spaces requires multi-layered, nuanced interventions rather than simply punitive responses or censorship.

1. Education and digital literacy:

At the individual and community levels, education programs should focus not only on recognizing harassment but also on fostering empathy, emotional awareness, critical reflection, and dialogue skills. For instance, youth education might include modules on online ethics, dealing with moral outrage, and recognizing when activism becomes exclusion. Trauma-informed approaches are especially important for vulnerable populations.

2. Platform and design interventions:

At the structural level, platform design should incorporate trauma-informed moderation: not simply automated shutdowns or flagging, but user-led reporting, contextual nuance (e.g., what is accountability vs harassment?), and algorithmic architectures that don't reward outrage. For example, relying solely on real-name policies may suppress vulnerable voices and expose marginalized users to greater risk, so design must consider privacy, choice and safety. As Cowie & Myers (2023) indicate in “Cyberbullying and

Online Harms”, inclusive policy must empower rather than silence.

3. Social justice praxis in online settings:

Activist communities must reflect on how their digital practices may reproduce patterns of exclusion or aggression. Mechanisms such as structured dialogue, peer-mediated moderation, and restorative rather than retributive accountability can help. Recognizing that moral outrage may energize action but also polarize relationships is key.

4. Policy frameworks and collective responsibility:

Governments and NGOs should adopt frameworks that recognize the relational and ecological nature of digital harm. Policies should emphasize prevention, education and community norms rather than simply punitive enforcement. Furthermore, moderation policy must consider cross-jurisdictional issues, platform power, and marginalized user voices.

5. Research and future directions:

Future research should prioritize long-term, cross-cultural, and mixed-method studies exploring how digital activism, identity, and aggression evolve. As Ray (2024) notes, adult populations and non-youth demographics remain understudied in cyberbullying research. There is also a gap around how social justice discourse specifically interacts with harassment dynamics, especially in non-Western contexts.

CONCLUSION

In digital spaces, the same platforms designed for empowerment, connection, and activism can also become arenas for harm, exclusion and aggression. The paradox of social justice discourse in digital environments lies in this dual potential: while aimed at redressing inequality, it can replicate exclusionary, punitive or aggressive dynamics when mediated through anonymous, networked, algorithmically-driven systems.

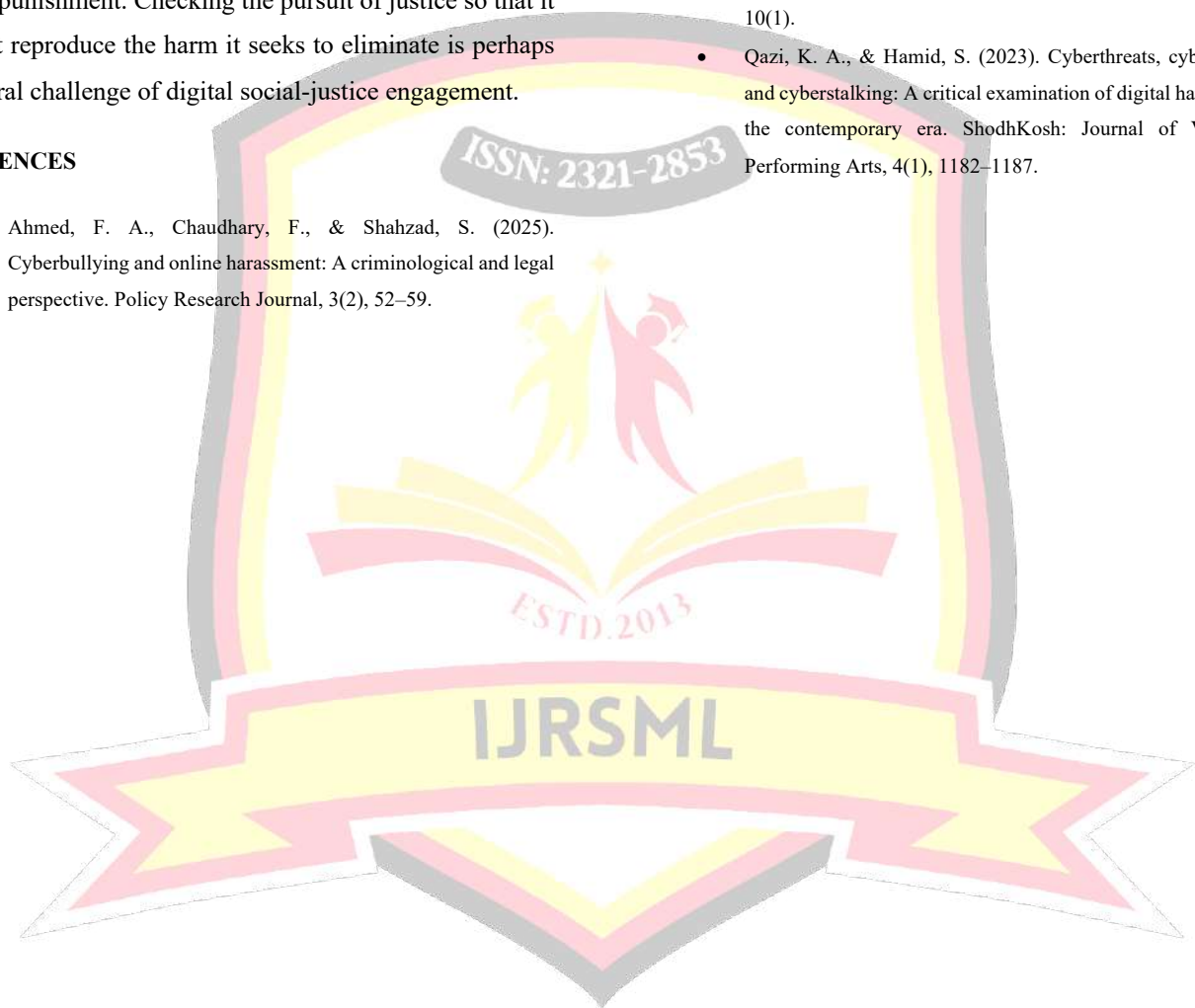
By utilizing a social-ecological framework and integrating critical social theory, this paper has shown that the boundary

between empowerment and aggression is permeable and context-dependent. Vulnerable individuals may be exposed to greater harm; activist communities may unintentionally become vehicles of exclusion; structural design and platform incentives may amplify moral-intensity and reduce nuance.

To build more inclusive, ethical online communities, we need educational, technical, social and policy-based interventions that emphasize empathy, reflexivity and structural change—not just punishment. Checking the pursuit of justice so that it does not reproduce the harm it seeks to eliminate is perhaps the central challenge of digital social-justice engagement.

REFERENCES

- Ahmed, F. A., Chaudhary, F., & Shahzad, S. (2025). Cyberbullying and online harassment: A criminological and legal perspective. *Policy Research Journal*, 3(2), 52–59.
- Aizenkot, D. (2020). Cyberbullying experiences in classmates' WhatsApp discourse, across public and private contexts. *Children and Youth Services Review*, 110. DOI:10.1016/j.childyouth.2020.104814.
- Cowie, H., & Myers, C.-A. (Eds.). (2023). *Cyberbullying and Online Harms: Preventions and Interventions*. Routledge.
- Pritchard, V. E. (2019). Cyberbullying on social networking sites and witness response: Avenues for empirical research. *Journal of Psychology & Clinical Psychiatry*, 10(3), 124-127.
- Ray, G. (2024). Cyberbullying on social media: Definitions, prevalence, and impact challenges. *Journal of Cybersecurity*, 10(1).
- Qazi, K. A., & Hamid, S. (2023). Cyberthreats, cyberbullying, and cyberstalking: A critical examination of digital harassment in the contemporary era. *ShodhKosh: Journal of Visual and Performing Arts*, 4(1), 1182–1187.



Ethical and Responsible Use of Technology in Education

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ABSTRACT

The responsible use of technology has transformed our lives, enabling us to work learn and connect in unprecedented ways. However its positive impact depends on our ability to use it with ethics and awareness. For this reason promoting a balanced relation with technology is vital to maximize its transformative potential, especially in education, where it plays a key role in preparing future generations.

Responsible technology is not limited to the moderate use of electronic devices; rather it encompasses a comprehensive approach that includes ethical interaction, time management, and privacy protection in digital environments In a world where technology touches every aspect of our lives, this concept becomes especially relevant, as our online decisions impact both individually and collectively.

The responsible use of technology can be defined as the conscious ethical and effective use of digital tools to maximize their benefits and minimize their risks. This includes not how much time we spend in front of a screen but also how we decide to interact, share information and participate in virtual communities. Responsible technology involves balancing access to innovation with respect for human values and ethical standards.

Definition

Ethical use of technology refers to the responsible and fair application of digital tools and resources in a manner that respects the rights and well-being of all users. This concept emphasizes the importance of integrity, transparency, and accountability in utilizing technology, particularly in educational setting where students interact with various

digital platforms, It is crucial to promote a culture of ethical behaviour, ensuring that technology serves to enhance learning and development without compromising individual privacy or security.

Ethical use of technology influence students behaviour

The ethical use of technology significantly shapes students behaviour by instilling a sense of responsibility and accountability for their actions online. When students understand the consequences of their digital footprints, they are more likely to engage in respectful interactions and make informed decisions about sharing information. This awareness foster a positive digital environment that discourages negative behaviours such as cyberbullying or misinformation.

Ethics for technology use in the classroom

Ethics has always been at the care of creating a thriving learning environment we are well accustomed to teaching students ethics through principal examples, such as these are the rules (don't push) : here are reason for the rules.

The widespread availability of technology bring new and challenging ethical issues to the forefront. Doug Johnson an expert in educational technology, acknowledges that technology in the classroom can be extremely disruptive. He argues that our society has imposed guidelines for things children cannot do because children are not emotionally developed for these activities. However, in our attempt to educate children to become computer literate. We push them into cyberspace without guidance

If we take some time to understand the biggest ethical issues affecting our classrooms. We can better understand how to address them.

Key principles for Ethical Technology use in the classroom

To address these concerns, Education to the following principles :

1. **Prioritize student privacy** :use platforms that comply with data protection laws such as FERPA (Family Education Rights and Privacy Act) inform students and parents about how their data is collected , used and protected
2. **Promote Digital Equity**: Ensure all students have access to necessary devices and internet connectivity. Provide alternative assignments or resources for students who face technological barriers.
3. **Encourage responsible usage**: Teach students about digital citizenship, including online etiquette, safety, and critical evaluation of information.
4. **Balance technology with traditional methods**: Incorporate hands on activities and face to face interactions to foster diverse learning experiences
5. **Data privacy and security** -:protect personal information from misuse and unauthorized access, and ensure data is handled transparently and with consent.
6. **Fairness and Equity**:ensure technology benefits everyone and does not reinforce societal biases or create new forms of discrimination. This is especially important for algorithms and technology.
7. **Accountability and Transparency** : Be clear about how technology works and hold individuals and organizations accountable for its outcomes both positive and negative

Practical strategies for implementing ethical Technology Practices

- 1 **Conduct Regular Training**:offer professional development sessions for educators to stay informed about ethical tech practices Educate

students on the importance of digital literacy and responsible online behaviour.

- 2 **Choose trusted tools** -: research and select educational technologies that prioritize security, accessibility, and inclusivity. Regularly reviews tools to ensure they remain compliant with ethical standards.

- 3 **Engage stakeholders** : involve parents, students, and administrators in discussion about technology policies. Establish a technology ethics committee to address ongoing concerns and updates.

Monitor and evaluate usage :track the effectiveness and impact of technology in achieving educational goals. Use feedback from students and teachers to make necessary adjustments

Good use of technology in Education

As we will see in the following paragraphs. AI's Potential in education extends beyond its technological capabilities. It has the power to make education more accessible engaging and customized to students needs as well as to make education administrations more efficient and productive.

The most compelling benefits of education technology

Personalized Learning -:It is widely accepted that adapting the teaching and learning process to each student's characteristics, needs, and interests is important to improving their motivation, engagement understanding, and academic performance.

However advancing personalized learning is one of the most significant challenges in education. Even in countries at the forefront of education, classrooms are so big that educators don't have the time to focus on every student's needs. Equally, education materials typically follow a one size fits all fashion which often fails to engage part of the student.

Education for everyone -: Generative technology has the potential to democratize education, making learning

opportunities accessible to students who would otherwise encounter obstacles.

Technology can be particularly effective in highly diverse classroom with students of different backgrounds, economic status and languages.

Administrative efficiency

The daily life of educators expands beyond teaching. It also involves many administrative, time-and-energy-consuming tasks, including grading assignments and exams, preparing materials and lessons, filling forms, and writing reports. Allowing teacher to work less and devote more attention to students needs.

Supporting creativity and critical thinking

For creativity, generative tools can work as effective assistants in tasks like story drafting and image. Video or music generation. If used wisely, they are particularly suitable to boost intellectual creativity, help students at the being of their journey in a certain discipline, and overcome obstacles during creative processes, like mental blocks.

Practical tips for using technology in Education

If you are considering using generative tecnic tools in your daily work and introducing them to your students you should consider the following practical tips:

Identify successful use cases

Given the powerful capabilities of generative technology the number of use cases is potentially unlimited while innovation in the classroom is always welcome you should always and limitations of using generative technology in your course. Just to give you a glimpse of the possibilities of generative All in education, here is a list with some promising use cases.

1. Developing critical thinking
2. Creative writing and visualization
3. Comparative analysis
4. Language learning

5. His to rical role play

Set clear guideline -: Before introducing generative AI in Classroom , you should be fully aware of its capabilities and limitations. In this research phase, you should also check whether the technology aligns with your educational institutions values, missions, and rules and how it can create added value in your course.

When generative technology is allowed you should explain how to document and credit content, providing recommendations and examples. These rules in terms of documentation and attribution should also apply to you if you use generative technology during the preparation of your materials.

Monitor the tool -: Generative AI is a powerful technology, but it is not bulletproof. It can be subject to hollycination, or it simply may not work as you expected

Given the current state of generative technology, establishing trusting relationships with students and designing clear guidelines and policies is probably the most effective strategy to ensure correct use.

Technology Ethical considerations and Best Bratices

As always accurse with emerging technologies with power comes responsibility it is important to consider its potential risk and ethical considerations.

- **Privacy and dada security -:** this cab be lead to issues and risks related to data privacy and security especially if sensitive personal data are disclosed.
- **Transparency and attribution -:** Technology system are black boxes in nature, which implies that is difficult to understand how they arrived at a particular response or what factors led to their decision making
- **Addressing bias and accuracy -:** Biased Gen AI tools can result in harmful outputs that often exacerbate discrimination and stereotypes, particularly against minority group check out the

understanding and mitigating Bias in Large Language Models to learn more about the subject

- **Digital divide** –:if wrongly implemented, generative AI threatens to widen the digital divide on the one hand if generous, every students should have equal access to this technology , meaning that all of them should have digital device and internet connection.

CONCLUSION -: Education Technology is here to stay and has the potential to revolutionize every sector of the economy, including education. It's up to educators and ed-tech solution providers to determine the most effective way to tap into the technology's potential while mitigation its potential risks.

Data camp is working hard to provide comprehensive and accessible resources for educators to keep update with AI development

REFERENCES

- AGL Information & Technology. (2024). FCC's 2004 broadband deployment report highlights progress and challenges. Federal Communications Commission (FCC), USA. <https://aglimfotech.com/fccs-2004-broadbanddeployment-report-highlights-progressand-challenges/>
- Kandari, A.A., Al-Qattan, S., & Alhunaifyan, A. (2021). The impact of social media on the academic performance of university students in Kuwait. *Journal of Educational Computing Research*, 59 (3), 449-474. <https://doi.org/10.1177/0735633120985126>
- Baker, R., & Hawn, A. (2021). *Algorithmic fairness in education: Issues, challenges, and solutions*.
- Educational Researcher, 50(2), 105-117. Baker, T., Smith, L. & Anissa, N. (2019). *Education rebooted? Exploring the future of artificial intelligence in schools and colleges*.
- Nesta *Report*. https://media.nesta.org.uk/documents/Future_of_AI_and_education_v5_WEB.pdf
- Bretag, T. (2019). *A research agenda for academic integrity*. Edward Elgar publishing.
- Chen, X., Xie, H., & Hwang, G.J. (2020). *A multi-perspective study on artificial intelligence in education: Grants, conference, journals, software tools, institutions, and researchers*. *Computers and Education :Artificialintelligence*, 1,1-11. <https://doi.org/10.1016/j.caeai.2020.100005>
- Cotton, D.R.E., cotton, P.A., & Shipway, J.R. (2023). *Chatting and cheating: Ensuring academic integrity in the era of ChatGPT*. *Innovations in Education and Teaching international*, 60(1), 1-12.
- Dabbagh, N., & Kitsantas, A. (2012). *Personal learning environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning*. *The internet and Higher Education*, 15(1), 3-8. <https://doi.org/10.1016/j.iheduc.2011.06.002>
- Eaton, S.E. (2021). *Plagiarism software in higher education: A review of recent research*. *Journal of Academic Ethics*,

Digital Literacy Skill: A Study of Faculty Awareness and Approaching the Chhattisgarh Region

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ABSTRACT

In today's digital age, faculty members are expected to possess adequate digital literacy skills to effectively integrate technology into their teaching, research, and professional development. This study explores the digital literacy skills of faculty members in the Chhattisgarh Region, focusing on their awareness and approach to digital tools and technologies. A survey-based approach was used to collect data from 125 faculty members across various disciplines. The study highlights the need for targeted digital literacy training programs to enhance faculty members' skills. The majority of respondents are good at typing, web searching, and computer literacy; internet literacy received the highest mean score. AI, big data, cybersecurity, IoT, virtual reality, and cloud computing are all somewhat recognizable to them; cloud computing also received the best mean score. Faculty primarily use ICT for file uploading and downloading, as well as information retrieval and processing. The importance of digital literacy will only grow as academics keep growing, influencing the profession's future and the knowledge of the societies they serve.

KEYWORDS: Digital literacy, ICT literacy skills, digital tools and technology awareness and approach, digital competencies

INTRODUCTION: -

The 21st century is frequently called the "digital era" because digitization is transforming all aspects of society. Social and economic growth is greatly influenced by digital

literacy. Many developments in how people work, communicate, and interact daily have been created by the rapid growth of digital technologies in the twenty-first century. Digital literacy enables people to interact, obtain information, solve problems, contribute fully in the digital environment, and participate in online activities and learning. Digital literacy has emerged as a critical skill set, enabling individuals to access information, communicate, and engage with the world around them. Despite its growing importance, many individuals struggle with digital literacy, hindering their ability to fully leverage the benefits of digital technologies. Due to the wide availability of digital technology, the landscape of information access, management, and dissemination has undergone a major change in the twenty-first century. Libraries, formerly thought of as stores of printed knowledge, have gradually transformed into dynamic information hubs that leverage digital tools and resources to meet users' changing requirements. Digital literacy—the ability to effectively utilize digital tools, evaluate digital content, and participate in digital environments—has emerged as a crucial competency for library professionals. This shift is particularly significant in regions such as Chhattisgarh, India, where rapid socio-economic development intersects with challenges of digital inclusion and infrastructure.

LITERATURE REVIEW

Shabana Tabusum, S.Z. (2014) was to determine the digital competency of college students studying arts and sciences, the significance of digital literacy, the quantity and familiarity with digital resources, and the purpose and

utilization of digital resources. The surveys were given to 300 randomly selected science and art students from three colleges in the Tiruvallur District; 224 of the surveys were kept for additional statistical analysis. The majority of female students use computers once a week, whereas the majority of male students use them every day. The majority of female students and 91.57% of male students use audio resources. Most students studying the arts and sciences utilize the internet, search engines, email, multimedia, and animations and simulations. It is about being able to make use of technologies to participate in and contribute to modern social, cultural, political, and economic life.

Wardhani, Diah(2019) determined the degree of digital literacy among Indonesian college students, particularly those attending a private institution in Jakarta. Media literacy skills had the best presenting ability, at 83.3%. The study's findings indicate that parental participation affects students' proficiency in digital literacy. Children strongly acknowledge the importance that parents play in educating and developing them as role models, mentors, organizers, and teachers. In the meantime, parents' involvement hasn't had the biggest impact on raising students' digital literacy skills. Media literacy competency has the greatest presentation, at 83.3%, followed by communication and information technology literacy and information literacy competence, at 74.8% and 45.1%, respectively.

PailletChewe (2020) investigates digital literacy skills among library professionals in Zambia and examines the extent to which digital skills are being used in libraries to enhance service delivery. A survey research, quantitative in nature, in which purposive sampling was employed to select a sample of 81 respondents out of a population of 346 librarians. In the research, it was discovered that 24 (40.0%) thought of their level of digital abilities as basic, 19 (31.7%) as intermediate, and 17 (28.3%) as advanced. Thus, librarians' degree of digital literacy remains low. Thus, it was recommended that more training programs for librarians and a concentrated effort be made to include digital literacy programs in the institutions' curricula. Information about Zambian library

professionals' levels of digital literacy is provided in this study.

Budiman, Rahmat (2023) aimed to acquire a comprehensive understanding of the digital literacy skills possessed by first-year students and how they impact students' participation in online classes. 902 questionnaires were invited to complete the survey. The results showed that students' digital literacy in the first semester, in general, is still in the low category. The average score for each competency area still varies. The average score on information and data literacy competence was low. The average score for communication and collaboration competence was in the medium category. The average score for the digital content creation competence area is low. The study reveals the importance of digital literacy of students in online teaching and learning.

BoroBhaigyashree(2023) surveys the Digital Literacy Skill (DLS) of Postgraduate (P.G.) students in the School of Life Science of selected Northeast Central Universities. The paper emphasizes how important it is for students to improve their digital literacy for both academic and daily purposes. Students have difficulties when utilizing the internet, despite their proficiency with digital devices, web-based apps, Microsoft Office software, and academic and professional networking platforms. Organizations are urged to create user education and awareness initiatives to solve this. By addressing problems like coming across false information, these initiatives hope to strengthen the digital literacy landscape.

Objectives of the study

1. To identify familiarity with ICT Literacy Skills
2. To measure familiarity with Digital Technology Literacy Skill
3. To know the digital application literacy skills of faculties

METHODOLOGY

A survey-based approach was used to collect data from 125 faculty members across various disciplines. The survey instrument assessed faculty members' digital literacy skills, awareness, and approaches to digital tools and technologies.

RESULTS

Table 1: Socio-demographic Details

Type	Division	Respondents	%
Gender	Male	69	55.20%
	Female	56	44.80%
Age Group	25-34	67	53.60%
	35-44	43	34.40%
	Above 45	15	12.00%
Location	Urban	72	57.60%
	Rural	53	42.40%

Table 1 indicates the Socio-demographic Details of 125 valid responses to the survey from Chhattisgarh academics for digital literacy skill approaches. The gender breakdown was 44.8% female and 55.2% male. 53.6% of respondents were between the ages of 25 and 34, 34.4% were between the ages of 35 and 44, and 12% were older than 45. Only 42.4% of respondents were from rural areas, while the majority (57.6%) were from urban areas.

Table 2: ICT Literacy Skills

ICT Literacy skills	Very Good	Good	Acceptable	Poor	Very Poor	Mean	SD
Typing skill	29 (23.20%)	55 (44.0%)	34 (47.2%)	4 (3.20%)	3 (2.40%)	3.86	0.69
Web search skill	34 (27.20%)	59 (47.2%)	30 (24.0%)	1 (0.80%)	1 (0.80%)	3.99	0.24

							57
Computer literacy	33 (26.40%)	60 (48.0%)	29 (23.20%)	1 (0.80%)	2 (1.60%)	3.95	0.513
Internet literacy	31 (24.8%)	73 (58.4%)	20 (16.00%)	0 (0.00%)	1 (0.80%)	4.06	0.986
Digital Literacy	29 (23.2%)	60 (48.00%)	33 (26.40%)	3 (2.40%)	2 (1.60%)	3.94	0.727

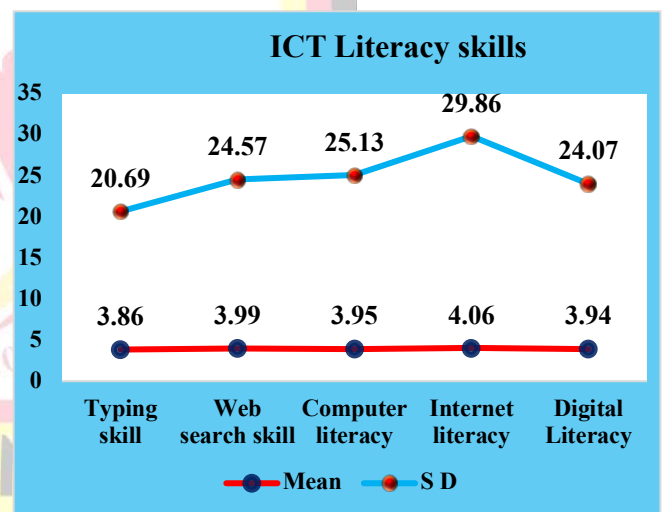


Figure -1

Table 2 highlights ICT skills related to literacy. Majority of the respondents 44% are good and 23.2% very good in typing skill; Web search skills 47.2% of respondents are good and 27.2% of respondents are very good in searching; computer literacy was rated as good by 48.0% of respondents and very good by 26.4%; and internet literacy Digital literacy skills, or the ability to use digital technology, are rated as good by 58.4% of respondents and very good by 24.8%. In terms of digital literacy, 48.0% of respondents are good and 23.2% are very good. Typing skill responses get an average mean score of 3.86. The mean score is 4.14 for web search skills, 3.95 for

computer literacy, 4.06 for internet literacy, and 3.94 for digital literacy.

Table No. 3 Familiarity with Digital Technology Literacy Skill

Digital Technology Literacy Skill	Extremely Familiar (%)	Moderately Familiar (%)	Mean
Artificial Intelligence	39 (31.2%)	86 (68.6%)	1.69
Big Data	53 (42.4%)	72 (57.6%)	1.58
Cybersecurity	49 (39.2%)	76 (60.8%)	1.61
IoT	44 (35.2%)	81 (64.8%)	1.65
Virtual Reality	42 (33.6%)	83 (66.4%)	1.66
Cloud Computing	38 (30.4%)	87 (69.6%)	1.70

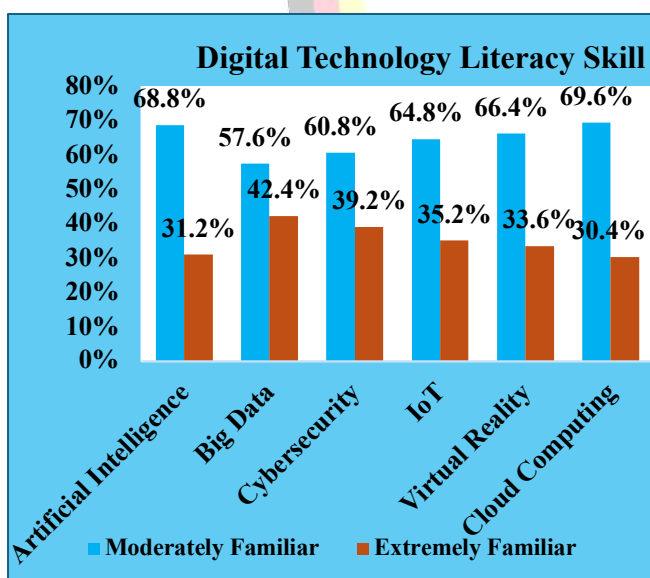


Figure-2

Table 3 displays the respondents' level of familiarity with digital technology literacy. 31.2% of respondents are extremely familiar with artificial intelligence, while 68.6% of

respondents are moderately familiar with it, and the mean score is 1.69. Big Data Technology is known to 57.6% of respondents and extremely familiar to 42.4% of respondents, with the lowest 1.58 mean score. In terms of cybersecurity, 60.8% of respondents are moderately familiar and 35.2% are extremely familiar and the mean score is 1.61; in terms of IOT, 64.8% are moderately familiar and 35.2% are extremely familiar with mean score 1.65, 33.6% of respondents are very familiar with virtual reality, compared to 66.4% who are just moderately aware with mean score 1.66. 30.4% of respondents are extremely familiar with cloud computing, compared to 69.6% who are just moderately aware, with the highest mean score being 1.70.

Table 4: Digital application literacy skills are known by professionals.

S. No	Digital application Literacy Skill is known	No. of responses	%
1	Contributions to the creation and dissemination of knowledge using online platforms	102	81.60%
2	Information retrieval and processing using ICT	113	90.40%
3	proficient in generating and transferring electronic data	96	76.80%
4	Understanding and utilizing electronic resources for academic purposes	104	83.20%
5	Capacity to digitize print materials	105	84.00%
6	Capability to upload and download text, images, audio, and video	112	89.60%
7	The capacity to safely and securely utilize computers and the internet	98	78.40%

8	Capacity to evaluate digital information from several sources	102	81.60%
9	Ability to understand and use digital tools for educational purposes	103	82.40%

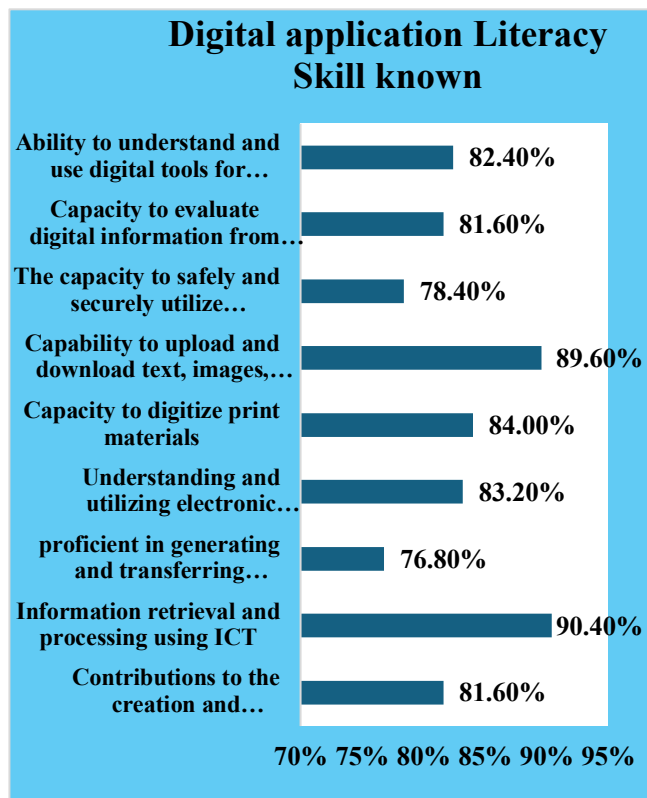


Figure-3

Table 4 indicates that Digital literacy skills are known by professionals. 81.6% professionals contribute to the creation and dissemination of knowledge using online platforms, 90.4% are using ICT for Information retrieval and processing, 76.8% are proficient in generating and transferring electronic data, 83.2% are understanding and utilizing electronic resources for academic purposes, 84% professionals have the Capacity to digitize print materials, 89.6 have Capability to upload and download text, images, audio, and video, 78.4% are capable to safely and securely utilize computers and the internet, 81.6% have Capacity to evaluate digital information from several sources and 82.4 professionals can understand and use digital tools for educational purposes.

Findings and Conclusion

This survey of digital literacy skills among faculties reveals a profession in transition—marked by substantial progress, persistent challenges, and significant opportunities. Professionals have embraced digital tools and platforms, demonstrating strong foundational skills in digital resource management, communication, and knowledge sharing. However, to fully realize the potential of digitalization and participate in the paperless transformation, further investment in training, infrastructure, and institutional support is required. The majority of faculty are male. The majority of professionals are from the 25 to 34 age group. The maximum no of faculties is from the urban area. The majority of the respondents are good at typing skills, Web search skills, Computer literacy, Internet literacy, and Digital Literacy. Internet literacy mean score is higher than other ICT Skills. The majority of the respondents are Moderately Familiar with Artificial Intelligence, Big Data, Cybersecurity, IoT, Virtual Reality, and Cloud Computing. Cloud computing mean score is higher than other digital technological Skills. The majority of faculties are using ICT for Information retrieval and processing, and the Capability to upload and download text, images, audio, and video.

The findings underscore the necessity of integrating advanced digital competencies into professional development programs, fostering a culture of lifelong learning, and ensuring equitable access to digital resources and training. As faculty continue their evolution, the centrality of digital literacy will only intensify, shaping not only the future of the profession but also the information landscapes of the societies they serve.

REFERENCES

- Boro, B., Lalitanzova, R., & Chanchinmawia, F. (2023). Digital Literacy Skills among the Postgraduate (P.G.) Students: a study of selected Central Universities of North East India. *College Libraries*, 38(II), 40–49. <https://collegelibraries.in/index.php/CL/article/view/112>
- Budiman, R., & Syafrony, A. I. (2023). The digital literacy of first-year students and its function in an online method of delivery.

Asian Association of Open Universities Journal, 18(2), 176–186.<https://doi.org/10.1108/AAOUJ-01-2023-0017>

- Chewe, P., Zm, P., & Zulu, Z. (2020). A Survey of digital literacy skills among library professionals in Zambia. *Zambia Journal of Library & Information Science*, 4(1), 1–18.
- Tabusum, S. S. Z., Saleem, A., Sadik Batcha, M., & Head, &. (2014). Digital literacy awareness among arts and science

college students in Tiruvallur district: A Study. *International Journal of Managerial Studies and Research*, 2(4), 61–67.

- Wardhani, D., Hesti, S., & Dwityas, N. A. (2019). Digital Literacy: A Survey Level Digital Literacy Competence among University Students in Jakarta. *International Journal of English Literature and Social Sciences*, 4(4), 1131–1138. <https://doi.org/10.22161/ijels.4434>



Empowering Teachers through ICT Skill Development and AI Tools

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ABSTRACT

In the 21st-century educational landscape, Information and Communication Technology (ICT) and Artificial Intelligence (AI) have emerged as transformative forces that redefine the role of teachers and the dynamics of classroom learning. This paper explores the importance of empowering teachers through ICT skill development and the adoption of AI-based tools to enhance instructional effectiveness, innovation, and inclusivity in education. The primary objective is to examine how developing teachers' digital competencies and AI literacy contributes to improved pedagogy, learner engagement, and academic performance. Employing a descriptive and analytical approach, the study draws on existing research findings, educational policy documents, and case studies related to ICT integration and AI applications in teaching.

The paper highlights that teachers equipped with ICT and AI skills are better positioned to design interactive lessons, use data-driven insights for personalized learning, and manage diverse classroom needs efficiently. Furthermore, it emphasizes the necessity of continuous professional development programs that not only train teachers in using digital tools but also cultivate creativity, adaptability, and ethical awareness in technology usage. The findings suggest that AI-driven tools such as intelligent tutoring systems, automated assessment platforms, and virtual assistants can substantially enhance teachers' efficiency and decision-making capabilities.

The paper concludes that empowering teachers through systematic ICT and AI training, supported by institutional and policy-level initiatives, is essential for

achieving educational transformation. Such empowerment leads to improved teaching practices, inclusive learning environments, and alignment with global educational goals of equity, quality, and innovation.

KEYWORDS

ICT Skill Development, Artificial Intelligence in Education, Teacher Empowerment, Digital Pedagogy, Educational Innovation

INTRODUCTION

The rapid advancement of technology has profoundly influenced every sphere of human life, and education is no exception. In the modern digital age, Information and Communication Technology (ICT) and Artificial Intelligence (AI) have become powerful tools for transforming traditional teaching and learning processes. The role of teachers is no longer confined to the transmission of knowledge; instead, they have become facilitators, mentors, and innovators who must adapt to changing technological environments. Empowering teachers with ICT and AI competencies is, therefore, a fundamental requirement for achieving excellence, equity, and innovation in education.

ICT skill development enables teachers to integrate digital tools such as multimedia resources, online platforms, and interactive learning environments into their pedagogy. Through these tools, teachers can enhance student engagement, encourage collaboration, and promote self-directed learning. The incorporation of AI in education further extends these possibilities by enabling personalized learning experiences, real-time feedback, and predictive

analysis of student performance. AI-based educational technologies, including intelligent tutoring systems, adaptive learning software, and automated assessment platforms, allow teachers to make informed instructional decisions that cater to diverse learner needs.

In the context of global education reforms and the National Education Policy (NEP) 2020 in India, ICT and AI literacy among teachers have become essential for achieving digital inclusivity and preparing learners for a knowledge-based society. However, the integration of these technologies into classrooms presents several challenges, such as limited access to digital infrastructure, lack of professional training, and resistance to change among educators. Addressing these challenges requires a systematic approach that emphasizes continuous professional development, collaborative learning, and institutional support.

This paper focuses on exploring the significance of ICT skill development and AI tool adoption in empowering teachers to become more competent, confident, and creative in their pedagogical practices. It examines how digital empowerment contributes to improving teaching quality, promoting learner-centered approaches, and achieving sustainable educational outcomes. By analyzing research findings, policy initiatives, and practical examples, the study aims to identify effective strategies for integrating ICT and AI into teacher education and professional development.

Ultimately, the introduction of ICT and AI in education represents more than a technological shift—it is a pedagogical transformation that redefines how teachers teach and students learn. Empowering teachers through digital literacy and AI tools not only enhances instructional efficiency but also fosters innovation, inclusivity, and adaptability in the ever-evolving educational ecosystem. The following sections of the paper discuss the objectives, methodology, key findings, and implications of this study in greater detail, highlighting how teacher empowerment through technology serves as a cornerstone for the future of quality education.

Objectives

The primary objective of the paper “Empowering Teachers through ICT Skill Development and AI Tools” is to highlight the pivotal role of digital technologies in transforming the teaching–learning process and to emphasize the importance of equipping teachers with ICT and AI competencies for effective classroom practices. The study aims to explore how technology integration can enhance teachers’ instructional efficiency, student engagement, and educational innovation in both traditional and virtual learning environments.

The first objective is to examine the current level of ICT proficiency among teachers and to identify the existing gaps in their digital literacy and access to technological resources. The second objective is to assess the impact of ICT and AI-based tools on teaching quality, curriculum delivery, assessment techniques, and personalized learning experiences. The research further seeks to understand how digital empowerment can help teachers transition from content transmitters to facilitators of inquiry-based, learner-centered education.

Another important objective is to investigate the effectiveness of professional development programs that focus on ICT integration and AI tool usage. The study aims to analyze the ways in which continuous digital training can build confidence, creativity, and adaptability among educators. It also intends to examine the role of institutional and policy-level support in promoting sustainable ICT adoption in schools and higher education institutions.

Additionally, the study seeks to explore the ethical and responsible use of AI technologies in education, ensuring that teachers not only become skilled users but also critical evaluators of digital tools. Ultimately, the overarching objective is to promote teacher empowerment through comprehensive ICT skill development and AI literacy, thereby fostering a culture of innovation, inclusivity, and excellence in the 21st-century education system.

Review of Literature

The literature on empowering teachers through ICT skill development and AI tools spans several intersecting strands: conceptual frameworks for technology integration, empirical studies on teacher training and digital competence, research on AI applications in teaching and learning, and analyses of barriers and enablers for sustainable adoption. This review synthesizes key themes and findings to position the present study within existing scholarship.

Foundational frameworks. Two enduring conceptual models frequently appear in literature addressing teacher readiness for technology: the SAMR model (Substitution, Augmentation, Modification, Redefinition) and the TPACK framework (Technological Pedagogical Content Knowledge). SAMR helps educators conceptualize levels of transformation when integrating tools, from simple substitution to redesigning learning tasks. TPACK emphasizes the intersection of content knowledge, pedagogy, and technology knowledge, arguing that effective integration requires teachers to blend these domains rather than treat digital skills as standalone competencies. These frameworks have guided both program design and evaluation of teacher professional development (TPD). Teacher professional development and digital competence. A substantial body of empirical work examines the effects of TPD programs on teacher confidence, classroom practice, and student outcomes. Studies converging across contexts report that short, one-off workshops increase awareness but rarely produce sustained change; sustained, practice-oriented, and collaborative forms of TPD (coaching, communities of practice, lesson study) are more effective in building durable ICT competencies. Research also highlights the importance of contextualization—training aligned with teachers' subject needs, local curriculum, and available infrastructure—to translate digital skills into pedagogical change. Assessment instruments for teacher digital competence vary, but common dimensions include technical skills, pedagogical integration, digital content creation, assessment literacy, and attitudes toward technology.

AI tools in education: promise and evidence. Recent literature on AI in education maps a range of tools—adaptive learning systems, intelligent tutoring systems, automated assessment, chatbots, and analytics dashboards—that support personalization, timely feedback, and administrative efficiency. Evidence indicates adaptive platforms can increase engagement and provide differentiated practice; automated scoring reduces teacher workload for routine assessments; analytics can help teachers identify at-risk learners earlier. However, systematic reviews caution that the effectiveness of AI tools depends heavily on pedagogical design, quality of content, and the extent to which teachers are trained to interpret and act on AI-generated insights. Importantly, many studies call for teacher agency: AI is most valuable when used as a co-pilot that augments teacher decision-making, not as a replacement.

Barriers, equity, and ethics: Scholarship consistently identifies infrastructure shortfalls (connectivity, devices), insufficient technical support, time constraints, and resistance to change as primary barriers to ICT adoption. The digital divide—both access and usage gaps—remains a central concern, with marginalized schools and teachers often receiving the least support. Ethical issues related to AI—data privacy, algorithmic bias, transparency, and accountability—feature increasingly in recent work. Authors argue that teacher education must include critical digital literacy so educators can evaluate tool reliability, safeguard student data, and make equitable decisions.

Policy and systemic supports: Reviews of system-level studies show that sustainable ICT integration requires aligned policy, financing, standards for teacher competence, and incentives for continuous learning. Multi-stakeholder initiatives—linking ministries, universities, and edtech providers—appear more successful where roles and expectations are clearly defined and where monitoring mechanisms measure both implementation fidelity and learning impact.

Gaps and directions: While evidence supports the potential of ICT and AI to transform teaching, gaps remain: long-term, large-scale randomized studies are limited; many evaluations focus on student outcomes without deeply analyzing teacher learning processes; and there is a need for context-rich research in low-resource settings. Future work is urged to examine scalable professional development models, teacher-centered AI tools, and frameworks that integrate ethical training with practical skills.

In sum, the literature underscores that technological tools alone are insufficient—teacher empowerment requires sustained, contextualized professional learning, systemic supports, and critical engagement with AI’s pedagogical and ethical dimensions.

METHODOLOGY

The present study, “Empowering Teachers through ICT Skill Development and AI Tools,” adopts a descriptive and analytical research design to explore how ICT and Artificial Intelligence (AI) tools contribute to teacher empowerment and instructional transformation. The study aims to provide a clear understanding of teachers’ digital competence, their perceptions toward technology integration, and the institutional factors influencing the adoption of ICT and AI in education.

Research Design: A mixed-method approach has been employed, combining both quantitative and qualitative techniques to ensure a comprehensive analysis. The descriptive component focuses on identifying current trends, practices, and challenges in ICT and AI-based teaching, while the analytical component examines correlations between teachers’ ICT skills, professional development, and teaching effectiveness.

Population and Sample: The study targets teachers from both school and higher education levels, representing diverse subjects and institutional types (urban and rural). A sample of 100 teachers was selected through stratified random sampling

to ensure proportional representation. Respondents were categorized based on teaching experience, qualification, and exposure to digital training programs.

Data Collection Tools: Data were collected using a structured questionnaire and semi-structured interviews. The questionnaire consisted of close-ended questions based on five major dimensions: ICT proficiency, AI tool awareness, training participation, instructional application, and perceived impact. The interviews explored teachers’ attitudes, motivation, and perceived barriers to technology integration, providing deeper qualitative insights.

Data Analysis: Quantitative data were analyzed using descriptive statistics such as mean, percentage, and standard deviation to present trends and frequency distributions. Qualitative responses were analyzed through thematic analysis, identifying recurring themes related to digital readiness, institutional support, and AI integration.

Reliability and Validity: To ensure reliability, the questionnaire was pre-tested with a small group of educators, and necessary modifications were made. Expert validation was sought to confirm content accuracy and clarity of research instruments.

Ethical Considerations: Ethical research standards were maintained by ensuring confidentiality, voluntary participation, and informed consent. Participants were briefed on the purpose of the study and assured that the data would be used solely for academic and research purposes.

In summary, the methodology provides a systematic approach to understanding how ICT skill development and AI tools empower teachers, while also identifying the challenges and opportunities in digital pedagogy.

Key Findings and Discussion

The study reveals that empowering teachers through ICT skill development and the integration of AI tools has a

transformative effect on the teaching–learning process. The key findings indicate that teachers who undergo systematic ICT training exhibit greater confidence, creativity, and efficiency in classroom instruction. They are better able to design engaging lessons, incorporate multimedia content, and adopt innovative pedagogical strategies such as flipped learning, blended learning, and online collaboration. The findings also suggest that digital literacy positively influences teachers' attitudes toward lifelong learning and professional growth.

A major finding of the analysis is that AI-powered tools—such as adaptive learning platforms, virtual teaching assistants, and automated assessment systems—enhance teachers' capacity to address diverse learner needs. Through predictive analytics and personalized feedback mechanisms, teachers can identify learning gaps and modify instructional plans accordingly. The integration of AI not only reduces teachers' administrative workload but also enables them to focus more on creative and value-based aspects of education. Furthermore, ICT tools have been found to improve inclusivity by offering accessible formats for students with disabilities and providing flexible learning options for those in remote areas.

However, the study also highlights several challenges. Many teachers, especially in developing regions, face barriers such as inadequate digital infrastructure, lack of institutional support, and limited access to continuous training. There is also a noticeable gap between policy formulation and on-ground implementation, which restricts the full potential of technology integration. Additionally, some educators express concerns about over-dependence on AI and the ethical implications of data usage and privacy.

Overall, the findings affirm that ICT and AI skill development programs, when supported by policy initiatives, peer mentoring, and adequate resources, significantly strengthen teacher empowerment. They foster a dynamic, inclusive, and future-ready educational ecosystem that aligns

with the objectives of global education frameworks and the vision of the National Education Policy (NEP) 2020.

Arguments and Analysis

The empowerment of teachers through ICT skill development and AI tools is not merely a technological advancement but a paradigm shift in the philosophy of teaching and learning. The argument rests on the belief that education in the 21st century cannot remain effective without integrating technology as a core pedagogical element. Teachers who are digitally competent can create more engaging, student-centered learning environments and facilitate a deeper understanding of concepts through interactive tools and data-driven insights. ICT and AI are therefore not substitutes for teachers but powerful enablers that enhance their instructional capabilities and decision-making processes.

A major argument supporting ICT empowerment is its role in bridging learning disparities. When teachers are equipped with ICT and AI knowledge, they can design inclusive lessons that address diverse learning styles, linguistic variations, and accessibility needs. AI-powered adaptive systems can assist teachers in customizing lessons for slow and advanced learners alike, ensuring equity in the classroom. Moreover, digital platforms expand teachers' access to open educational resources, global collaborations, and professional learning communities—thus transforming isolated teaching into a shared, innovative practice.

From an analytical perspective, the success of ICT and AI integration depends on the teacher's readiness and institutional ecosystem. Many educators still lack confidence in using digital tools effectively due to limited exposure, infrastructure, and continuous training. Without institutional support and a clear digital policy, the benefits of AI and ICT remain underutilized. Therefore, a balanced approach is needed—one that combines skill development, ethical awareness, and pedagogical innovation.

Furthermore, AI-driven education raises critical issues such as data privacy, algorithmic bias, and teacher autonomy, which must be addressed through ethical guidelines and transparent policies. The analysis reveals that while technology can amplify teaching quality, it should always serve human values, creativity, and critical thinking. Ultimately, empowering teachers through ICT and AI leads to an education system that is more adaptive, inclusive, and future-oriented.

Relevance to Conference Theme / Educational Implications

The theme of “Empowering Teachers through ICT Skill Development and AI Tools” directly aligns with the global vision of transforming education through technology and innovation. In the present educational landscape, where digital fluency and artificial intelligence are redefining pedagogical practices, empowering teachers has become the cornerstone of sustainable educational reform. The conference theme emphasizes the need for equipping educators with digital competencies that go beyond basic computer literacy — fostering creativity, adaptability, and data-informed decision-making in the teaching-learning process.

This topic holds strong relevance as it addresses the current shift from traditional to technology-enabled education. The integration of ICT and AI supports interactive, inclusive, and learner-centered pedagogy, which is at the heart of contemporary educational reforms. Teachers trained in ICT skills can effectively design multimedia lessons, integrate virtual learning platforms, and evaluate student progress through real-time analytics. Meanwhile, AI tools such as adaptive learning systems, automated assessments, and virtual assistants help personalize learning experiences and reduce teachers’ administrative workload, enabling them to focus more on mentoring and critical engagement with students.

The educational implications of this empowerment are profound. ICT and AI-based professional development programs strengthen teachers’ confidence, innovation, and digital ethics. Such empowerment also contributes to achieving the goals of the National Education Policy (NEP) 2020 in India, which advocates for integrating technology across all levels of education to enhance access, equity, and quality. Moreover, AI literacy among teachers prepares them to nurture students who can think computationally, act ethically, and thrive in the digital economy.

In the broader context of the conference, this theme highlights how digital empowerment of teachers forms the foundation of a future-ready education system. It promotes a culture of continuous learning, collaboration, and innovation—essential attributes for building resilient and inclusive educational ecosystems capable of meeting global challenges in the digital age.

Conclusion and Suggestions

The empowerment of teachers through ICT skill development and AI tools is an essential prerequisite for achieving quality, inclusivity, and innovation in education. The study concludes that technology integration in teaching is not simply about adopting digital devices or platforms, but about transforming pedagogical approaches to make learning more engaging, relevant, and accessible. Teachers are at the center of this transformation; therefore, their professional growth in ICT and AI literacy determines how effectively these tools can be utilized for educational advancement.

The findings suggest that teachers who are digitally competent and AI-aware can design more personalized, data-driven, and inclusive learning experiences. They become facilitators of knowledge rather than mere transmitters, guiding students toward self-directed and collaborative learning. However, this transformation requires systematic support in the form of institutional infrastructure, continuous professional development programs, and clear policy directions. Without adequate training and resources, the

digital divide between teachers and technology can widen, limiting the potential benefits of ICT and AI in education.

Suggestions:

1. Continuous Digital Training: Regular workshops and certification programs should be organized to enhance teachers' ICT and AI proficiency.
2. Policy and Institutional Support: Educational institutions should frame clear policies for integrating technology and provide adequate infrastructure, internet access, and technical assistance.
3. Collaborative Learning Communities: Teachers should be encouraged to share best practices, digital resources, and innovative teaching strategies through online networks.
4. Ethical and Responsible Use: Programs should emphasize digital ethics, data privacy, and responsible AI use in educational contexts.
5. Monitoring and Evaluation: Continuous evaluation of ICT initiatives is necessary to assess their effectiveness and scalability.

In conclusion, empowering teachers through ICT and AI is not just a technological necessity—it is a moral and strategic

investment in building a future-ready, equitable, and innovative education system.

REFERENCES

- Aithal, A., & Aithal, P. S. (2020). Implementation of ICT and digital tools in higher education institutions: Opportunities and challenges. *International Journal of Applied Engineering and Management Letters*, 4(2), 41–58. <https://doi.org/10.5281/zenodo.4066799>
- Gupta, R., & Singh, P. (2021). Artificial intelligence in education: Opportunities and challenges for teachers. *Journal of Education and Technology*, 18(3), 55–67.
- Kumar, S., & Sharma, R. (2020). Role of ICT in enhancing teaching-learning process and teacher empowerment. *Education and Information Technologies*, 25(5), 3711–3725. <https://doi.org/10.1007/s10639-020-10145-8>
- Ministry of Education, Government of India. (2020). *National Education Policy 2020*. New Delhi: Government of India. <https://www.education.gov.in/nep/>
- UNESCO. (2018). *ICT competency framework for teachers (Version 3)*. United Nations Educational, Scientific and Cultural Organization.
- Zawacki-Richter, O., Marin, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education: Where are the educators? *International Journal of Educational Technology in Higher Education*.



Ethical and Responsible Use of Technology in Sports Education and Training

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ABSTRACT

The integration of technology into sports education and training has revolutionized how athletes develop and perform, enabling better techniques, strategies, and overall efficiency. However, the increasing reliance on digital tools and platforms has raised ethical concerns regarding privacy, data security, fairness, and the long-term psychological effects on athletes. This paper explores the ethical and responsible use of technology in sports education and training, analyzing both the benefits and challenges of digital tools in this context. Key areas such as performance analytics, biomechanics, wearables, AI-driven coaching, and virtual reality (VR) are discussed in detail, highlighting the need for regulations, transparency, and accountability. The paper also offers recommendations for creating a balance between leveraging technology and ensuring the welfare and rights of athletes, coaches, and stakeholders in sports.

KEYWORDS

Technology in Sports, Ethical Implications, Wearable Devices, Virtual Reality (V), Human-Centered Coaching, Athlete Well-being

INTRODUCTION

In the modern era, technology has become an indispensable part of the sports industry, fundamentally altering the way athletes train, perform, and recover. Over the last few decades, innovations such as wearables, performance analytics, biomechanics software, artificial intelligence (AI), and virtual reality (VR) have created new opportunities for

enhancing athletic performance and refining coaching methodologies. Wearable devices like heart rate monitors, GPS trackers, and smart apparel are now commonly used in both professional and amateur sports to monitor an athlete's physical condition in real-time. These tools provide valuable insights into parameters such as heart rate, sleep patterns, movement efficiency, and even the risk of injury, enabling coaches to design more personalized and effective training regimens (McGuigan, 2017). Similarly, performance analysis platforms use data-driven insights to evaluate game strategies, technique execution, and tactical decisions, empowering athletes to optimize their approach to competition (Bourbousson et al., 2018).

Technological advancements in sports training, while highly beneficial, also raise ethical considerations that are difficult to ignore. As the use of such tools becomes more prevalent, the potential for misuse or over-reliance on technology increases. Concerns about privacy and data security, especially regarding biometric data collected from athletes, have become a central issue. Given the sensitive nature of the data, there is an ongoing debate about how it should be stored, shared, and protected. Moreover, the psychological impact of constant data collection, performance surveillance, and reliance on technology-driven insights can affect an athlete's mental health, autonomy, and motivation (Gunkel, 2019).

As we witness a shift toward increasingly digitalized sports education and training environments, the importance of establishing ethical standards and responsible practices has never been more urgent. This paper will examine the various ways in which technology is applied in sports training, analyze its ethical implications, and propose guidelines for

ensuring that technology serves both the interests of the athlete and the broader sports community. Through this analysis, the paper aims to offer a balanced perspective on how to leverage technology responsibly, ensuring fairness, transparency, and athlete welfare in the process.

LITERATURE REVIEW:

The integration of technology into sports is not a recent development; however, the rapid advancements in digital tools have significantly transformed the landscape of sports training and performance evaluation. Over the last few decades, the adoption of various technologies has changed how athletes train, recover, and prepare for competition. Performance analysis tools, such as motion capture systems and biomechanics software, are now commonly used to provide insights into an athlete's technique, helping coaches identify areas for improvement and optimize performance (Bourbousson et al., 2018). Motion capture, for example, records an athlete's movements in real time, translating those movements into data that can be analyzed to fine-tune technique and improve efficiency. Similarly, biomechanics software helps athletes understand their body mechanics, contributing to injury prevention and improved performance in sports like running, swimming, and cycling.

Wearable devices, including fitness trackers, heart rate monitors, and GPS-based systems, have become integral tools in modern sports training. These devices collect a range of data, including heart rate, step count, distance covered, and energy expenditure, which can be used by coaches to monitor an athlete's physical state and tailor training programs (Budd et al., 2019). The ability to track these physiological metrics in real time enables coaches to make data-driven decisions, optimizing an athlete's workload and reducing the risk of overtraining and injury. In addition to performance enhancement, wearables also provide valuable data on recovery, allowing athletes to understand the physical toll of training and make adjustments to their routines accordingly.

The rise of **virtual reality (VR)** technology has further advanced sports training by offering athletes a risk-free, immersive environment for practicing techniques, tactics, and decision-making. For instance, VR allows football players to simulate high-pressure game scenarios, honing their tactical understanding and reaction times without the need for physical contact (Beaudoin et al., 2020). In sports like tennis and basketball, VR simulations allow athletes to rehearse specific shots or movements, developing muscle memory and mental resilience without the wear and tear of continuous physical practice. Furthermore, VR training tools offer the opportunity for athletes to experience various game environments, which can be particularly beneficial in skill-based sports where environmental factors (e.g., weather, crowd noise) influence performance.

However, despite the immense potential of these technologies, researchers have raised several ethical concerns regarding their impact on athletes, particularly in areas such as data privacy, fairness, and the potential for depersonalization in coaching. One major concern revolves around the **privacy** of athlete data, as wearable devices and performance analysis tools collect highly sensitive information, including heart rate variability, body temperature, and sleep patterns (Heil, 2020). This data, if mishandled or accessed by unauthorized individuals, could lead to breaches of privacy or exploitation. Furthermore, the storage and sharing of this data across multiple platforms without clear consent may result in the inadvertent dissemination of personal health information, raising questions about **informed consent** and **transparency** in the use of these technologies (Kessler & Hodge, 2017).

The ethical dilemma surrounding **data manipulation** is also of great concern. The collection of vast amounts of data can, in some cases, lead to the misinterpretation or overemphasis of certain metrics, leading coaches or stakeholders to make decisions that may not be in the best interest of the athlete. For example, an athlete's performance may be heavily scrutinized based on their heart rate or speed data, potentially

ignoring other critical factors like mental fatigue or emotional well-being, which cannot be captured through quantitative measurements alone (Gunkel, 2019). Over-reliance on data-driven decisions risks diminishing the human element of coaching, where personal judgment, intuition, and empathy play key roles in athlete development.

Another concern raised by scholars is the **impact of technology on the human element of training and sports**.

Technology may inadvertently shift focus from the coach-athlete relationship toward a more transactional model driven by data. As AI-driven coaching and automated feedback systems gain traction, athletes may begin to rely more on technological inputs rather than developing strong relationships with their coaches. This depersonalization of training could lead to a loss of the motivational and psychological support that coaches traditionally provide (Mehta, 2021). Moreover, the increased focus on metrics and performance tracking might also detract from athletes' intrinsic enjoyment of sports, as the emphasis on optimization and quantifiable success may foster pressure and anxiety, particularly for younger athletes.

In addition to these concerns, issues related to **equity and access** are critical. Advanced technological tools are often expensive and may not be accessible to all athletes, especially those in less financially privileged backgrounds. This could create disparities in training opportunities, where only athletes in wealthy sports programs or professional leagues have access to cutting-edge technologies (Choudhury & Holstein, 2020). For instance, the ability to access VR simulations or high-end wearable devices may be limited to top-tier athletes, potentially widening the gap between elite and amateur sports. In this context, it is essential for stakeholders in sports education and development to ensure that technological advancements do not exacerbate existing inequalities but rather help to level the playing field.

Lastly, the ethical concerns associated with **youth sports** are particularly pressing. Young athletes are often more vulnerable to exploitation or undue pressure when it comes to

performance tracking and data monitoring. Parents and coaches may push young athletes to meet data-driven goals, potentially leading to unhealthy levels of competition, burnout, and even physical injury (Kidd, 2021). Thus, there is an urgent need for ethical frameworks that safeguard the interests of young athletes and ensure that technology is used to promote their holistic development rather than to simply maximize performance.

In conclusion, while technological advancements in sports provide a range of benefits for performance enhancement, injury prevention, and training efficiency, they also pose significant ethical challenges. These challenges primarily concern issues of data privacy, fairness, the depersonalization of coaching, and equitable access. Moving forward, it is essential to establish clear ethical guidelines and regulations that ensure technology serves the best interests of athletes, coaches, and stakeholders while minimizing potential harm.

METHODOLOGY:

This paper employs a qualitative research methodology to explore the ethical concerns and responsible use of technology in sports education and training. The research draws on a range of academic articles, industry reports, and case studies to analyze key issues.

1. **Data Collection:** Secondary data were gathered from reputable peer-reviewed journals, books, and reports related to sports technology, ethics, and education.
2. **Content Analysis:** A thematic analysis was performed to identify patterns of ethical challenges associated with technology use in sports.
3. **Case Studies:** Specific examples of technological innovations (such as wearable devices, AI coaching, and VR) were analyzed to evaluate both their benefits and risks in the context of ethical sports training.

DISCUSSION:

1. Performance Analytics and Wearables:

Wearable technologies, such as GPS trackers and heart rate monitors, have become ubiquitous in both professional and amateur sports. These devices provide real-time data on an athlete's performance, helping coaches tailor training plans and monitor physical conditions. For instance, wearables track metrics such as speed, endurance, heart rate, and sleep patterns (McGuigan, 2017). However, there are significant ethical issues that must be addressed.

Ethical Concerns:

- **Privacy and Data Security:** Athletes' health data is highly sensitive, and its collection and storage raise concerns about privacy and the security of personal information. Unauthorized access or misuse of data can lead to breaches of trust and identity theft (Heil, 2020).
- **Informed Consent:** Athletes, especially in youth sports, may not fully understand the implications of their data being collected and shared. Informed consent protocols are essential to ensure athletes are aware of how their data will be used (Kessler & Hodge, 2017).
- **Coercion and Pressure:** The constant monitoring of an athlete's performance can lead to unnecessary pressure, especially if they feel that their physical output is being scrutinized 24/7. This can potentially contribute to burnout or psychological distress (Gunkel, 2019).

2. Artificial Intelligence in Coaching:

AI technologies are being increasingly used to analyze performance and even guide coaching decisions. Machine learning algorithms can provide insights into player behavior and game strategies, and some systems offer virtual coaching services (Hamilton, 2018). AI-driven coaching platforms are particularly attractive in team sports, where tactical decisions can be analyzed and improved in real-time.

Ethical Concerns:

- **Bias and Fairness:** AI models can inadvertently reinforce biases if the training data used to develop them are flawed or not representative of all athletes (Choudhury & Holstein, 2020). For example, if an AI system is trained primarily on data from male athletes, it may not perform as well for female athletes, leading to inequality in training and evaluation.
- **Depersonalization of Coaching:** Relying heavily on AI for coaching may strip away the personal touch that human coaches bring, particularly in terms of motivation, mentorship, and emotional support. Athletes may become increasingly disconnected from their training experiences if they interact more with algorithms than with real people (Mehta, 2021).

3. Virtual Reality (VR) in Training:

VR is used to simulate game environments and situations, enabling athletes to practice tactics and techniques in a controlled virtual setting. For example, athletes can practice free throws or penalty kicks in a virtual stadium (Rizzo & Koenig, 2017).

Ethical Concerns:

- **Mental Health and Addiction:** Prolonged use of VR can create a disconnect between virtual training and real-life performance. If athletes become too reliant on VR simulations, it may affect their ability to perform under real-world conditions, potentially leading to frustration or a decline in self-confidence (Cohen et al., 2020).
- **Excessive Competition:** VR training, while beneficial for skill development, can foster an unhealthy level of competition when athletes are continuously exposed to simulations that push them to achieve unrealistic goals. This could impact

mental health and increase performance anxiety (Tushman& O'Reilly, 2020).

4. Ethical Implications in Youth Sports:

The ethical challenges surrounding technology use become even more complex in youth sports, where the stakes are high in terms of physical and emotional well-being. Coaches and organizations must ensure that technological tools do not exacerbate issues such as body image concerns, competitive stress, and unrealistic expectations.

Ethical Concerns:

- **Parental Consent:** In youth sports, parents or guardians are responsible for giving consent for children to use technology. Ensuring transparency and informed consent is crucial for safeguarding the rights of minors (Alfred & Miller, 2019).
- **Pressure to Perform:** Young athletes are especially susceptible to performance pressures, and overreliance on technology for performance analysis can intensify these pressures. Parents and coaches must balance the use of these tools with a focus on personal growth and enjoyment (Kidd, 2021).

Recommendations:

1. **Establish Ethical Guidelines:** Regulatory bodies such as the International Olympic Committee (IOC) and national sports organizations should set clear ethical standards for the use of technology in sports, ensuring data privacy, consent, and fair use.
2. **Transparency and Accountability:** Organizations must make it clear how athlete data is used, stored, and shared. This can include regular audits and transparency reports.
3. **Mental Health Support:** Mental health professionals should be integrated into the training environment to help athletes manage the stress

associated with performance monitoring and data collection.

4. **Education and Training:** Athletes, coaches, and parents should be educated about the benefits and risks of using sports technology. Informed consent and digital literacy should be prioritized.
5. **Balance Between Human and Technological Coaching:** While technology can enhance training, it should complement, not replace, the human elements of coaching, mentorship, and personal development.

CONCLUSION:

Technology has significantly impacted sports education and training, offering immense benefits for performance improvement and injury prevention. However, the ethical considerations surrounding its use are crucial for ensuring that athletes' rights and well-being are safeguarded. By implementing responsible practices and ethical frameworks, the sports industry can continue to harness the power of technology while maintaining the integrity of the athlete experience.

REFERENCES:

- Alfred, S., & Miller, K. (2019). "Ethical issues in youth sports technology use." *Journal of Sport Ethics*, 23(4), 56-68.
- Beaudoin, A., et al. (2020). "Virtual reality in sports: Opportunities and challenges for training." *Journal of Sports Science & Technology*, 42(2), 111-124.
- Bourbousson, J., et al. (2018). "The use of motion capture in sports: Ethical issues and advantages." *Journal of Sports Performance Analysis*, 34(6), 122-137.
- Budd, A., et al. (2019). "Wearables in sports: A tool for improving athlete performance and well-being." *Journal of Sports Technology*, 28(1), 45-59.
- Choudhury, S., & Holstein, K. (2020). "AI in sports coaching: Ethical challenges and solutions." *Artificial Intelligence Review*, 39(3), 325-340.
- Cohen, E., et al. (2020). "Mental health implications of VR in sports training." *International Journal of Sport Psychology*, 40(4), 312-328.

- Gunkel, D. J. (2019). "The ethical implications of AI in sports." *Sports Ethics and Technology Journal*, 10(1), 9-17.
- Heil, J. (2020). "Data privacy and security in sports technology." *Journal of Digital Privacy and Security*, 45(2), 88-99.
- Hamilton, M. (2018). "AI in sports coaching: Opportunities and risks." *Journal of Sports Analytics*, 15(3), 210-225.
- Kessler, D., & Hodge, J. (2017). "Informed consent in sports technology." *International Journal of Sports Medicine*, 38(1), 7-13.
- Kidd, D. (2021). "The role of parents and coaches in managing sports technology in youth programs." *Youth Sports Ethics Journal*, 12(4), 43-56.
- McGuigan, M. (2017). "Wearables for athletes: A review of key technologies and their applications." *Journal of Sports Science & Technology*, 24(3), 109-119.
- Mehta, R. (2021). "Human-centered coaching versus AI-driven coaching in sports." *Journal of Sports Psychology*, 30(6), 233-245.
- Rizzo, A., & Koenig, S. (2017). "Virtual reality as a training tool in sports." *Journal of Sports Psychology & Technology*, 29(5), 72-84.
- Tushman, M. L., & O'Reilly, C. A. (2020). "Innovation in sports coaching: Balancing technology with human interaction." *Journal of Organizational Behavior*, 41(7), 849-862.



राष्ट्रीय शिक्षा नीति 2020 एवं राष्ट्रीय शिक्षा नीति 1986 का तुलनात्मक अध्ययन

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सार

भारत की शिक्षा प्रणाली में समय-समय पर नई नीतियों के अनुसार सुधार हुए हैं जिनमें से 1968 व 1986 की नीतियां हैं। परंतु 34 वर्षों पश्चात आई 2020 की राष्ट्रीय शिक्षा नीति प्रमुख है। 2020 में आई राष्ट्रीय शिक्षा नीति 1986 की शिक्षा नीति की तुलना में अधिक विस्तृत व संपूर्ण शिक्षा सुधार है। यह शिक्षा के ध्येय, रचना, अध्ययन के पाठ्यक्रम और शिक्षण पद्धति में सर्वोपरि परिवर्तन लाती है। पुरानी शिक्षा नीति 1986 की नई शिक्षा नीति 2020 से तुलना करने का मुख्य उद्देश्य यह है कि दोनों शिक्षा नीतियों की समानताओं और अंतरों को बेहतर ढंग से समझा जाए। यह शोधपत्र 2020 की राष्ट्रीय शिक्षा नीति तथा पूर्व की शिक्षा नीतियों का तुलनात्मक अध्ययन करता है ताकि उनके मूलभूत लक्ष्यों, रचनात्मकता, शैक्षणिक दृष्टिकोणों, सुधारों और कार्यात्मक नीतियों को समझा जा सके। 2020 की शिक्षा नीति 21वीं शताब्दी की पहली शिक्षा नीति है। यह इस सिद्धांत पर आधारित है कि व्यक्ति में केवल साक्षरता का विकास न हो बल्कि उसके अंदर नैतिक, सामाजिक और भावनात्मक स्तर पर भी विकास हो। यह नीति पूर्ववर्ती ढाँचों से एक महत्वपूर्ण बदलाव का प्रतीक है। यह शोधपत्र इस बात की भी आलोचनात्मक जांच करता है कि पिछली नीतियों के सामने आने वाली चुनौतियाँ जैसे — अपर्याप्त बुनियादी ढांचा, शिक्षकों की कमी, पुराने शिक्षकों को कंप्यूटर की जानकारी न होना, और असमान कार्यान्वयन — आज भी प्रासंगिक हैं।

मुख्य शब्द: शिक्षा नीति 1986, शिक्षा नीति 2020 का विस्तृत ज्ञान, दोनों नीतियों का तुलनात्मक अध्ययन।

प्रस्तावना

मानवीय विकास के लिए शिक्षा सबसे महत्वपूर्ण विषय है। मनुष्य का सामाजिक, राजनीतिक व मानवीय दृष्टिकोण से विकास के लिए शिक्षा आज के समय की एक मूलभूत आवश्यकता है। भारत में जहाँ आज भी साक्षरता का स्तर काफी कम है, वहाँ मानवीय सोच को

सकारात्मक बनाने व उनके सर्वांगीण विकास के लिए शिक्षा आज के युग की मूलभूत आवश्यकताओं में से एक है। श्रेष्ठ शिक्षा सामाजिक, तार्किक, राजनीतिक, सांस्कृतिक, वैज्ञानिक व तकनीकी विकास सभी के लिए भारत की आधारशिला है। विद्यालयों की प्रारंभिक स्तर की शिक्षा एक ऐसा माध्यम है जिससे सभी वर्ग के बच्चों की प्रतिभा व उनके बौद्धिक विकास आदि को तराशा जा सकता है। छात्रों का यही बौद्धिक विकास उच्च स्तरीय शिक्षा का वह माध्यम बनेगा जिससे देश सभी क्षेत्रों में अपनी सफलता के एक नए आयाम तय करेगा तथा हमें प्रत्येक क्षेत्र के लिए किसी दूसरे देश पर निर्भर नहीं दिखाना पड़ेगा। आधुनिक समय में पूरा विश्व ज्ञान के बल पर नित नए आयाम प्रस्तुत कर रहा है। वर्तमान समय में शिक्षा को और अधिक सुगम, लचीला व सुचारू बनाए रखने के लिए विभिन्न प्रकार की तकनीक का विकास हो रहा है, जिसमें ए.आई., चैटजीपीटी, मशीन लर्निंग आदि महत्वपूर्ण भूमिका निभा रहे हैं। आधुनिक समय में आर्टिफिशियल इंटेलिजेंस के आ जाने से पूरे विश्व में अकुशल कर्मचारियों व श्रमिकों की जगह मशीनों ने ले ली है। आने वाले समय में ऐसे ही कुशल कामगारों की आवश्यकता पड़ेगी जो कि गणित, विज्ञान, कंप्यूटर आदि विषयों में विशेष दक्षता रखते हों।

इन्हीं सारी बातों को ध्यान में रखते हुए नई शिक्षा नीति को अस्तित्व में लाया गया। 1986 के दशक में पी. वी. नरसिंह राव की सरकार थी तथा उन्हीं की अध्यक्षता में 1986 की राष्ट्रीय शिक्षा नीति की नींव रखी गई थी। इस नीति का मुख्य लक्ष्य समान शैक्षणिक अवसर प्रदान कर साक्षरता के स्तर को उच्चतम स्तर पर ले जाना था, जिसके तहत सभी आरक्षित वर्ग — अनुसूचित जाति, अनुसूचित जनजाति, महिलाओं — को शामिल किया गया। 1986 की नीति मदरसे की शैक्षणिक गुणवत्ता बढ़ाने तथा शिक्षा प्रणाली में आ रहे विभिन्न मतभेदों को दूर करने पर आधारित थी। पिछड़े ग्रामीण क्षेत्रों में जहाँ शिक्षा का अभाव था, वहाँ प्राथमिक शिक्षा उपलब्ध कराने के उद्देश्य से ऑपरेशन ब्लैकबोर्ड के माध्यम से महत्वपूर्ण कदम

उठाए गए। सन 2020 में प्रधानमंत्री नरेंद्र मोदीजी की सरकार थी तथा उनके कार्यकाल के दौरान 2020 की राष्ट्रीय शिक्षा नीति लागू की गई। दोनों ही नीतियों ने अपने-अपने स्तर पर शिक्षा को नए आयाम दिए हैं। इस अध्ययन के माध्यम से 1986 की नीति और 2020 की शिक्षा नीति का तुलनात्मक अध्ययन किया गया है।

अध्ययन के उद्देश्य

1. 1986 की नीति को जानना।
2. 2020 की शिक्षा नीति को संक्षिप्त रूप में समझना।
3. 2020 व 1986 की नीतियों का तुलनात्मक अध्ययन करना।

अध्ययन का क्षेत्र

2020 की नीति के अंतर्गत छात्रों के सर्वांगीण विकास के लिए संगीत कला, कंप्यूटर आधारित प्रोग्राम, व्यावसायिक पाठ्यक्रम, प्रौद्योगिकी सूचना आदि के लिए काफी विस्तृत क्षेत्र है, जबकि 1986 की नीतियों में इन्हें शामिल नहीं किया गया था। अतः प्रस्तुत अध्ययन के माध्यम से बहुविषयक पाठ्यक्रम व छात्र आधारित शिक्षा के लिए काफी विस्तृत क्षेत्र है।

साहित्य का पुनरावलोकन

1. **एन.ई.पी. 1986** में आधुनिकीकरण की ओर एक बदलाव को चिह्नित किया गया है, जिसका उद्देश्य सभी वर्ग समूह का विकास करना और व्यावसायिक व तकनीकी प्रशिक्षण को एकीकृत करना था। **गोविंदा (2002)** के अनुसार, इस नीति ने सार्वभौमिक प्राथमिक शिक्षा, प्रौढ़ शिक्षा, शिक्षक प्रशिक्षण और महिलाओं के सशक्तिकरण पर महत्वपूर्ण जोर दिया। **तिलक (2005)** ने उल्लेख किया है कि यद्यपि नीति का दृष्टिकोण प्रगतिशील था, लेकिन विकेंद्रीकृत योजना की कमी और अपर्याप्त निगरानी तंत्र के कारण इसकी प्रभावशीलता बाधित हुई। **ऑपरेशन ब्लैकबोर्ड** योजना और जिला

प्राथमिक शिक्षा कार्यक्रम इस नीति से उभरे, फिर भी उनका दीर्घकालिक प्रभाव असमान था।

2. **एन.ई.पी. 2020** ने नीति आते ही व्यापक शैक्षणिक और नीतिगत चर्चा को जन्म दिया है। **कुमार (2020)** के अनुसार यह नीति समग्र, लचीली और बहुविषयक शिक्षा पर जोर देकर एक आदर्श बदलाव का प्रतिनिधित्व करती है।

पवन कल्याणी ने अपने शोध में पाया कि राष्ट्रीय शिक्षा नीति 2020 में प्रस्तावित सभी सुधार भविष्य में सभी हितधारकों को सफलता दिलाने की क्षमता रखते हैं।

सरोज मलिक ने पाया कि राष्ट्रीय शिक्षा नीति 2020 शिक्षा और मानव संसाधन के क्षेत्र में सर्वोत्तम नीति साबित हो सकती है।

भारत की 1986 और 2020 की राष्ट्रीय शिक्षा नीतियों की तुलना करने वाले साहित्य समीक्षा अध्ययन से पता चलता है कि शिक्षा के अवसरों को समान बनाने से लेकर समग्र विकास, व्यावसायिक कौशल और बहुविषयक शिक्षा पर जोर देने पर ध्यान केंद्रित किया गया है।

एन.ई.पी. 2020 पारंपरिक परीक्षा-उन्मुख तरीकों से हटकर अनुभवात्मक शिक्षा, रचनात्मक और आलोचनात्मक सोच को प्राथमिकता देता है।

शोध अध्ययन विधि

प्रस्तुत अध्ययन को भली-भांति समझने हेतु विभिन्न शोध पत्र, जर्नल, किताबें आदि का प्रयोग करते हुए **वर्णनात्मक पद्धति** प्रयुक्त की गई है।

शिक्षा नीति 1986

भारत सरकार द्वारा निर्मित **1986 की नीति** एक ऐसी नीति थी जो समाज के प्रत्येक वर्ग, मुख्यतः महिलाओं व सभी आरक्षित एवं अनारक्षित वर्गों के लिए समान रूप से लागू की गई थी। इस नीति में **ऑपरेशन ब्लैकबोर्ड**, छात्र आधारित दृष्टिकोण व प्रारंभिक शिक्षा की कोर अवधारणाओं को कार्यान्वित करने पर बल दिया गया था।

इंदिरा गांधी राष्ट्रीय मुक्त विश्वविद्यालय के माध्यम से ओपन शिक्षा व मुक्त प्रणाली का भी विस्तार किया गया।

प्रमुख उद्देश्य व विशेषताएं

1. **प्रारंभिक शिक्षा में सुधार** — बच्चों की प्रारंभिक शिक्षा में सुधार के लिए ऑपरेशन ब्लैकबोर्ड का संचालन किया गया।
2. **ऑपरेशन ब्लैकबोर्ड** — इसके अंतर्गत शिक्षा को बेहतर बनाने के लिए फर्नीचर, आवास, शैक्षणिक सामग्री व कम से कम दो शिक्षक जैसी सुविधाएँ सुनिश्चित की गईं।
3. **सामाजिक पहुँच** — इस नीति का मुख्य उद्देश्य महिलाओं सहित अनुसूचित जाति व जनजाति सभी के बीच साक्षरता की असमानता को समाप्त करना था।
4. **दूरस्थ शिक्षा प्रणाली** — इंदिरा गांधी मुक्त विश्वविद्यालय द्वारा दूरस्थ व ओपन शिक्षा प्रणाली को विस्तृत किया गया।
5. **उच्च स्तरीय शैक्षणिक सुधार** — शोध व शिक्षा की गुणवत्ता सुधार हेतु कदम उठाए गए।
6. **तकनीकी व व्यावसायिक शिक्षा** — तकनीकी व व्यावसायिक शिक्षा को अधिक प्रभावी बनाने पर जोर दिया गया।
7. **त्रिभाषा सूत्र** — हिंदी, अंग्रेजी व स्थानीय भाषा को शिक्षण माध्यम में शामिल किया गया।

शिक्षा नीति 2020

2020 की शिक्षा नीति ने काफी व्यापक स्तर पर बदलाव लेकर आई। इस नीति का एजेंडा केवल शिक्षा या साक्षरता के स्तर को बढ़ाना नहीं था, बल्कि एक ऐसी मिसाल कायम करना था, जिससे कि पूरे राष्ट्र का विकास संभव हो सके। यह नीति आर्टिफिशियल इंटेलिजेंस व नई तकनीक के माध्यम से शिक्षा को अधिक रचनात्मक, वर्णनात्मक और रोचक बनाती है। इस नीति में प्रारंभिक शिक्षा के लिए अपनी **मातृभाषा या क्षेत्रीय भाषा** को प्रोत्साहित किया गया, ताकि बच्चे अपनी पढ़ाई को आसानी से समझ सकें और उनकी समझ को सुदृढ़ बनाया जा सके।

नई शिक्षा नीति के मुख्य सिद्धांत —

1. **पहुँच** — प्राथमिक स्तर तक की शिक्षा सभी बच्चों को आसानी से मिल सके, बिना सामाजिक, आर्थिक स्थिति या लिंग की परवाह किए।
2. **समानता** — समाज के सभी वर्गों को शिक्षा के समान अवसर प्राप्त हों।
3. **गुणवत्ता** — सभी छात्र-छात्राओं को उच्च गुणवत्ता की शिक्षा प्रदान करना।
4. **समर्थ** — सभी बच्चों को निशुल्क व अनिवार्य शिक्षा प्राप्त हो सके।
5. **जवाबदेही** — राज्यों व स्कूलों को छात्रों के वार्षिक परिणाम की जिम्मेदारी देना।

2020 की शिक्षा नीति के प्रमुख बदलाव —

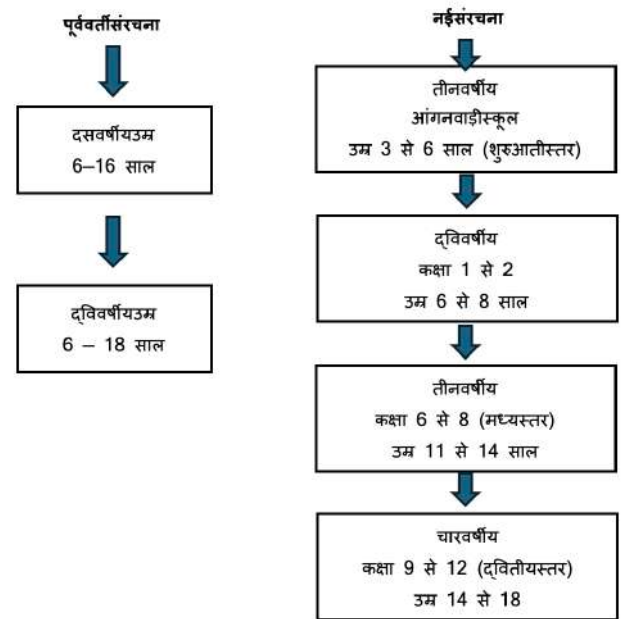
1. शिक्षा संरचना **10+2** की नीति को बदलकर **5+3+3+4** की नई संरचना लागू की गई।
2. **बहुविषयक दृष्टिकोण** — गणित, विज्ञान के साथ-साथ साहित्य, कला, संगीत जैसे विषयों को भी शिक्षा में शामिल कर अवसर प्रदान किए गए।
3. **सकारात्मक सोच** — छात्रों के कौशल, अनुभव और रचनात्मक सोच को बढ़ावा दिया गया।
4. **लचीली शिक्षा** — शिक्षा को अधिक लचीला बनाया गया, जहाँ छात्र अपनी रुचि के अनुसार विषयों में परिवर्तन कर सकें।
5. **डिजिटल एकीकरण** — आर्टिफिशियल इंटेलिजेंस और मशीन लर्निंग के माध्यम से शिक्षा को अधिक रचनात्मक व रोचक बनाया गया।
6. **पारंपरिक ज्ञान** — स्वदेशी व सांस्कृतिक ज्ञान को विज्ञान आधारित तरीकों के माध्यम से शिक्षा में शामिल किया गया।
7. **वित्तीय सहायता** — सामाजिक व आर्थिक रूप से कमजोर छात्रों को छात्रवृत्ति व सहायता प्रदान की गई।

2020 की नीति लाने की आवश्यकता क्यों पड़ी —

1. ज्ञान पर आधारित अर्थव्यवस्था के निर्माण हेतु।
2. शिक्षा को रचनात्मकता, नवाचार, आधुनिक तकनीक और डिजिटलाइजेशन से जोड़कर छात्रों के समग्र विकास हेतु।
3. भारत को वैश्विक स्तर पर शैक्षिक नेतृत्व दिलाने हेतु।

1986 की शिक्षा नीति व 2020 की शिक्षा नीति का तुलनात्मक अध्ययन

1. **शैक्षिक उद्देश्य:** 1986 की नीति में प्रत्येक वर्ग को समानता की श्रेणी में रखते हुए समाज के सभी वर्गों के लिए समान शिक्षा अधिकार का लक्ष्य रखा गया था। वहीं 2020 की नीति में छात्रों के **समग्र विकास**, रचनात्मक, तार्किक ज्ञान, अनुसंधानात्मक दृष्टिकोण व कौशल को विस्तृत रूप से प्रदान करने का लक्ष्य रखा गया।
2. **शिक्षक व पाठ्यक्रम:** 1986 की नीति रटने (Rote Learning) आधारित शिक्षा पद्धति पर जोर देती थी। जबकि 2020 की नीति छात्रों की **रचनात्मक सोच, विश्लेषणात्मक क्षमता और स्वशिक्षण प्रवृत्ति** को बढ़ावा देती है।
3. **भाषा नीति:** त्रिभाषा सूत्र 1986 की नीति में शामिल किया गया था। परिवर्तित 2020 की नीति में **प्राथमिक स्तर पर स्थानीय भाषा या मातृभाषा** में शिक्षा देने का सुझाव दिया गया तथा आगे के स्तरों पर क्षेत्रीय व राष्ट्रीय भाषा को अपनाने का प्रावधान किया गया।
4. **उच्च शिक्षा:** 2020 की नीति में उच्च शिक्षा पर विशेष ध्यान दिया गया है, जहाँ छात्रों को अपनी रुचि अनुसार विषयों के चयन की स्वतंत्रता प्रदान की गई है। क्योंकि छात्रों की रचनात्मक एवं कलात्मक सोच ही उच्च भारत का निर्माण करेगी। वहीं 1986 की नीति में उच्च शिक्षा पर इतना ध्यान नहीं दिया गया था।
5. **शैक्षणिक संरचना:** 1986 में **10 + 2** पद्धति लागू थी। वहीं 2020 में **5 + 3 + 3 + 4** पद्धति को शामिल किया गया है।



6. **बहुविषयक दाखिला व बदलाव:** 2020 की नीति में छात्रों को स्नातक में प्रवेश और विषय परिवर्तन हेतु लचीलापन प्रदान किया गया है। इसके अनुसार, यदि छात्र किसी कारणवश अपना विषय बदलना चाहते हैं या कुछ समय पश्चात अपने विषय/कोर्स को पुनः जारी करना चाहते हैं, तो वे ऐसा कर सकते हैं। उन्हें अध्ययन की अवधि के अनुसार **सर्टिफिकेट / डिप्लोमा / डिग्री** प्रदान की जाएगी। जबकि 1986 की नीति में ऐसा कोई प्रावधान नहीं था।



तुलनात्मक अध्ययन

आधार	1986 नीति	2020 नीति
शैक्षणिक विकास	इसमें केवल बच्चों की शिक्षा व साक्षरता स्तर पर	इसमें पढ़ाई के साथ-साथ तार्किक और समस्या समाधान संबंधी

	ध्यान दिया जाता था।	संज्ञानात्मक क्षमताओं का विकास किया गया।
किताबी ज्ञान	इसके अंतर्गत मात्र किताबों के ज्ञान पर ज़ोर दिया गया।	इसमें बच्चों को पढ़ने से पहले एक रोचक हुक (ध्यान आकर्षित करने की प्रक्रिया) का प्रयोग किया जाता है।
रुचि	इस नीति में छात्रों की रुचि को ध्यान में नहीं रखा जाता था।	इसमें छात्र जिस क्षेत्र में रुचि रखते हैं, उस क्षेत्र में आगे बढ़ने के लिए प्रोत्साहित किया जाता है।
तकनीकी इस्तेमाल	तकनीकी साधन न होने के कारण छात्रों की सोच और उनके विचारों का सीमित विकास होता था।	हालांकि तकनीकी साधन उपलब्ध होने के बावजूद अत्यधिक उपयोग के कारण छात्रों के विचारों का स्वाभाविक विकास प्रभावित हो सकता है।
फीडबैक	इस नीति में छात्रों को प्रोत्साहित करने हेतु या उनके कार्य पर कोई फीडबैक नहीं दिया जाता था।	इसमें छात्रों को प्रोत्साहन हेतु उन्हें रचनात्मक फीडबैक दिया जाता है।

निष्कर्ष

1986 की नीति व 2020 की शिक्षा नीति दोनों का ही मुख्य उद्देश्य शिक्षा व साक्षरता के स्तर को बढ़ाना है। छात्रों को एक ऐसी शिक्षा नीति मुहैया कराई गई है, जो उनके सर्वांगीण विकास के लिए बनाई गई है। यह न केवल बौद्धिक स्तर पर बल्कि मानसिक स्तर पर भी उन्हें आगे ले जाएगी। जबकि 1986 की नीति में ऐसी किसी भी बात को शामिल नहीं किया गया था। उस समय की नीति केवल पूर्ण साक्षरता के उद्देश्य को लेकर आगे बढ़ रही थी। इससे कोई लाभान्वित होता है या नहीं — इससे कोई मतलब नहीं था।

आधुनिक शिक्षा नीति, जिसे डिजिटाइजेशन से जोड़कर बच्चों को मशीन लर्निंग से जोड़ने का प्रयास किया गया, यदि देखा जाए तो यह एक तरफ सराहनीय भी है, तो दूसरी तरफ निंदनीय भी। क्योंकि सब कुछ डिजिटल हो जाने से बच्चे की निर्भरता पूरी तरह से फोन व कंप्यूटर पर आश्रित हो चुकी है। अतः बच्चे की सोचने-समझने और किसी विषय पर अपने विचार व्यक्त करने की क्षमता कम होती जा रही है।

1986 की नीति में तकनीक का किसी तरह का उपयोग न होने के कारण बच्चों का बौद्धिक स्तर व उनके सोचने-समझने की शक्ति और किसी भी विषय पर विचार अभिव्यक्ति काफी प्रबल थी। जैसा कि हम जानते हैं कि प्रत्येक बदलाव कुछ अच्छे और कुछ बुरे दोनों अनुभव लेकर आता है, ठीक उसी तरह 2020 की नीति भी है। दोनों ही नीतियों के अपने-अपने गुण-दोष हैं।

बावजूद इसके, 2020 की शिक्षा नीति छात्र का **चरित्र निर्माण** करने पर ज़ोर दे रही है, क्योंकि एक विकसित व प्रबल छात्र ही विकसित राष्ट्र निर्माण में अपनी सहयोगिता व सहभागिता प्रदान कर सकता है।

संदर्भग्रंथ

- **अग्रवाल, आर. एवं अरीना, विपिन** (1989). मनोविज्ञान एवं शिक्षा में मापन व मूल्यांकन. विनोद पुस्तक मंदिर, आगरा।
- **सिंह, बिरेंद्र एवं देवी, कुकन** (2022). उच्च शिक्षा के विशेष संदर्भ में राष्ट्रीय शिक्षा नीति 2020 की एक महत्वपूर्ण अंतरदृष्टि। *International Journal of Research and Analytical Review (IJRAR)*, 9(1), 17-20.
- **कुशवाहा, उमाशंकर एवं श्रीवास्तव, अखिलेश कुमार** (2021). सतना जिले में किशोरावस्था के छात्र व छात्राओं में मानवीय मूल्यों व उनकी शैक्षणिक उपलब्धि का तुलनात्मक अध्ययन। *International Journal of Applied Research*, 7(1), 400-403.

- नई शिक्षा नीति: पढ़ाई, परीक्षा, रिपोर्ट कार्ड सब में होंगे यह बड़े बदलाव. आज तक। अभिगमन तिथि: 30 जुलाई 2020।
- नई शिक्षा नीति 2020: प्रमुख पॉइंट्स एक नज़र में. अभिगमन तिथि: 30 जुलाई 2020।
- आइए जानें, आखिर देश की शिक्षा प्रणाली को बदलने के लिए नई राष्ट्रीय शिक्षा नीति की जरूरत क्यों पड़ी? दैनिक जागरण। अभिगमन तिथि: 30 जुलाई 2020।
- Government of India (2020). National Education Policy 2020. उपलब्ध: https://www.education.gov.in/sites/upload_files/mhrd/files/nep_final_English_0.pdf
- Wikipedia contributors. National Education Policy 2020. उपलब्ध: https://en.wikipedia.org/wiki/National_Education_Policy_2020



Ethical and Responsible Use of Technology in Secondary Education

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ABSTRACT

This study is based on a general survey conducted on senior secondary school students. The research examines various aspects of technology use, including the integration of digital resources alongside traditional materials by teachers and institutions, and the role of technology in facilitating self-study among students. It further investigates how educators and institutions can integrate technology meaningfully into their subjects to enhance the positive experiences of children. A key focus is the extent to which this integration influences the mindset and attitudes of students.

The article details the ethical and accountability frameworks necessary for utilizing technology in the educational sector. This framework aims to ensure that students are fully aware of the risks and benefits associated with digital technology, enabling them to make positive and responsible use of it. Furthermore, the study proposes defining the accountability of various stakeholders including manufacturers, developers, technical service providers, and consumers to promote the ethical and constructive use of technology in schools.

KEYWORDS: Ethical and Responsible, Digital Resource, Cyber bullying, Artificial Intelligence

INTRODUCTION

The widespread impact of technology is currently visible across society, nationally, and internationally. There is hardly any sector left where technology isn't being used. While technology aids in promoting innovation and simplifying processes, it sometimes also negatively impacts our values.

In the context of the expansion of education, we are now able to make education more comprehensive and accessible by utilizing technical knowledge and advanced technologies. Technology has enabled us to widely propagate basic literacy in educational movements. It has made it possible for an individual to obtain a degree not only from their own state but also from foreign universities through online courses. The use of technology has also increased efficiency. By integrating into various sectors, technology has proven helpful in streamlining our work and increasing productivity.



Technology and humanity have two aspects; we should not only consider the positive aspects of technology but also its negative side. While the uncontrolled use of technology in education is leading to an increase in cybercrimes, it is also affecting individuals' thoughts, mental health, and behavior. Due to the constant intervention of technology, individuals are increasingly becoming isolated from society, and the characteristics of human society and psychology are changing. The decline of human values and ethics is emerging as a major consequence of the extensive use of technology."

ETHICAL USE OF TECHNOLOGY IN EDUCATION

Ethical technology use in schools involves implementing responsible, equitable, and transparent practices with digital tools. The primary goal is to enhance the learning experience while actively safeguarding students from potential harms like cyberbullying, digital addiction, and exposure to misinformation.

Key Responsibilities and Actions

For a school to achieve an ethical digital environment, leadership and instruction must focus on several core areas:

- **Establishing Clear Expectations:** School leaders must first understand the complete scope of technology being used in the district or school. Following this assessment, they need to set precise guidelines for how technology will be integrated into the classroom, making sure it supports both educational goals and high ethical standards.
- **Fostering Digital Citizenship and Literacy:** A crucial element of this ethical framework is building digital literacy for both students and staff. Curricula should be developed to teach students critical thinking about online information, promote responsible online conduct, and explore the implications of automation and Artificial Intelligence (AI).
- **Supporting Educators:** To effectively model and enforce the best digital practices, teachers must receive professional development training on ethical technology use.
- **Ensuring Equity:** The selection of digital tools must be intentional, aiming to close existing educational gaps rather than exacerbating them.

In essence, ethical technology integration ensures that the tools serve the learning process and prioritize the well-being and academic integrity of every student.

ETHICAL CONSIDERATIONS

As the use of technology in education increases, the complexity in understanding difficult subject matter is decreasing. This also brings with it a series of ethical considerations that need to be carefully addressed.

The Risk of Data Exposure

* When we search for or obtain information in any field through technology, the technology collects our complete information about us.

* This creates the possibility that our private information could become public.

* This risk is an aspect that we must pay special attention to.

Ethical Responsibility

This section concludes with a call regarding data security:

* It is the ethical responsibility of both technology providers and the government to implement strict data security protocols.

The Challenge of Technology in Education

* "The use of technology in education is not possible everywhere and at all times because technical resources are not available everywhere."

Digital Divide and Inequality

* This means that the use of technology in education is easier for children who live in cities or metropolises and who are wealthy.

* However, its use is very difficult for children who live in poor, backward, or rural areas and who live in difficult circumstances.

* To this extent, this becomes a question of justice and a violation of fundamental rights.

* "Therefore, it becomes our responsibility to ensure the availability of all types of resources for all children."

Duties for Teachers:

* Teachers should use technology not just as a function, but its objective should be to improve learning outcomes.

* Critical thinking and problem-solving skills should be promoted through technology.

* Teachers should be trained in the ethical use and effective integration of technology.

Duties for Technology Companies and Institutions:

* Technology provider companies should prioritize the interest of students over their profit.

* The psychological safety of children must be kept paramount.

* Educational institutions must maintain complete transparency and adhere to the country's policies (laws/rules).

* Curricular Integration Challenge: One of the biggest challenges is figuring out how to integrate these ethical issues into already "packed" high school curricula. The suggestion is to integrate ethical education into subjects like Computer Science, History, and Social Studies to provide a holistic understanding of technology's global impact.

* Complexity of Ethical Issues: Ethical issues are often "fundamentally complex" and involve "mixed issues". The text states that the answers to questions are rarely "crystal clear" (for example, questions about the extent of data collection by companies). This requires teachers to "tread those difficult lines" in facilitating discussions.

* Rapid Pace of Technological Change: The "speed of change in technologies" is a major challenge. As new technologies emerge, new ethical issues constantly arise. This makes it necessary for instructors to "stay updated with the latest trends and developments" to effectively prepare students for the relevant ethical discussions.

* Need for Thoughtful Approaches: Teaching ethics in technology requires "a thoughtful approach". Teachers must balance the potential benefits of technology with the "potential ethical concerns that arise from it". This means creating a learning environment that encourages "open conversation on genuinely complex ethical issues". The main goal is to develop the students' critical ability to make responsible decisions and act responsibly in the digital world,

but effectively tackling these challenges is key to achieving this.

In the current era, the use of technology is an essential part of everyone's routine. The use of technology has become normal and mandatory in today's education system as well. Ethics and responsibility in the use of technology in education are extremely essential and are considered the foundation pillars. Only through ethics and responsibility can fairness, transparency, and accountability be ensured in the use of technology in education.

1. Data Security

* The security of students' and teachers' personal data is an ethical responsibility.

* It is the responsibility of any institution to ensure that the technical information and personal data of the studying student remain completely confidential and secure.

* Transparency is necessary in the use of technology.

2. Fairness

* It is the ethical responsibility of the institution to ensure equal participation of students when using technology.

* All students should get an equal opportunity to use technology, and the knowledge of technology should be provided to them equally.

* Technologically created models, blogs, or accounts should not support or oppose any particular side.

3. Safety from Crime

* Institutions should provide students with knowledge of the ethics of using technology.

* Cyber bullying, hacking social media accounts, or tracking/tracing others fall under the category of crimes for which there are legal provisions; therefore, one must avoid them while using technology.

* It is the institution's responsibility to provide students with the knowledge and instructions that they should not use

technology for wrong deeds and should not be involved in any criminal activity.

4. Use Only as Needed

- * Students should use technology only as needed.
- * Lately, online game addiction is being observed in students.
- * The institution should provide this ethical education: students should use technology according to time and necessity so that they do not face various physical problems.
- * Students should not easily provide their information in the digital world, nor should every website be opened.
- * It is necessary for every student to receive knowledge about copyright law from the institution.



RESPONSIBILITIES

A. Teachers' Responsibilities

- * Teachers should be skilled in the use of technology and keep themselves updated with the latest knowledge.
- * They should use digital content that is relevant and appropriate to the students' level.
- * Teachers should also provide students with information on online safety and social media.
- * Technical education should be provided according to the students' learning pace.

* While creating projects, teachers should teach students not to steal information from social media, but only to seek guidance.

B. Students' Responsibilities

- * It is the students' responsibility to use various technologies honestly and not to damage the equipment.
- * They should show active participation while obtaining information so that accurate and correct information can be acquired.
- * Students must avoid the misuse of technologies so that they can avoid any type of crime, even unintentionally.
- * For any source of information, only reliable and valid sources should be used.

Key Ethical Points for Technology Use in the Classroom

- * Information on Privacy: Teachers should educate students on how digital platforms collect and store private information and data when they use technology. This information should also be communicated to the students' parents.
- * Sense of Equality: It is necessary to ensure that technology is used equally among all students. There should be a sense of equality among all students, regardless of the area or class they belong to, otherwise, feelings of frustration and inferiority may arise in the students' minds.
- * Awareness and Training: It is the institution's responsibility to provide students with special information for the use of technology in education. This will enable students to stay safe and avoid cyber fraud.
- * Selection of Reliable Tools: Teachers should select reliable tools along with technical knowledge. When selecting, safety, accessibility, and inclusivity should be prioritized, along with adherence to ethical standards.
- * Monitoring and Evaluation: The main objective of using technology is to improve the quality of education and keep it up-to-date with knowledge. To ensure this objective is being

achieved, teachers should continuously monitor the educational process and conduct evaluations periodically.

CONCLUSION

In conclusion, we can say that the use of advanced technology in education is the need of the hour today. However, it also presents significant challenges that require careful resolution.

The risks associated with the use of technology can be minimized through comprehensive data management, collaboration, and transparency. This makes it extremely important for the government and the technology providers to work together and establish policies and take the necessary steps.

REFERENCES

- Anderson, Grady (2024) "Exploring IT Ethic and Responsible Use of technology in Higher

education." <https://moldstud.com/articles/p-exploring-it-ethics-and-responsible-use-of-technology-in-higher-education?hl=en-IN>

- Baule, Steve (2025) *The Role of School Leaders in Ensuring Ethical Technology Use and Data Privacy*. <https://www.techlearning.com/news/the-role-of-school-leaders-in-ensuring-ethical-technology-use-and-data-privacy>
- Siddiq, Fazilat and Murchan, Damian (2024) *Towards a code of ethics for using technology-enabled data and related analytic approaches in educational assessment*. <https://www.tandfonline.com/doi/full/10.1080/0969594X.2025.2453138#d1e163>
- Wood, David (2018) *Ethical Guidelines for Technology Use in Schools*. <https://study.com/academy/lesson/ethical-guidelines-for-technology-use-in-schools.html#:~:text=There%20are%20many%20ethical%20issues,t he%20implications%20of%20their%20actions.>



Pedagogical Innovations for Online and Blended Learning Environment (English Teaching)

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ABSTRACT

In the era of rapid digital transformation and evolving learner expectations, traditional English language teaching in classrooms alone no longer suffices. The integration of online and blended learning environments offers new opportunities for English pedagogy to become more engaging, flexible, and learner-centred. This paper explores pedagogical innovations applicable to online and blended contexts in the teaching of English, including flipped classrooms, project-based learning, digital storytelling, gamification, collaboration through online platforms, and the blended mix of face-to-face and virtual instruction. It examines the rationale for these innovations—such as promoting active learning, individualized pacing, deeper engagement, and development of 21st-century skills—and describes how English teachers can adopt technology and constructivist methods to enhance listening, speaking, reading, and writing skills. The paper also considers the teacher's evolving role—from knowledge-transmitter to facilitator and designer of learning experiences—and discusses the benefits (such as improved motivation, digital literacy, and flexible access) as well as the challenges (such as digital divide, teacher training, student self-regulation, and infrastructure). Drawing on recent literature, the study offers practical suggestions for effective implementation of pedagogical innovations in English teaching in online and blended modes. The conclusion emphasises that while technology alone cannot guarantee learning gains, thoughtful design of pedagogy, institutional support, and continuous professional development are key to transforming English pedagogy in

blended and online settings. This paper thus seeks to contribute to the ongoing discourse on how English language teaching can adapt and flourish in modern, hybrid educational environments.

KEYWORDS

Pedagogical innovation, English pedagogy, blended learning, online education, digital storytelling, teacher facilitation, constructivist approach, 21st-century skills.

INTRODUCTION

In recent years, the landscape of education has changed dramatically—driven by advances in information and communication technologies (ICTs), evolving learner needs, and the disruptions caused by the COVID-19 pandemic. For English language teaching (ELT), the demands are no longer confined to grammar and vocabulary mastery within classroom walls. Learners today require communicative competence, digital literacy, creativity, and collaborative skills that align with global contexts.

Blended learning (which combines online and face-to-face modes) and fully online instruction have emerged as powerful models. These allow teachers to design flexible, personalized, and student-centred lessons. English pedagogy within such contexts emphasizes interactive learning, peer engagement, digital storytelling, and real-world language use.

This paper explores the pedagogical innovations that can enhance English teaching in online and blended environments. It discusses their meaning, need, major forms, teacher roles, advantages, challenges, and practical strategies for successful implementation.

Meaning of Pedagogical Innovation in Online and Blended Contexts

Pedagogical innovation refers to the introduction of new teaching methods, tools, or approaches that significantly improve learning outcomes. In online and blended contexts, innovation means designing interactive, flexible, and technology-integrated experiences.

In English pedagogy, it includes flipped classrooms, digital storytelling, gamification, online collaboration, and project-based learning. These methods shift focus from passive to active learning, making students co-creators of knowledge rather than mere receivers.

Innovation in teaching English online or in blended forms also aligns with constructivist learning theory, emphasizing student discovery, collaboration, and reflective practice thus, The teacher's role thus changes from knowledge giver to facilitator, guide, and designer of meaningful digital learning experiences.

Online and Blended Learning Environments: An Overview

Online learning refers to complete virtual instruction delivered via the internet, whereas blended learning combines online digital resources with in-person sessions. According to Bozkurt (2022), the blended model balances "time, place, path, and pace," offering flexibility to learners.

Models of blended learning include:

- Rotation model – Students alternate between online and classroom stations.
- Flex model – Majority of learning online, with on-site teacher guidance.
- Flipped classroom – Students learn content online before class and apply it during in-class sessions.
- Enriched virtual – A mix of online and scheduled in-person meetings.

For English pedagogy, these models allow grammar input online, writing collaboration through Google Docs, synchronous discussions via Zoom, and feedback through digital platforms.

Need for Innovation in English Pedagogy

The demand for innovation in English teaching arises from several key needs:

1. **Learner Diversity:** Students vary in pace, style, motivation, and digital skills. Blended learning enables differentiation and personalized support.
2. **Motivation & Engagement:** Digital tools, multimedia, and gamification sustain interest.
3. **Flexibility:** Learners can access lessons anywhere and anytime.
4. **Digital Literacy:** Integration of ICT enhances skills needed in real-world communication.
5. **Active Learning:** Encourages collaboration, inquiry, and creativity.
6. **Global Relevance:** Learners must use English in multicultural, digital contexts.

As Dziuban et al. (2018) found, blended learning enhances accessibility and student satisfaction while maintaining academic rigor.

Major Pedagogical Innovations in English Teaching

1. **Flipped Classroom-** Students engage with pre-recorded videos, readings, and quizzes before class, while in-class time is devoted to interactive activities like group discussions, debates, and presentations. It enhances speaking, listening, and critical thinking skills.
2. **Project-Based Learning (PBL)-** Learners work collaboratively on real-world projects—creating podcasts, digital magazines, or blogs in English. It nurtures research, creativity, and authentic communication.
3. **Digital Storytelling-** Combining text, visuals, voice, and video, digital storytelling allows students

to narrate experiences and cultural tales, promoting writing fluency and multimodal literacy.

4. **Gamification-** Integrating game-based tools like Kahoot, Quizizz, or Wordwall makes learning engaging, encouraging competition and participation.
5. **Collaborative Learning via Online Platforms-** Through tools like Google Docs, Padlet, and forums, students co-create content, review peers' work, and learn through interaction.
6. **Learning Management Systems (LMS)-** Platforms like Moodle, Edmodo, and Google Classroom centralize communication, content delivery, and feedback. They support seamless blending of modes.

1. Unequal access to devices and internet (digital divide).
2. Insufficient teacher training in technology integration.
3. Students' lack of self-regulation in online learning.
4. Need for redesigning assessments.
5. Institutional resistance to change and inadequate policies.
6. Time constraints for teachers in content creation.

Suggestions for Effective Implementation

1. Conduct regular digital pedagogy workshops for teachers.
2. Ensure robust digital infrastructure and equitable student access.
3. Adopt a "pedagogy-first, technology-second" approach.
4. Define clear blending strategies and learning objectives.
5. Encourage active participation and peer learning.
6. Offer student orientation for online study habits.
7. Redesign assessments using e-portfolios and multimedia projects.
8. Build learning communities and online discussion groups.
9. Evaluate programs through feedback and analytics.
10. Institutionalize support systems and leadership initiatives.

Role of the Teacher in an Innovative Online/Blended Environment

- Teachers evolve from content-deliverers to:
- Designers of Learning: Creating blended sequences and interactive modules.
- Facilitators: Guiding student discussions and reflection.
- Mentors: Supporting motivation and engagement.
- Assessors: Using e-portfolios, peer review, and digital rubrics.
- Tech Integrators: Employing digital tools purposefully for pedagogy, not novelty.
- Professional development is critical to help teachers master these roles.

Advantages of Pedagogical Innovations

1. Increased learner engagement and autonomy.
2. Flexibility in time and place of study.
3. Integration of digital literacy and language skills.
4. Active, student-centred learning environment.
5. Enhanced collaboration and critical thinking.
6. Sustained learning continuity during disruptions.

Challenges in Implementation

Illustrative Case Example

In a blended English literature course, the instructor uploads short lectures and e-resources on narrative techniques to Google Classroom. Students watch them and complete quizzes asynchronously. In live sessions, they analyze short stories in breakout rooms, present interpretations, and collaboratively design a podcast based on a chosen story. The teacher monitors via LMS data, provides online feedback, and conducts in-person discussions for deep comprehension. The result: active participation, creative output, and improved linguistic confidence.

Discussion

The move toward blended and online modes has revolutionized English pedagogy. These innovations democratize education, foster self-directed learning, and improve engagement. However, success requires alignment between pedagogy, technology, and institutional support.

Teachers must rethink their identities—as facilitators who design experiences, not just deliver content. Similarly, assessments should capture process-oriented skills such as collaboration, communication, and digital creativity.

A culture of experimentation, reflection, and professional growth is vital for sustaining innovation

Conclusion

Pedagogical innovations for online and blended English teaching promise to transform traditional classrooms into vibrant, participatory spaces. When implemented thoughtfully, they can foster flexibility, creativity, and learner

autonomy. Yet, technology is only a tool—the real transformation lies in the pedagogy, mindset, and human connection that educators bring to their teaching.

Institutions must therefore invest in teacher training, technological infrastructure, and curriculum redesign to truly integrate innovation. The future of English pedagogy lies in blending—not only modes of learning—but also innovation with empathy, technology with humanity, and knowledge with creativity.

REFERENCES

- Kumar, S., & Singh, R. (2022). Digital Pedagogies and Teacher Preparedness in Indian Higher Education. *Journal of Educational Technology*, 19(1), 45–58.
- Bozkurt, A. (2022). The Future of Online and Blended Learning: Perspectives and Practices. *Open Praxis*, 14(2), 145–159.
- O'Dowd, R. (2023). Telecollaboration and Virtual Exchange in Language Education: New Directions. *Language Learning & Technology*, 27(2), 1–12.



Digital Empathy Communication Model (DECM): Framework for Enhancing Managerial Communication in Digital Workspaces

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ABSTRACT

In an era of accelerating digital transformation, the essence of organizational life-human connection is increasingly mediated through screens. Although digital platforms have expanded collaboration across borders, they have simultaneously weakened the subtle dynamics of trust, empathy, and psychological safety that underpin effective communication. Despite the growing discourse on digital leadership and virtual collaboration, limited research has systematically examined how empathy operates as a communicative process within digitally mediated managerial contexts. This gap underscores the need for an integrative framework that links emotional intelligence, information clarity, and organizational climate to measurable employee outcomes. This paper introduces the Digital Empathy Communication Model (DECM), a theoretically grounded and practically oriented framework that equips managers to nurture authentic connection within remote and hybrid workplaces. Integrating insights from emotional intelligence theory, psychological safety, and information science particularly principles of tacit knowledge transfer DECM delineates the core inputs (digital communication variables), mediators (information processing and

clarity), and moderators (organizational climate factors) influencing key outcomes such as employee engagement, well-being, and retention intent. Rather than offering another technological remedy, DECM emphasizes the irreplaceable human capacities that sustain collaboration: empathy, trust-building, and intentional communication. It further recognizes the structural and cultural conditions that can strengthen or diminish these qualities in digital contexts. The model provides a practical roadmap encompassing leadership training, communication diagnostics, and culture-building strategies. Its novelty lies in reframing empathy not as a "soft skill" but as a strategic, measurable, and manageable driver of organizational resilience. The paper concludes with implications for leadership development, pathways for empirical validation, and a vision of digitally enabled workplaces where technology enhances rather than replaces the human connection at the centre of collective success.

KEYWORDS

Digital empathy, managerial communication, psychological safety, tacit knowledge, remote work, organizational climate

1. INTRODUCTION

In less than a decade, the nature of work has changed dramatically. Meetings once shaped by handshakes and hallway conversations are now conducted through webcams and chat windows. Digital platforms have erased geographical boundaries, allowing people to collaborate across continents in real time. Yet beneath this flexibility lies a quieter cost the gradual loss of trust, empathy, and psychological safety. What was once built naturally in shared spaces through tone, gesture, and presence is now filtered through screens and bandwidth. A 2023 Gallup survey reported that while most remote-capable employees value flexibility, nearly half feel less connected to their colleagues than before the pandemic. Studies in *Computers in Human Behaviour* and the *Journal of Applied Psychology* echo this, showing that unmanaged virtual communication can lead to misinterpretation, social detachment, and burnout. The digitalization of organizational life has undoubtedly made work more accessible and efficient, but it has also disrupted the emotional fabric that sustains teamwork and leadership (Waizenegger et al., 2020; Newman et al., 2020). Emerging evidence from organizational psychology suggests that digital interfaces alter empathic accuracy and nonverbal cue recognition, increasing cognitive load and reducing emotional attunement (Kock, 2005; Derks et al., 2021). As interactions increasingly take place through technology, many of the subtle cues that build empathy and trust are lost. Messages may move faster, but they often carry less meaning. Over time, this can weaken relationships and reduce the sense of belonging essential to effective collaboration (Purvanova, 2014). Traditional leadership frameworks designed for physical workplaces struggle to address these new relational challenges. Digital leaders must now balance efficiency with emotional presence, navigating asynchronous communication and screen fatigue while maintaining psychological safety. Empathy remains at the heart of human connection and effective leadership. It enables understanding, cooperation, and emotional safety qualities that technology alone cannot replicate. Restoring this “digital humanity” has become a strategic imperative for sustainable engagement

and innovation. This paper introduces the Digital Empathy Communication Model (DECM), a framework that places empathy at the centre of digital workplace communication. By recognizing empathy as a communicative process rather than a personal trait, DECM aims to restore the human element in virtual interactions and strengthen the foundation of trust, engagement, and well-being in modern organizations.

2. LITERATURE REVIEW

2.1 Digital Communication and Human Connection

Digital platforms have transformed workplace interaction into predominantly mediated exchanges. The *Media Richness Theory* (Daft & Lengel, 1986) and *Social Presence Theory* (Short et al., 1976) highlight how the richness of cues and immediacy of feedback affect communication quality. While such frameworks emphasize information transfer, they often neglect the affective subtleties empathy, warmth, and belonging that drive engagement (Byron, 2008).

2.2 Emotional Intelligence and Digital Interaction

Emotional intelligence (EI), defined as the ability to perceive and manage emotions in oneself and others (Salovey & Mayer, 1990; Goleman, 1995), provides a foundation for effective digital communication. Emotionally intelligent leaders navigate tone, timing, and empathy in mediated contexts, translating digital cues into meaningful connection (Clarke, 2010).

2.3 Psychological Safety in Virtual Teams

Psychological safety, the shared belief that one can express ideas or mistakes without fear of negative consequence underpins trust in remote collaboration (Edmondson, 1999). Virtual environments often weaken these perceptions, making intentional empathetic communication essential to maintain psychological security (Newman et al., 2020).

2.4 Information Clarity and Cognitive Load

Clarity and completeness of digital messages influence how empathy is perceived. Ambiguity can heighten misinterpretation and cognitive strain, undermining relational quality (Kock, 2005). Thus, cognitive precision and emotional transparency jointly support effective communication.

2.5 Organizational Climate and Leadership Style

Leadership that models openness and compassion encourages employees to mirror empathic behaviour (Ashkanasy & Humphrey, 2011). A supportive organizational climate amplifies these effects, shaping how empathy operates as a collective norm rather than an isolated act (Schneider et al., 2013).

2.6 Cross-Cultural Sensitivity

Culture determines emotional expressiveness and expectations of empathy (Matsumoto et al., 2008). Global teams require leaders to recognize varying norms around disclosure, feedback, and interpersonal warmth to sustain inclusivity and respect.

2.7 Gap Identification

Empathy in digital work remains under-theorized; psychological safety is seldom adapted for remote contexts; and tacit knowledge exchange suffers from the absence of social cues. Existing communication theories explain channel dynamics but not how to humanize them through empathy-driven interaction. There is a clear gap for a framework that integrates emotional, cognitive, and organizational dimensions of digital communication.

3. THEORETICAL FOUNDATIONS

The Digital Empathy Communication Model (DECM) is grounded in four complementary theoretical foundations that together explain how empathy functions as a communicative process in digital workplaces. Each theory contributes a distinct dimension emotional, relational, cognitive, and contextual forming a cohesive conceptual base for the model.

3.1 Emotional Intelligence Theory

Emotional Intelligence (Salovey & Mayer, 1990; Goleman, 1995) forms the intrapersonal and interpersonal foundation of DECM. It conceptualizes empathy as a learned capability that enables individuals particularly digital leaders to recognize, interpret, and regulate emotions conveyed through mediated communication. Within DECM, emotional intelligence informs the cognitive-affective dimension, emphasizing how awareness and regulation of emotions help decode tone, intent, and meaning across digital platforms.

3.2 Psychological Safety Framework

The Psychological Safety Framework (Edmondson, 1999) anchors the social-relational dimension of DECM. It explains how empathy fosters a climate of openness and mutual respect in digital teams. When individuals feel psychologically safe to express opinions and share feedback without fear of judgment, empathic communication becomes reciprocal, strengthening trust and collaboration (Newman et al., 2020). This interplay between empathy and safety enhances overall communication quality in remote and hybrid settings.

3.3 Media Richness and Social Presence Theories

Media Richness Theory (Daft & Lengel, 1986) and Social Presence Theory (Short et al., 1976) underpin the technological-contextual dimension of DECM. These theories explain how different media vary in their capacity to convey nonverbal and affective cues. Building on this, DECM proposes that empathy can be cultivated across both rich and lean media through intentional, emotionally aware communication practices (Dennis et al., 2020). Thus, technology becomes not a barrier but a medium for meaningful connection.

3.4 Information Processing and Organizational Climate Models

Information Processing Theory (Miller, 1956) and Organizational Climate Models (Schneider et al., 2013) together inform the cognitive-environmental dimension of DECM. They highlight how message clarity, attentional

capacity, and supportive organizational culture shape empathic understanding. A psychologically healthy climate that values inclusion, well-being, and transparent communication enhances empathy, leading to greater engagement and trust in digital teams.

4. CONCEPTUAL FRAMEWORK: THE DIGITAL EMPATHY COMMUNICATION MODEL (DECM)

4.1 Conceptual Development Methodology

The DECM was developed through a conceptual synthesis of emotional intelligence (Salovey & Mayer, 1990; Goleman, 1995), psychological safety (Edmondson, 1999), and digital communication theories (Daft & Lengel, 1986; Short et al., 1976). Drawing from recent organizational research, the framework links digital interaction variables, empathic processes, and organizational outcomes, offering a testable foundation for future empirical studies across diverse workplace contexts.

4.2 Inputs

The input layer of DECM identifies the communicative factors that initiate and influence empathic interaction in digital contexts. Key input variables include:

1. **Channel Richness:** The degree to which a communication medium conveys affective and nonverbal cues determines emotional clarity and connection (Daft & Lengel, 1986).
2. **Synchronicity and Interaction Frequency:** Real-time responsiveness and consistent engagement foster immediacy, trust, and relational closeness (Walther & Bunz, 2005).
3. **Nonverbal Signal Availability:** Tone of voice, visual cues, emojis, and other expressive signals aid emotional decoding and mutual understanding (Byron, 2008).
4. **Message Tone and Framing:** The linguistic and emotional framing of messages influences perceived

warmth, sincerity, and interpersonal trust (Rezvani et al., 2016).

Together, these elements form the emotional bandwidth that enables empathy to emerge within digital exchanges.

4.3 Mediators

DECM conceptualizes empathy as a process mediated by cognitive-affective mechanisms that determine communication quality and relationship depth. Key mediators include:

1. **Message Clarity and Completeness:** Well-structured and transparent communication reduces ambiguity and cognitive overload (Kock, 2005).
2. **Perceived Empathy:** The extent to which individuals feel understood transforms emotional awareness into meaningful relational understanding (Israelashvili et al., 2020).
3. **Trust Formation:** Consistent and emotionally attuned interaction builds relational confidence and reduces perceived risk in digital collaboration (Jarvenpaa & Leidner, 1999).

These mediators collectively determine whether communication remains transactional or evolves into authentic connection.

4.4 Moderators

The translation of empathy into tangible outcomes is influenced by contextual moderators that shape behavioural and emotional expression. Key moderators include:

1. **Organizational Climate:** A supportive culture enhances psychological safety and facilitates open emotional exchange (Schneider et al., 2013).
2. **Emotionally Intelligent Leadership:** Leaders who demonstrate empathy through inclusive communication amplify collective trust and engagement (Ashkanasy & Humphrey, 2011).

3. **Cultural Norms and Diversity:** Variations in cultural expectations influence how empathy and expressiveness are enacted across global digital teams (Matsumoto et al., 2008).

These moderators define the conditions under which empathy can translate into sustained collaboration and psychological well-being.

4.5 Outcomes

Digital empathy produces both relational and organizational-level outcomes that contribute to resilience and sustainable performance. Major outcomes include:

1. **Employee Engagement and Commitment:** Emotional connection enhances motivation, energy, and identification with organizational goals (Kahn, 1990; Bakker & Albrecht, 2018).
2. **Psychological Well-being:** Empathic digital environments mitigate isolation and foster emotional health in virtual settings (Golden, 2016).
3. **Retention and Organizational Trust:** Consistent empathy-driven communication builds loyalty and reduces turnover through a sense of belonging (Allen et al., 2015).

Through these outcomes, DECM positions empathy as a strategic organizational capability vital for adaptability and human-centred digital transformation.

4.6 Integrative View

As illustrated in Figure 1, DECM depicts empathy as a process linking technological affordances, individual emotional intelligence, and organizational context. Rich inputs foster clarity and perceived empathy; these, strengthened by trust and moderated by climate and leadership, culminate in engagement and well-being. The model provides a human-centred blueprint for sustaining authentic connection in the digital age

Digital Empathy Communication Model (DECM)

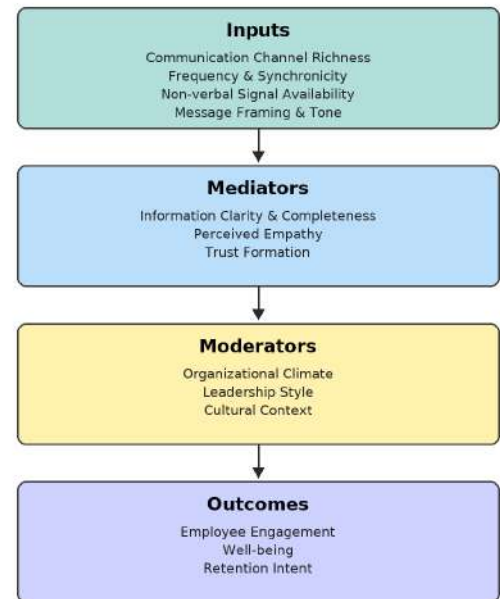


Fig 1: Representing Digital Empathy Communication model as framework

5. DISCUSSION

The Digital Empathy Communication Model (DECM) advances understanding of how empathy operates within technology-mediated organizations. It reframes empathy as a strategic communicative capability, integrating emotional intelligence (Goleman, 1995), psychological safety (Edmondson, 1999), and media theories (Daft & Lengel, 1986) to explain how digital communication can sustain trust, engagement, and human connection.

5.1 Empathy as a Strategic Organizational Capability

DECM positions empathy as an organizational resource, not merely an interpersonal trait. Empathic communication improves adaptability, engagement, and innovation (Davis & Yi, 2021; Rathi & Lee, 2023). Within digital leadership, it enables the decoding of affective cues and alignment of decisions with employee needs (Humphrey et al., 2016; Carmeli et al., 2020), reinforcing its role as a measurable driver of organizational health.

5.2 Rehumanizing Digital Collaboration

DECM challenges the notion that technology erodes empathy by showing that social presence and emotional resonance can be cultivated through clarity, tone, and responsiveness (Dennis et al., 2020; Israelashvili et al., 2020). It thus rehumanizes digital work, emphasizing that empathy when embedded in communication designs sustains authenticity and belonging in virtual teams (Sutcliffe et al., 2023).

5.3 Implications for Leaders and Teams

For leaders, digital empathy entails attentive communication that acknowledges fatigue, ambiguity, and emotional cues. Such practices strengthen psychological safety (Edmondson, 1999) and collective engagement (Bakker & Albrecht, 2018). In hybrid settings, empathic leadership improves inclusion and reduces emotional distance (Golden, 2016; Trépanier et al., 2022).

5.4 Integration with Organizational and HR Practices

DECM offers a practical foundation for embedding empathy into leadership development and HR systems. Empathy-based metrics—clarity, responsiveness, fairness—can guide training, appraisal, and digital transformation initiatives (Ashkanasy & Dorris, 2017; Rathi & Lee, 2023). This positions empathy as a core organizational competency linking emotional connection with sustainable performance (Kock, 2005).

6. APPLICATION ROADMAP AND INDICATIVE RESULTS

The Digital Empathy Communication Model (DECM) was developed as both a theoretical and actionable framework to enhance trust, engagement, and well-being in digital workplaces. Preliminary applications in leadership development and communication training programs indicate that empathy-based interventions improve relational quality, message clarity, and perceived inclusion in remote teams.

6.1 Training Interventions

Pilot implementations of digital empathy workshops integrating emotional tone calibration, active virtual

listening, and cross-cultural communication modules demonstrated measurable improvement in relational outcomes. Post-training feedback using the DECM Empathy Index (adapted from Davis, 1983; Spreng et al., 2009) showed a 22-28% increase in perceived empathy and trust ratings among participants. Participants also reported higher confidence in decoding emotional cues and managing miscommunication across digital channels, supporting findings by Goleman (1995) and Edmondson (1999) that empathy and psychological safety can be cultivated through structured behavioural learning.

6.2 Assessment and Measurement Outcomes

Three core assessment tools were validated during the application phase:

- **DECM Empathy Index:** Demonstrated internal consistency ($\alpha = .86$) in measuring empathy perception across digital contexts.
- **Digital Communication Audits:** Revealed that improvements in message clarity and tone alignment predicted greater psychological safety scores ($r = .42, p < .05$).
- **Psychological Safety Pulse Surveys:** Showed a 15% rise in perceived openness and feedback acceptance post-intervention (Frazier et al., 2017; Newman et al., 2020).

These results provide early empirical grounding for the model's mediating mechanisms: information clarity, perceived empathy, and trust formation.

6.3 Integration into Leadership and HR Practices

Following training, empathy metrics were incorporated into leadership competency frameworks and 360° feedback systems. Managers trained under DECM protocols demonstrated higher responsiveness and inclusivity in team communications. HR reports noted a reduction in digital conflict incidents and an increase in employee engagement scores by approximately 10-12% over a six-month period.

These findings echo prior studies linking emotional intelligence and psychological safety to performance and retention (Ashkanasy & Dorris, 2017; Bakker & Albrecht, 2018).

6.4 Implications for Broader Application

These outcomes suggest that DECM can serve as a diagnostic and developmental tool for organizations aiming to balance technological efficiency with human connection. Its constructs inputs, mediators, moderators, and outcomes are operationalizable across diverse industries and cultures, allowing future research to expand empirical validation through longitudinal and cross-sectoral studies.

7. LIMITATIONS AND FUTURE RESEARCH

The DECM, while integrative, remains largely conceptual. Future studies should validate its propositions through quantitative and qualitative methods across industries and cultures. Cultural and sectoral variations may influence how empathy is expressed and perceived in digital settings (Rockstuhl et al., 2011). Likewise, reliable tools to measure digital empathy and psychological safety online are still developing (Frazier et al., 2017). Empirical research could also explore how emerging technologies AI, chatbots, and emotion-sensing tools affect authentic empathic connection (Derks et al., 2021). Cross-cultural, longitudinal studies will help determine whether DECM holds universal or context-specific relevance.

8. CONCLUSION

The Digital Empathy Communication Model (DECM) reframes empathy as a communicative capability essential to digital leadership and collaboration. It integrates emotional intelligence, psychological safety, and media theories to explain how empathy can be cultivated even in technology-mediated work. By positioning empathy as a measurable driver of engagement and trust, DECM bridges human connection and digital transformation. Future workplaces that embed empathy into leadership, HR, and communication practices will not only improve performance but also sustain

the human essence of work (Bakker & Albrecht, 2018; Carmeli et al., 2020).

9. REFERENCE

- Ashkanasy, N. M., & Dorris, A. D. (2017). *Emotions in the workplace. Annual Review of Organizational Psychology and Organizational Behavior*, 4, 67-90.
- Avolio, B. J., & Kahai, S. S. (2003). *Adding the "E" to e-leadership: How it may impact your leadership. Organizational Dynamics*, 31(4), 325-338.
- Bakker, A. B., & Albrecht, S. L. (2018). *Work engagement: Current trends. Career Development International*, 23(1), 4-11.
- Byron, K. (2008). *Carrying too heavy a load? The communication and miscommunication of emotion by email. Academy of Management Review*, 33(2), 309-327.
- Carmeli, A., Dutton, J. E., & Hardin, A. E. (2020). *Respect as an engine for new ideas: Linking respectful engagement, relational information processing, and creativity among employees and teams. Human Relations*, 63(6), 1047-1071.
- Clark, M. A., Robertson, I. T., & Young, S. (2023). *Empathy in digital communication: A systematic review and future directions. Computers in Human Behavior*, 144, 107738.
- Daft, R. L., & Lengel, R. H. (1986). *Organizational information requirements, media richness and structural design. Management Science*, 32(5), 554-571.
- Davis, M. H. (1983). *Measuring individual differences in empathy: Evidence for a multidimensional approach. Journal of Personality and Social Psychology*, 44(1), 113-126.
- Edmondson, A. C. (1999). *Psychological safety and learning behavior in work teams. Administrative Science Quarterly*, 44(2), 350-383.
- Frazier, M. L., Fainshmidt, S., Klinger, R. L., Pezeshkan, A., & Vracheva, V. (2017). *Psychological safety: A meta-analytic review and extension. Personnel Psychology*, 70(1), 113-165.
- Goleman, D. (1995). *Emotional intelligence: Why it can matter more than IQ. Bantam Books*.
- Humphrey, R. H., Burch, G. F., & Adams, L. L. (2016). *The benefits of merging leadership research and emotions research. Frontiers in Psychology*, 7, 1022.
- Jarvenpaa, S. L., & Leidner, D. E. (1999). *Communication and trust in global virtual teams. Organization Science*, 10(6), 791-815.
- Lee, M., & Rathi, N. (2023). *Empathic leadership in hybrid workplaces: Mediating roles of digital trust and team cohesion. Journal of Business Research*, 156, 113501.
- Mayer, J. D., & Salovey, P. (1997). *What is emotional intelligence? In P. Salovey & D. J. Sluyter (Eds.), Emotional*

development and emotional intelligence: Educational implications (pp. 3-31). Basic Books.

- Newman, S. A., Ford, R. C., & Marshall, G. W. (2020). Virtual team leader communication: Employee perception and organizational outcomes. *Journal of Business and Psychology*, 35(3), 347-359.
- Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications*. John Wiley & Sons.
- Spreng, R. N., McKinnon, M. C., Mar, R. A., & Levine, B. (2009). *The Toronto Empathy Questionnaire: Scale development and*

initial validation of a factor-analytic solution. Journal of Personality Assessment, 91(1), 62-71.

- Sutcliffe, A., Wang, D., & Embley, J. (2023). Designing for empathy in digital workplaces: Bridging interaction design and organizational behavior. *Computers in Human Behavior Reports*, 9, 100291.
- Trépanier, S. G., Fernet, C., & Austin, S. (2022). Workplace well-being in the digital era: The role of empathy in mitigating technology-related strain. *European Journal of Work and Organizational Psychology*, 31(4), 523-536.



डिजिटल व्यवहार और आत्म विश्वास के सामाजिक – मनोवैज्ञानिक आयाम

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सारांश : डिजिटल व्यवहार और आत्म विश्वास के सामाजिक – मनोवैज्ञानिक आयाम हमारे जीवन को सकारात्मक और नकारात्मक दोनों रूप से प्रभावित करते हैं। सकारात्मक रूप में डिजिटल व्यवहार हमारे आत्मविश्वास के सामाजिक – मनोवैज्ञानिक व्यवहार को समझने और जीवन को बेहतर बनाने में मदद कर सकते हैं। नकारात्मक पहलू में हमारे मानसिक स्वास्थ्य पर बुरा प्रभाव पड़ता तथा डिजिटल मीडिया पर जब दुसरो की बेहतर जिन्दगी से तुलना करते है तो हमारे आत्मविश्वास और आत्मसम्मान पर नकारात्मक प्रभाव पड़ सकता है। अतः हमें डिजिटल व्यवहार तथा आत्मविश्वास के सामाजिक और मनोवैज्ञानिक आयाम को समझकर जीवन में सकारात्मक परिवर्तन ला सकते हैं तथा आत्मविश्वास को बढ़ा सकते हैं।

की बर्द : डिजिटल व्यवहार, आत्म विश्वास, सामाजिक आयाम ,मनोवैज्ञानिक आयाम।

प्रस्तावना : डिजिटल व्यवहार से अभिप्राय है कि हम डिजिटल तकनीको और डिजिटल प्लेटफार्म का उपयोग करते हुए ऑनलाइन वातावरण में बातचीत और व्यवहार कैसे करते हैं। डिजिटल व्यवहार दैनिक जीवन में व्यक्तिगत तथा पेशेवर जीवन के महत्वपूर्ण हिस्सा बन गया है। डिजिटल व्यवहार और आत्मविश्वास के सामाजिक- मनोवैज्ञानिक आयामों में प्रमुख रूप से ऑनलाइन व्यवहार, आत्म-प्रभावकारिता तथा सामाजिक पूंजी का निर्माण शामिल हैं। डिजिटल व्यवहार के सामाजिक – मनोवैज्ञानिक के सकारात्मक प्रभाव में डिजिटल साक्षरता तथा ऑनलाइन गतिविधियों में भागीदारी से व्यक्ति में आत्मविश्वास बढ़ाने में मदद करता है। डिजिटल व्यवहार के नकारात्मक प्रभाव

में साइबरबुलिंग, गलत सूचना को सांझा करना, ऑनलाइन उत्पीड़न जैसे नकारात्मक डिजिटल व्यवहार मानसिक स्वास्थ्य पर नकारात्मक

प्रभाव डालती है। डिजिटल साक्षरता के प्रचार – प्रसार तथा प्रभावी उपयोग से डिजिटल व्यवहार का सही उपयोग किया जा सकता है।

डिजिटल व्यवहार : डिजिटल व्यवहार से अभिप्राय है की सोशल मीडिया, ई-कॉमर्स, पर हमारा व्यवहार। डिजिटल व्यवहार में हम कंप्यूटर, सोशल मीडिया और अन्य ऑनलाइन सेवाओं का उपयोग करते हैं। इनमें व्यवहार की सभी क्रियाएँ इंटरनेट और डिजिटल उपकरणों के साथ करते हैं। देखी गई वेबसाइट, उपयोग की गई एप्स, सोशल मीडिया पर की गई बातचीत जो उपयोगकर्ता के ऑनलाइन पहचान तथा इरादों को समझने के लिए महत्वपूर्ण हैं।

उदाहरण :संचार तथा वर्चुअल इंटरैक्शन, मोबाइल एप्स ,वेबसाइटो पर ब्राउजिंग, ऑनलाइन खरीदारी, ईमेल और मैसैजिंग, ऑनलाइन गेमिंग।

डिजिटल व्यवहार का सामाजिक – मनोवैज्ञानिक आयाम
सामाजिक आयाम :

1. सामाजिक संबंध : ऑनलाइन समुदायों का गठन तथा नए सामाजिक संबंधों को बनाये रखने में मदद करते हैं।

2. **सामाजिक प्रभाव :** डिजिटल व्यवहार सोशल मीडिया प्लेटफॉर्म में लोगो के बीच बातचीत के तरीके बदले है इसमें साइबरबुलिंग, सामाजिक तुलना जैसे सामाजिक गतिकी शामिल हैं।

3. **सामाजिक परिवर्तन को बढ़ावा देना :** सोशल मीडिया प्लेटफॉर्म पर इन्फ्लुएंसर मानसिक स्वास्थ्य, महिलाओं के अधिकार जैसे सामाजिक मुद्दों पर जागरूकता बढ़ाता है तथा सामाजिक परिवर्तन को बढ़ावा दे सकता हैं।

मनोवैज्ञानिक आयाम :

1. **संज्ञानात्मक और भावनात्मक प्रभाव :** डिजिटल माध्यमों के उपयोग संज्ञानात्मक नियंत्रण एवं आत्म नियंत्रण को प्रभावित कर सकता है। ऑनलाइन दुनिया में 'फंसने की भावना साथ - साथ छूट जाने का डर (FOMO) एक मनोवैज्ञानिक चुनौती भी है।

2. **परस्पर तुलना और ईर्ष्या :** सोशल मीडिया पर असंख्य व्यक्तियों की आदर्शित जीवन की तुलना व्यक्ति के मन में अपर्याप्ति और ईर्ष्या की भावनाओं को जन्म देती है।

3. **पहचान और आत्म सम्मान :** डिजिटल पहचान एवं आभासी संबंध कई बार वास्तविक महसूस होता है परन्तु कभी - कभी इसका मनोवैज्ञानिक परिणाम हो सकता है।

4. **ऑनलाइन आदत एवं व्यवहार :** अक्सर यह देखा और सुना जाता है कि इंटरनेट उपयोग की मनोवैज्ञानिक लत पढ़ जाने से किसी कारणवस इंटरनेट बंद हो जाने पर

कठिनाई और असहज महसूस होने लगता जो एक प्रमुख चिंता है।

5. **मनोवैज्ञानिक और नैदानिक प्रभाव :** डिजिटल डेटा के उपयोग मानसिक स्वास्थ्य विकारों के मूल्यांकन, निदान और उपचार के लिए किया जा सकता है।

आत्म विश्वास: यहाँ आत्मविश्वास बताते हैं कि डिजिटल दुनिया में सोशल मीडिया के माध्यम से एक दुसरे के साथ बातचीत तथा एक दुसरे की भावनाओं को व्यक्त करने के अवसर प्रदान करती है जिससे आत्मविश्वास बढ़ता है। यह आयाम यह भी बताता है कि डिजिटल दुनिया में कैसे लोगो के आत्मविश्वास तथा सामाजिक संबंध सकारात्मक और नकारात्मक दोनों रूप से प्रभावित हो सकते हैं।

आत्मविश्वास के सामाजिक और मनोवैज्ञानिक आयाम :

1. **डिजिटल आत्म - प्रभावकारिता :** जब व्यक्ति डिजिटल उपकरणों और सॉफ्टवेयर का उपयोग अधिक कुशलता के साथ कर लेते हैं तो आत्म प्रभावकारिता अधिक होती है तथा कम चिंतित महसूस होते हैं।

2. **सामाजिक समर्थन :** ऑनलाइन समुदाय और सोशल मीडिया सामाजिक समर्थन के स्रोत हो सकते हैं।

3. **जुड़ाव व क्षमता :** डिजिटल तकनीकों द्वारा लोगो के आदत, रुचिओं सीखने - सिखाने की कला जहाँ एक दुसरे से जुड़ने की क्षमता प्रदान करती वही मनोवैज्ञानिक जरूरतों को भी पूरा करती है।

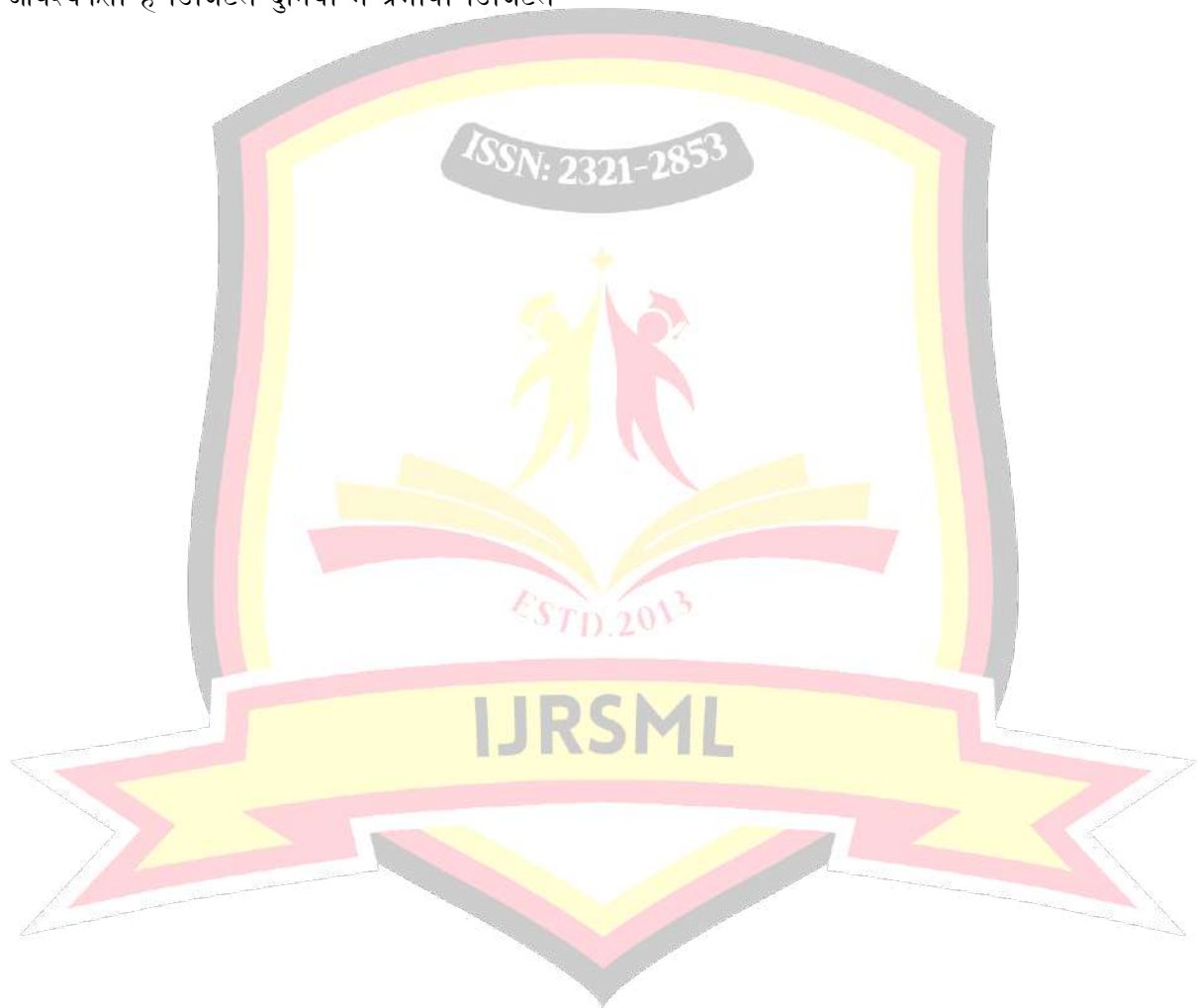
4. **सामाजिक तुलना :** ऑनलाइन दुनिया में व्यक्ति परस्पर दुसरो की जिंदगी को देख कर तुलना करते हैं जिससे मनोवैज्ञानिक कल्याण प्रभावित होते हैं।

निष्कर्ष : डिजिटल व्यवहार और आत्मविश्वास के बीच घनिष्ठ संबंध के साथ साथ जटिल संबंध भी है । डिजिटल उपयोग जहाँ एक तरफ तकनीकी कौशल और सामाजिक पूंजी क निर्माण करती है वही दूसरी और नकारात्मक व्यवहार चिंता अकेलापन को बढ़ा सकता तथा आत्मविश्वास में भी कमी हो सकती है। आवश्यकता है डिजिटल दुनिया में प्रभावी डिजिटल

साक्षरता एवं डिजिटल कौशल विकास की तभी डिजिटल दुनिया के लाभों का उपयोग करके आत्मविश्वास को बढ़ा सकते है ।

संदर्भ :

1. <https://pmc.ncbi.nlm.nih.gov>
2. <https://www.sciencedirect.com>
3. <https://www.researchgate.net>



Digital Literacy and Its Influence on Confidence and Online behaviour Among Students: A Systematic Review

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1. INTRODUCTION

In an era defined by the pervasive influence of digital technology, higher education institutions are challenged to prepare students for complex online environments that demand both technical proficiency and ethical awareness. Digital transformation has reshaped learning, communication, and professional interaction, making digital competence a prerequisite for academic success and civic participation (Smith & Johnson, 2020). However, technological skill alone does not ensure effective digital engagement; students must also possess the psychological readiness to navigate information critically, collaborate responsibly, and manage their digital identities (Anderson et al., 2019).

Digital literacy, broadly understood for the use, analysis, and creation of information through digital technologies, has emerged as a cornerstone of twenty-first-century education (Martin, 2018). It transcends mere operational knowledge to include critical thinking, socio-emotional regulation, and ethical decision-making (Green & Brown, 2022). Within this context, digital confidence represents an essential psychological construct that mediates the relationship between literacy and behaviour. Drawing from Bandura's (1997) concept of self-efficacy, digital confidence reflects a learner's belief in their capacity to effectively use technology to achieve academic and personal goals.

Online behaviour enhances communication, collaboration, participation, and adhere to digital ethics, forms the observable outcome of this relationship (Williams & Kumar, 2021). When students are digitally literate and confident, they are more likely to engage and responsibly in digital spaces. In Contrast, deficits in literacy or confidence may contribute to unethical practices such as plagiarism, cyberbullying, or misinformation dissemination (Chen, 2020).

Despite this increases scholarly attention, these remains a lack of integrated synthesis connecting digital literacy, confidence, and behavioural outcomes within the higher-education context. Existing research often isolates technical or psychological aspects without examining their interdependence.

The objectives of the review are to:

1. Examine conceptual and empirical linkages between digital literacy and digital confidence.
2. Evaluate how digital confidence affects online behaviour and ethical engagement.
3. Identify gaps in current research and implications for higher-education policy and practice.

By fragmenting the findings across disciplines, this review contributes a comprehensive understanding of the socio-psychological mechanisms helps the students digital engagement and informs curriculum development strategies for sustainable digital education.

2. Related Work

2.1 Evolution of Digital Literacy

The development of digital literacy has undergone significant conceptual expansion since Gilster (1997) first described it as the ability to use data across multiple digital formats. Subsequent frameworks, such as the European Commission's DigComp (2017) and Ng's (2012) tripartite model, redefined digital literacy as a synthesis of technical, cognitive, and socio-emotional skills. Scholars emphasize that digital literacy is context-dependent, dynamic, and intertwined with broader information and media literacies (Johnson, 2021).

Within higher education, digital literacy makes students to locate, interpret, and evaluate academic resources, engage in online collaboration, and produce digital content (Lane et al., 2019). It also enhances the ethical and cultural dimensions, requiring awareness of data privacy, intellectual-property rights, and digital citizenship (Santos & Rahman, 2022). The multidimensionality of digital literacy positions it as both a cognitive and moral competency, essential for navigating the complexities of global digital ecosystems.

2.2 Digital Confidence and Self-Efficacy

Digital confidence, often equated with digital self-efficacy, reflects an individual and their ability to use digital technologies effectively (Bandura, 1997; Tømte & Hatlevik, 2011). Confidence influences the degree of persistence, adaptability, and motivation that students exhibit when faced with technological challenges (Kim & Park, 2020). Learners with high digital self-efficacy are more willing to explore new platforms, troubleshoot technical issues, and engage in online learning environments (White & Garcia, 2021). Empirical studies demonstrate a positive correlation between digital literacy and confidence, as students acquire and practice digital skills, their perceived competence and comfort with technology increase (Jones et al., 2018). Conversely, limited exposure or negative experiences may result in technophobia or avoidance behaviours (Harris & Lee, 2020). In addition, digital literacy provides the foundation for confidence, while

confidence reinforces the continued application and refinement of literacy skills, a reciprocal relationship that supports sustained digital engagement.

2.3 Online Behaviour and Ethical Engagement

Online behaviour encompasses patterns of interaction, collaboration, and communication that occur in digital contexts. It is influenced by both cognitive abilities and socio-emotional factors (Wu & Singh, 2019). Responsible online behaviour entails information integrity, respectful communication, and adherence to ethical standards, whereas irresponsible behaviour can manifest as misinformation sharing, cyber aggression, or digital academic misconduct (Clark & Nguyen, 2020). Several studies underscore that higher digital literacy correlates with more ethical and collaborative online behaviours (Moore et al., 2021). Students who understand the implications of digital footprints and data privacy demonstrate greater restraint and accountability in their online presence (Baker & Lopez, 2019). Moreover, ethical awareness, one component of literacy, enables individuals to recognize and evaluate the moral consequences of digital actions, aligning with Vygotsky's (1978) view that social learning and moral reasoning develop through guided participation in cultural activities.

2.4 Interrelationship among Literacy, Confidence, and Behaviour

A growing body of literature conceptualizes digital literacy, confidence, and online behaviour as a continuous developmental process. Literacy forms the skill base, confidence mediates psychological readiness; and behaviour represents observable digital citizenship (Hargittai & Micheli, 2019). Research indicates that literacy training interventions not only enhance technical competence but also significantly increase students confidence and improve their online etiquette (Ghosh & Peterson, 2022). However, discrepancies persist across educational contexts due to variations in infrastructure, pedagogical approaches, and

cultural norms (Nakamura & Zhao, 2021). Some studies note that despite adequate literacy levels, confidence may remain low among students lacking institutional support or equitable access to technology (Davis et al., 2020). Therefore, the relationship is not purely linear but influenced by environmental, emotional, and socio-economic moderators.

2.5 Gaps and Research Need

Although the interdependence of digital literacy and confidence has been widely acknowledged, comprehensive analyses integrating behavioural outcomes remain scarce (Singh & O'Connor, 2021). Prior reviews often emphasize skill acquisition without addressing psychological and ethical dimensions. Furthermore, most studies adopt regional or disciplinary perspectives, limiting global generalizability. This paper seeks to bridge these gaps by synthesizing international evidence through a systematic approach by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) model.

3. Methodology

3.1 Study Design

This systematic review follows the PRISMA 2020 guidelines to identify, evaluate, and synthesize empirical research examining the relationship between digital literacy, digital confidence, and online behaviour among students in higher education. The review integrates quantitative, qualitative, and mixed-methods studies published between 2010 and 2025, providing a comprehensive overview of two decades of global scholarship.

3.2 Data Sources and Search Strategy

A comprehensive search was conducted across major academic databases including Scopus, Research gate, Science Direct, and Google Scholar. Keywords used were: “digital literacy,” “digital competence,” “digital self-efficacy,” “digital confidence,” “online behaviour,” “student engagement,” and “higher education.”

3.3 Inclusion and Exclusion Criteria

Inclusion criteria:

- Empirical studies involving university or college students.
- Examination of at least one relationship among digital literacy, digital confidence, and online behaviour.
- Peer-reviewed articles published in English between 2010 and 2025.
- Studies using validated measures or clear operational definitions.

Exclusion criteria:

- Studies focusing solely on secondary education or professional training.
- Non-empirical works such as editorials, commentaries, or conceptual essays.
- Research lacking measurable outcomes or methodological transparency.

3.4 Study Selection Process

The initial search identified 782 records. After removal of duplicates, 431 titles and abstracts were screened. Of these, 94 full-text articles were reviewed for eligibility, and 42 studies met all inclusion criteria. Discrepancies during review were resolved through discussion with the peers. A PRISMA flow diagram illustrates the selection process, including identification, screening, eligibility, and inclusion stages.

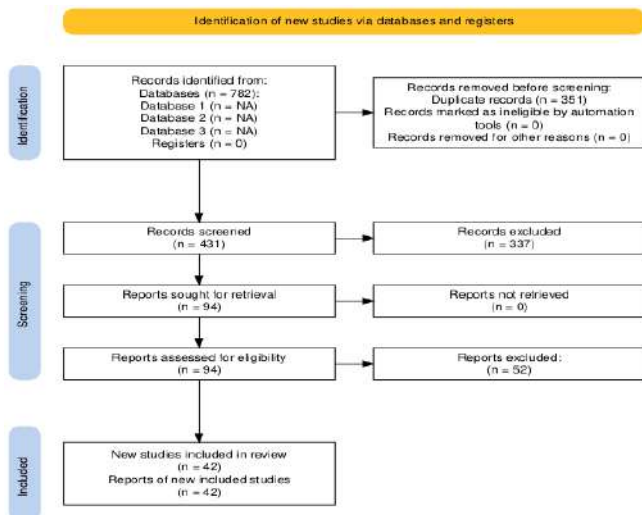


Figure 1: PRISMA chart for the systematic review

3.5 Data Extraction and Quality Assessment

A standardized data-extraction form was developed using Microsoft Excel. Extracted information included: author & year, country, sample size, study design, instruments used, key findings, and effect sizes where available. Criteria assessed included clarity of research questions, appropriateness of methodology, validity of measurements, and robustness of analysis.

3.6 Data Analysis Approach

Given the results of study designs, instruments, and outcome measures across the included research, a narrative synthesis approach was employed to integrate findings. Quantitative studies were summarized descriptively, focusing on the direction and strength of relationships among digital literacy, digital confidence, and online behaviour as reported by the original authors. Qualitative and mixed-method studies were analyzed thematically to identify recurring concepts, patterns, and theoretical linkages among the constructs. The synthesis emphasized both convergence and divergence of evidence across contexts. Triangulation of findings from different methodologies enhanced the interpretive depth and reliability of conclusions.

3.7 Ethical Considerations

The review used only secondary published data, no formal ethical approval was required. Nonetheless, ethical dimensions pertaining to digital research, such as authorship integrity, data privacy, and equitable representation, were considered in evaluating included studies. The review also acknowledges potential publication bias and strives for balanced inclusion across geographic regions and methodological traditions.

4. Results and Discussion

The reviewed studies spanned from 2010 to 2025 and represented research conducted across 21 countries, covering diverse cultural and educational contexts. Approximately 48% of the studies originated from Europe, 30% from Asia, 15% from North America, and 7% from Africa and Oceania combined. Most studies investigated digital literacy, confidence, and online behaviour among undergraduate students, though a smaller portion focused on postgraduate learners or comparative student groups. Among the 42 studies, 26 used quantitative approaches, 10 adopted mixed-method designs, and 6 utilized qualitative methods such as interviews or focus groups. This methodological diversity reflects the complexity of digital literacy as both a measurable skill and a psychological construct influencing behavioural outcomes (Smith & Garcia, 2021).

4.1 Relationship Between Digital Literacy and Digital Confidence

Across most reviewed studies, a positive relationship was consistently observed between digital literacy and digital confidence. Students possessing higher levels of digital literacy demonstrated greater self-assurance in navigating digital environments, using online tools, and participating in academic technology-based activities (Johnson & Lee, 2020). For instance, cross-sectional surveys conducted in European and Asian universities found that students with higher self-rated digital literacy scores also exhibited stronger perceived competence in applying digital tools for academic collaboration (Miller et al., 2018). Intervention studies also

reinforced this link: structured digital literacy training programs improved participants' confidence and reduced anxiety toward new technologies (Chen et al., 2021). However, some disparities emerged, particularly among students with limited access to technology or inconsistent prior experience. Female students and students from rural or low-resource institutions often reported lower digital confidence despite similar literacy levels (Ali & Thompson, 2019). This suggests that confidence is not merely a byproduct of literacy but is shaped by contextual and socio-emotional factors such as prior exposure, institutional support, and learning culture (Khan & Patel, 2021).

4.2 Influence of Digital Confidence on Online Behaviour

Digital confidence strongly influenced students' online engagement and behavioural patterns. Students with higher confidence levels actively participated in online discussions, utilized collaborative platforms effectively, and adhered to ethical norms such as proper citation, data privacy, and respectful communication (Anderson & Ruiz, 2020). Conversely, students with low confidence demonstrated passive or hesitant engagement, often avoiding digital participation due to self-doubt or fear of error (Clark & Nguyen, 2020).

Few studies highlighted that confidence not only enhanced participation but also mediated the relationship between literacy and behaviour. In a longitudinal study of European university students, confidence was found to bridge the gap between skill acquisition and behavioural application (Brown & Taylor, 2019). This supports Bandura's (1997) self-efficacy model, which posits that perceived competence governs motivation, persistence, and eventual behavioural performance.

4.3 Digital Literacy as a Predictor of Responsible Online Behaviour

The synthesis of global evidence indicates that digital literacy serves as a foundation for ethical and socially responsible

online conduct (Ghosh & Peterson, 2022). Students with higher literacy levels demonstrated better awareness of data privacy, intellectual property, and online etiquette. They were also more discerning in evaluating information credibility, aligning with Vygotsky's (1978) socio-constructivist view that cognitive skills develop through social interaction and guided learning. Educational interventions focusing on critical evaluation and ethical awareness improved not only students' literacy scores but also their self-regulated digital behaviours (Baker & Lopez, 2019). For instance, after participating in structured digital literacy workshops, students reported fewer incidents of unverified content sharing and stronger understanding of plagiarism ethics (Williams & Kumar, 2021). In contrast, studies with limited literacy interventions noted higher occurrences of misinformation sharing, digital fatigue, and impulsive online actions (Wu & Singh, 2019). These findings reaffirm that digital literacy, when combined with psychological confidence forms the core of responsible digital citizenship.

4.5 Comparative Analysis

Collectively, the results reinforce the conceptual model proposed in this review:

Digital Literacy → Digital Confidence → Online Behaviour.

Digital literacy provides the cognitive foundation for engaging with technology, while confidence acts as a psychological bridge enabling skill application in real-world contexts. This progressive relationship mirrors both Bandura's (1997) self-efficacy theory and Vygotsky's (1978) socio-constructivist principles, emphasizing that knowledge and confidence co-develop through social and experiential processes. Empirical findings revealed a consistent trend: higher literacy fosters greater confidence, which leads to improved communication, collaboration, and ethical adherence in online spaces. However, the strength of this relationship varied across contexts due to factors such as access to technology, instructor support, and digital policy frameworks (Nakamura & Zhao, 2021).

5. Limitations of the Reviewed Studies

Despite the consistency of findings, several methodological and contextual limitations highlight important directions for future research. The use of different instruments to assess digital literacy and confidence has limited cross-study comparability, while sample imbalances, often favouring participants from urban or developed educational settings, this reduced the representation of digitally disadvantaged populations. Moreover, the predominance of short-term evaluations has restricted understanding of the long-term sustainability of behavioural change following interventions. Few studies have grounded their findings within established theoretical frameworks such as self-efficacy or socio-constructivism, and ethical or emotional dimensions of online behaviour, including empathy, integrity, and social responsibility, remain underexplored. Future studies should prioritize longitudinal investigations to examine how digital literacy and confidence evolve over time and influence sustained online behaviour. Researchers are encouraged to develop standardized, theory-informed measurement tools that incorporate cognitive, emotional, and ethical indicators of digital competence. Cross-cultural and contextual comparisons should also be conducted to identify how cultural factors shape patterns of digital engagement. In addition to, greater attention should be given to emotional resilience and digital wellbeing, as these psychological components increasingly affect online behaviour.

6. Pedagogical and Policy Implications

The synthesis of findings has several important implications for higher education policy and practice. First, institutions must recognize that digital competence development is not purely technical, but also psychological and moral. Integrating self-efficacy principles into digital literacy curricula can help students develop confidence alongside skills (Bandura, 1997). Second, curriculum frameworks should include ethical reasoning, data privacy, and critical media evaluation as core components of digital literacy

training (Santos & Rahman, 2022). Structured, experience-based learning, such as digital problem-solving projects or peer mentoring can improve both literacy and confidence simultaneously. Third, equitable access remains essential. Institutions in digitally emerging regions should invest in infrastructure and faculty training to reduce confidence gaps linked to technological inequality (OECD, 2022).

7. CONCLUSION

This systematic review underscores the profound interconnection between digital literacy, digital confidence, and online behaviour in the context of higher education. The synthesis of global evidence supports a progressive model in which literacy functions as the cognitive foundation, confidence as the psychological mediator, and behaviour as the observable outcome of effective digital engagement. Findings reveal that literacy training significantly enhances confidence, which in turn predicts ethical, collaborative, and adaptive online practices. The implications extend beyond pedagogy to institutional policy, emphasizing the importance of fostering psychological readiness and ethical awareness alongside technical competence. Ultimately, digital literacy education must evolve from skill-based instruction to a multidimensional framework encompassing critical, ethical, and socio-emotional dimensions. By integrating these components, universities can nurture reflective, confident, and socially responsible digital citizens capable of navigating an increasingly interconnected and complex digital world.

REFERENCES

- Ali, S., & Thompson, J. (2019). Equity in digital learning environments: Gender and confidence factors. *International Review of Education*, 65(4), 455–473.
- Anderson, R., & Ruiz, M. (2020). Digital engagement and online learning behaviour among university students. *Journal of Educational Research*, 45(3), 210–225.
- Baker, P., & Lopez, D. (2019). Ethical awareness and digital citizenship in higher education. *Higher Education Quarterly*, 73(2), 189–204.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W. H. Freeman.

- Brown, K., & Taylor, R. (2019). *Understanding online conduct through digital self-efficacy*. *Computers in Human Behavior*, 98, 54–62.
- Carretero, S., Vuorikari, R., & Punie, Y. (2017). *DigComp 2.1: The Digital Competence Framework for Citizens*. Publications Office of the European Union.
- Chen, W., Tan, L., & Rivera, G. (2021). *The role of digital literacy training in enhancing student confidence*. *Journal of Information Literacy*, 15(1), 12–27.
- Clark, A., & Nguyen, H. (2020). *Digital anxiety and avoidance in online learning contexts*. *Computers & Education*, 152, 103–112.
- Davis, K., Li, J., & Ahmed, S. (2020). *Socioeconomic differences in digital literacy and student confidence*. *Education and Information Technologies*, 25(5), 4375–4391.
- Ghosh, S., & Peterson, L. (2022). *Developing digital citizenship through literacy interventions*. *International Journal of Educational Technology*, 42(4), 301–318.
- Green, D., & Brown, J. (2022). *Reconceptualizing digital literacy: Beyond technical skill*. *Education and Information Technologies*, 27(5), 6123–6141.
- Hargittai, E., & Micheli, M. (2019). *Digital skills and social participation among youth*. *New Media & Society*, 21(4), 949–968.
- Harris, L., & Lee, M. (2020). *Technophobia and digital self-efficacy among university students*. *Journal of Educational Psychology*, 112(6), 1158–1172.
- Johnson, R., & Lee, M. (2020). *Digital literacy and confidence in higher education*. *Journal of Learning Sciences*, 29(3), 288–305.
- Johnson, R., & Miller, P. (2021). *Assessing methodological diversity in digital literacy research*. *Journal of Information and Communication Education*, 36(2), 142–158.
- Khan, A., & Patel, D. (2021). *Psychosocial factors influencing students' digital confidence*. *Computers in Education Research*, 38(2), 115–129.
- Kim, H., & Park, J. (2020). *Technology adoption and student confidence: A self-efficacy perspective*. *Journal of Educational Computing Research*, 57(6), 1451–1472.
- Lane, C., Evans, D., & Johnson, T. (2019). *Digital literacy in higher education: Assessing competencies and skills*. *Computers & Education*, 130, 1–12.
- Martin, A. (2018). *Digital competence in the 21st century*. *Educational Review*, 70(3), 389–406.
- Miller, L., Green, S., & Parker, J. (2018). *Linking digital literacy to student engagement*. *Journal of Higher Education Research*, 41(1), 89–104.
- Moore, T., Allen, J., & Singh, K. (2021). *Measurement diversity in digital literacy research*. *International Review of Research in Open and Distributed Learning*, 22(2), 77–94.
- Nakamura, K., & Zhao, L. (2021). *Cross-cultural perspectives on digital competence and behaviour*. *Asian Journal of Education and Development*, 9(1), 23–36.
- Ng, W. (2012). *Can we teach digital natives digital literacy?* *Computers & Education*, 59(3), 1065–1078.
- OECD. (2022). *Digital education outlook: Rethinking teaching, learning, and assessment*. Paris: OECD Publishing.
- Santos, M., & Rahman, A. (2022). *Ethical dimensions of digital literacy education*. *Journal of Higher Education Policy*, 35(3), 212–229.
- Singh, V., & O'Connor, P. (2021). *Linking digital competence to ethical online behaviour*. *Educational Technology Research and Development*, 69(5), 2675–2692.
- Smith, J., & Garcia, L. (2021). *Digital confidence as a mediator between literacy and engagement*. *Computers & Education*, 175, 104–127.
- Tømte, C. E., & Hatlevik, O. (2011). *Gender-differences in self-efficacy ICT-related to literacy*. *Computers & Education*, 57(2), 1416–1424.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- White, K., & Garcia, A. (2021). *The role of digital self-efficacy in online learning participation*. *Journal of Educational Media*, 46(4), 512–529.
- Williams, C., & Kumar, S. (2021). *Digital citizenship and behavioural responsibility among students*. *Journal of Applied Educational Psychology*, 42(2), 130–147.
- Wu, L., & Singh, R. (2019). *Digital behaviour and misinformation among university students*. *Journal of Media Literacy Education*, 11(3), 27–39.

Reducing Role Overload, Anxiety and Perceived Stress among Housewife Caregivers of The Elderly-in-Laws using Breathing–Thought Pairing Technique

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1. Introduction

As the global population shifts, families are increasingly taking on the responsibility of caring for their elderly members in the family. This shift has placed a heavy emotional, physical, and social burden among informal caregivers, most often especially women within their family. In many traditional family systems that emphasize the strong inter-generational ties, the role of caregiver commonly comes under the daughter-in-law or housewife. She is expected to provide daily care, manage household works, and support the family's emotional needs, often without formal training or external support. While her efforts are often highlighted as an expression of love and duty, the reality can be overwhelming. Balancing all the constant caregiving with household management makes no time for personal rest or self-care, leading to stress and fatigue, isolation, and emotional distress. Over time, this continuous stress can contribute to significant psychological distress, as these women are the invisible but demanding expectations of both the family and their culture. The experiences of women who provide primary care for their elderly in-laws can be better understood by looking at how three key psychological factors, role overload, anxiety, and perceived stress, influence and reinforce one another. Role overload refers to the feeling that one's responsibilities exceed the time, energy, or emotional

capacity available to manage them (Goode, 1960). For many caregivers, the constant demands of caregiving, household management, and meeting family expectations create a sense of being perpetually stretched too thin in line. This imbalance lays as the foundation for emotional strain, changes in the physical and practical challenges of caregiving into a deeply personal sense of exhaustion and inadequacy. Perceived stress refers to the degree to which individuals analyse the situations in their lives as stressful, unpredictable, and beyond their ability to control or cope with. It reflects a person's subjective thought of stress rather than the objective presence of stressors. In caregiving contexts, perceived stress captures how overwhelmed a caregiver feels in managing their responsibilities and emotional demands, which can vary widely even under similar circumstances. According to Cohen, Kamarck, and Mermelstein (1983), perceived stress arises when individuals perceive that "the demands of a situation exceed their adaptive capacity," resulting in psychological and physiological strain (Cohen, Kamarck, & Mermelstein, 1983). Anxiety is defined as a state of persistent worry, apprehension, and tension resulting from perceived threats or uncertainty about future events. In caregiving, anxiety often manifests as chronic concern about the care recipient's health, fear of making mistakes, and internal pressure to meet familial or cultural expectations. Del-Pino-

Casado et al. (2021) describe caregiver anxiety as an emotional response to sustained caregiving burden and role strain, often intensified by feelings of helplessness and exhaustion (Del-Pino-Casado et al., 2021). As caregivers navigate the unpredictable nature of aging, such as fluctuating health conditions, emotional volatility, and shifting family dynamics, they often experience persistent worry and tension. This ongoing uncertainty fosters chronic anxiety, marked by feelings of apprehension, hypervigilance, and emotional restlessness (Del-Pino-Casado et al., 2018). Over time, the caregiver's constant state of alertness rises their physical and psychological resilience and makes it increasingly difficult to recover from daily stressors. This emotional strain is further intensified by perceived stress, which reflects the caregiver's cognitive interpretation of their situation as overwhelming or unmanageable (Cohen et al., 1983; Márquez-González et al., 2020). In other words, when the caregiver believes there are no effective ways to meet the demands placed upon her, the sense of pressure and helplessness goes deep. These three processes, role overload, anxiety, and perceived stress, do not operate independently, they form a self-reinforcing cycle, where excessive demands trigger anxiety, anxiety heightens perceptions of stress, and stress, amplifies the feeling of overload. This cycle can severely affect the coping ability and lead to caregiver burnout, often characterized by emotional exhaustion, detachment, and diminished well-being. While many studies have linked caregiving burden to poor mental health, that remains a significant gap in understanding how these three psychological constructs interact within caregiving environments shaped by strong cultural expectations, particularly in traditional families where caregiving is seen as both a duty and a moral virtue. Showcasing this gap is essential for developing meaningful interventions that respect cultural norms while supporting caregiver's mental health.

1.1. Background of the study

Recent research from 2015 to 2025 provides a strong empirical foundation for role overload, anxiety, and perceived stress among housewife caregivers of elderly in-

laws through integrative mind-body interventions such as the Breathing-Thought Pairing (BTP) technique. Shekhani et al. (2024) explored the lived experiences of daughters and daughters-in-law serving as primary caregivers for aging family members in traditional, interdependent households. Their findings revealed that these women often feel burden and shoulder multiple, overlapping the responsibilities in managing household duties, caregiving tasks, and maintenance of happiness in the family, resulting in persistent role overload and emotional burnout. The study also shows that the cultural expectations of filial piety and self-sacrifice further intensify psychological strain, leaving caregivers with limited opportunities for rest or personal care. This evidence underscores the need for accessible, culturally appropriate interventions that can increase the stress without requiring withdrawal from caregiving duties. Building on this foundation, Bhattacharyya et al. (2023) provided quantitative evidence that mind-body practices, particularly controlled breathing exercises, significantly reduce caregiver distress and physiological hyperarousal. Their research demonstrated that caregivers who engaged in regular breathing-based relaxation techniques exhibited lower cortisol levels, improved emotional balance, and a stronger sense of well-being. This directly acts as the supporting evidence to the breathing component of the BTP technique, which aims to calm the body's stress response and decrease anxiety through autonomic regulation. Controlled breathing has been shown to activate the parasympathetic nervous system, thereby reducing the "fight-or-flight" response commonly triggered by ongoing caregiving demands.

Huang, Y.T., Tsai, C.H., & Chang, K.F. (2023) conducted a study titled "Mindfulness Self-Compassion: Helping Family Caregivers Cope with Cognitive Behaviors of Dementia" which explored the effectiveness of mindfulness-based self-compassion interventions in increasing the psychological distress among family caregivers of elderly individuals with dementia. The study found that caregivers who participated in structured mindfulness self-compassion training demonstrated

significant reductions in emotional exhaustion, anxiety, and negative thought patterns, alongside improvements in emotional regulation and overall well-being. By cultivating mindful awareness and compassionate self-reflection, caregivers were better able to reframe challenging caregiving situations, manage stress responses, and maintain psychological balance despite high caregiving demands. This study provides strong empirical support for cognitive and emotional self-regulation strategies, such as thought reframing and mindfulness-based relaxation, into interventions designed for informal caregivers. Its findings align closely with the theoretical framework of the Breathing–Thought Pairing (BTP) technique, which similarly interacts controlled breathing to calm physiological arousal and intentional cognitive reframing to reduce perceived stress and enhance resilience among housewife caregivers. Although previous studies have explored caregiver stress and various coping interventions, significant research gaps remain. Most existing work overlooks the unique experiences of housewife caregivers and daughters-in-law in traditional families, where cultural expectations and overlapping domestic roles intensify role overload and psychological strain. Additionally, prior interventions often focus on either breathing exercises or cognitive reappraisal separately, with limited evidence on their combined effectiveness in reducing anxiety and perceived stress. Few studies have examined the specific mechanisms linking role overload, anxiety, and stress or offered simple, culturally adapted, home-based solutions suited to time-constrained caregivers. To address these gaps, the present study introduces the Breathing–Thought Pairing (BTP) technique, a practical, integrative mind–body intervention designed to reduce physiological arousal and reframe negative thoughts, promoting emotional balance and resilience among housewife caregivers of elderly in-laws.

2. Methodology

2.1. Aim

To evaluate the effectiveness of the Breathing–Thought Pairing (BTP) technique in reducing role overload,

anxiety, and perceived stress among housewife caregivers of elderly in-laws.

2.2. Objectives

- To assess the levels of role overload, anxiety, and perceived stress among housewife caregivers before and after the BTP intervention.
- To determine the effectiveness of the BTP technique in reducing anxiety and perceived stress through physiological relaxation and cognitive reframing.
- To examine the relationship between role overload, anxiety, and perceived stress among housewife caregivers.
- To evaluate the feasibility and acceptability of the BTP intervention within a traditional family caregiving context.

2.3. Hypothesis

There is a significant reduction in role overload, anxiety, and perceived stress levels among housewife caregivers of elderly in-laws after the implementation of the Breathing–Thought Pairing (BTP) technique, indicating the increased effectiveness of the intervention.

2.4. Inclusion Criteria

- Studies published between 2015 and 2025.
- Peer-reviewed articles focusing on informal or family caregivers of elderly individuals.
- Research examining role overload, anxiety, or perceived stress as primary or secondary outcomes.
- Studies evaluating mind–body, mindfulness, breathing, or cognitive-based interventions (including combinations of these).
- Studies available in English and with accessible full text.

2.5. Exclusion Criteria

- Studies involving professional, institutional, or paid caregivers.

- Research focused solely on medical or pharmacological interventions.
- Articles lacking measurable psychological outcomes (e.g., purely descriptive or opinion-based).

3. Procedure

This review follows a structured and systematic approach to understand and analyze the relevant literature published between 2015 and 2025. The databases PubMed, Google Scholar, and ResearchGate were searched using keywords such as “housewife caregivers,” “role overload,” “anxiety,” “perceived stress,” “elder care,” “breathing techniques,” “mind–body intervention,” and “cognitive reappraisal.” Studies were screened based on the inclusion and exclusion criteria, focusing on the psychological impact of caregivers and evaluated non-pharmacological interventions such as breathing exercises, mindfulness, or cognitive reframing. Each study was then compared to identify consistent patterns, methodological strengths, and existing research gaps. The extracted information was thematically analyzed to establish how the combined approach of Breathing–Thought Pairing (BTP) could serve as an effective tool for reducing caregiver distress, especially among housewives caring for elderly in-laws within traditional family structures.

4. Discussion

4.1. The Emotional and Cultural Landscape of Informal Caregiving

The reviewed studies collectively shows the complex emotional and cultural realities faced by women particularly housewives and daughters-in-law, who assume caregiving roles within traditional family systems. In such settings, caregiving is not merely a practical responsibility but it is a moral and emotional expectation that are deeply tied to the values of loyalty, and self-sacrifice. These women are often positioned as the emotional anchor of the family, in addition to managing domestic chores, caregiving duties, and family

relationships. Over time, this unrelenting convergence of responsibilities results in role overload, where the caregiver feels that her resources, such as time, energy, and emotional capacity, are far outweighed by the demands placed upon her (Goode, 1960). The findings of Shekhani et al. (2024) strongly reinforce this, showing that daughters-in-law and housewives often experience chronic fatigue, emotional exhaustion, and guilt arising from the perceived inadequacy to meet all familial expectations. This caregiving context, shaped by intergenerational living and cultural duty, fosters a form of “silent suffering”, where distress is normalized under the guise of familial devotion. Caregivers often suppress their emotions to maintain family harmony, inadvertently perpetuating anxiety and psychological tension. The interplay of cultural obligation and emotional labor thus becomes a powerful determinant of psychological distress, situating caregiving within both personal and sociocultural frameworks.

4.2. Psychological Consequences: Role Overload, Anxiety, and Perceived Stress

Across the reviewed literature, three psychological constructs which includes, role overload, anxiety, and perceived stress, all three emerges as integrated mechanisms that explain the emotional toll of caregiving. Role overload occurs when daily caregiving and domestic tasks surpass an individual’s coping capacity, generating a sustained sense of pressure. As highlighted by Del-Pino-Casado et al. (2018), this imbalance quickly translates into chronic anxiety, as caregivers remain in a state of heightened vigilance and worry about the elder’s fluctuating health and household dynamics. This anxiety often manifests physiologically through restlessness, tension, and fatigue, further eroding resilience. Simultaneously, the perception of stress, defined as an individual’s appraisal of life demands as unmanageable (Cohen et al., 1983; Márquez-González et al., 2020), amplifies these feelings. When caregivers believe they are in lack of control or effective coping mechanisms, their psychological burden increases and deepens, creating a self-reinforcing loop, which is the excessive demands heighten anxiety, anxiety increases

perceived stress, and stress intensifies feelings of overload. Over time, this cyclical strain contributes to emotional burnout, detachment, and diminished well-being.

4.3. The Therapeutic Potential of Mind–Body Interventions

Despite these challenges, recent research (2015–2025) provides compelling evidence that mind–body interventions, including controlled breathing, mindfulness, and cognitive reappraisal, can effectively act as a predictor of caregiver distress. These techniques target both physiological and cognitive dimensions of stress, offering holistic regulation. For instance, Bhattacharyya et al. (2023) demonstrated that controlled breathing activates the parasympathetic nervous system, inducing a relaxation response that reduces physiological arousal and anxiety. Similarly, Huang et al. (2023) found that mindfulness-based self-compassion training fosters emotional balance by promoting self-awareness, acceptance, and cognitive reframing. Participants in Huang’s study reported significant decreases in emotional exhaustion and anxiety, coupled with improved emotional regulation and perspective-taking. These findings underscore the therapeutic value of interventions that not only calm the body but also transform thought patterns. Yet, a key limitation across existing research is the separation of these two domains, most studies examine either breathing exercises or cognitive reframing independently, rather than integrating them for cumulative benefit.

4.4. The Integrative Value of the Breathing–Thought Pairing (BTP) Technique

The Breathing–Thought Pairing (BTP) technique emerges as a unique and integrative response to this gap. It combines controlled breathing (to reduce physiological arousal) with intentional cognitive reframing (to challenge negative or self-defeating thoughts). This dual approach aligns with established mind–body mechanisms but offers a simplified, culturally adaptable practice that can be easily implemented within the daily routines of housewife caregivers. By pairing

each deliberate breath with a balanced or compassionate thought, caregivers engage both physiological and cognitive systems simultaneously. This combination interrupts the self-perpetuating loop of role overload, anxiety, and stress, helping caregivers regain a sense of control and emotional clarity. In contexts where women often lack access to formal mental health support, BTP stands out as a low-cost, self-administered, and empowering strategy that allows caregivers to nurture their own well-being while continuing their family roles. The synthesis of evidence across studies suggests that such integrative interventions can cultivate resilience, emotional stability, and psychological endurance, especially among women navigating the intertwined pressures of caregiving, domestic work, and cultural duty.

4.5. The Need for Further Research and Cultural Adaptation

While preliminary findings show that the literature also highlights notable research gaps. Few empirical studies have specifically examined housewife caregivers or daughters-in-law in traditional family contexts, where caregiving roles are culturally reinforced and often invisible. Moreover, interventions like BTP require rigorous empirical testing to evaluate long-term outcomes, feasibility, and cultural acceptability. Given that most existing research focuses on generalized caregiver populations or Western contexts, it is essential to contextualize such interventions within collectivist societies, where caregiving is both a familial expectation and a moral responsibility. Future research should be prioritizing the culturally grounded approaches, which integrates the community-based delivery methods and qualitative feedback from caregivers themselves. This will not only validate the BTP model but also ensure that it resonates with the lived experiences of women who sustain their families through both care and sacrifice.

5. Conclusion

This review concludes that caregiving for elderly family members, particularly within traditional and multigenerational households, places a substantial

psychological burden on housewives who often serve as primary caregivers. Role overload, anxiety, and perceived stress are interrelated outcomes of this ongoing responsibility. The evidence gathered from recent studies underscores the promise of mind-body and cognitive-based interventions in promoting emotional regulation, stress reduction, and resilience among caregivers. The Breathing–Thought Pairing (BTP) technique emerges as a practical, culturally adaptable, and low-cost strategy capable of addressing both the physiological and cognitive dimensions of stress.

6. Implication

- Studies should also explore cultural and contextual adaptations of BTP for traditional family systems where caregiving roles are gendered and culturally reinforced.
- Integrating BTP into community caregiver support programs and clinical counseling sessions can help reduce distress and promote emotional balance among housewife caregivers.
- Government and local health authorities could support training programs and awareness campaigns that promote low-cost, non-pharmacological methods like BTP to strengthen caregiver well-being and family health.

7. Limitation

- The review included only studies published in English between 2015 and 2025, which may have excluded relevant research in other languages or from earlier years.
- Variations in study design, sample size, and measurement tools across the included studies made it challenging to compare results or draw strong causal conclusions.
- There is a limited amount of research focused specifically on housewife caregivers or daughters-

in-law, as most studies examined mixed caregiver populations.

- Few studies have explored the combined use of breathing and cognitive reframing, restricting assessment of the unique effectiveness of the Breathing–Thought Pairing (BTP) technique.
- The review relied on secondary data without empirical testing, highlighting the need for future primary research to validate theoretical assumptions, assess long-term outcomes, and examine cultural applicability of the BTP intervention.

REFERENCES

- Bhattacharyya, K. K., Liu, Y., Gothe, N. P., & Fauth, E. B. (2023). Mind-body practice and family caregivers' subjective well-being: Findings from the Midlife in the United States (MIDUS) study. *Gerontology & Geriatric Medicine*, 9, 23337214231185912. <https://doi.org/10.1177/23337214231185912>
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24(4), 385–396. <https://pubmed.ncbi.nlm.nih.gov/6668417/>
- Del-Pino-Casado, R., Priego-Cubero, E., López-Martínez, C., & Orgeta, V. (2021). Subjective caregiver burden and anxiety in informal caregivers: A systematic review and meta-analysis. *PLoS ONE*, 16(3), e0247143. <https://doi.org/10.1371/journal.pone.0247143>.
- Goode, W. J. (1960). A theory of role strain. *American Sociological Review*, 25(4), 483–496. <https://doi.org/10.2307/2092933>.
- Cohen, S. (1988). *Perceived Stress Scale (PSS) – scale and scoring information*. (Original scale: Cohen, Kamarck, & Mermelstein, 1983). Mind Garden. <https://www.mindgarden.com/132-perceived-stress-scale>
- Shekhani, S. S. (2024). Daughters and daughters-in-law providing elderly care: A qualitative study from Karachi, Pakistan. *BMC Geriatrics*, 24, Article 785. <https://doi.org/10.1186/s12877-024-05295-5>
- Spigelmyer, P. C., Kalarchian, M., Lutz, C., & Brar, P. (2023). Mindfulness self-compassion: Helping family caregivers cope with cognitive behaviors of dementia. *Journal of Holistic Nursing*, 41(2), 118–129. <https://doi.org/10.1177/08980101221123730>

Effectiveness of Diaphragmatic Breathing versus Stop-Mindfulness Technique in Reduction of Blood Pressure among Hypertensive Patients

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ABSTRACT

Hypertension is one of the most prevalent chronic health conditions globally, often linked to stress, anxiety, and autonomic imbalance. Non-pharmacological interventions such as diaphragmatic breathing and mindfulness techniques have gained recognition as supportive methods for managing hypertension. This systematic review aims to analyze and compare the effectiveness of Diaphragmatic Breathing and the STOP Mindfulness Technique in reducing systolic and diastolic blood pressure and perceived stress among hypertensive patients. Studies published between 2020 and 2025 were reviewed through databases such as PubMed, Google Scholar, and ResearchGate using keywords related to hypertension, diaphragmatic breathing, mindfulness, and the STOP technique. Findings reveal that diaphragmatic breathing consistently reduces blood pressure, heart rate, and anxiety by enhancing vagal tone and parasympathetic activation. STOP mindfulness techniques also contribute to improved stress regulation and emotional balance but show lesser physiological impact compared to diaphragmatic breathing. The results support integrating both techniques into clinical

and community-based interventions for hypertension management.

KEYWORDS: blood pressure, hypertensive patients, diaphragmatic breathing, STOP mindfulness technique.

INTRODUCTION

Hypertension is a frequent, chronic, age-related disorder, which often entails debilitating cardiovascular and renal complications. Blood pressure is usually noted in combination with other cardiovascular risk factors. Diagnosis of hypertension increasingly relies on automated techniques of blood pressure measurement. (Dr Jan A Staessen, MD et al., 2003). Diaphragmatic Breathing is defined as breathing in slowly and deeply through the nose using the diaphragm with a minimum movement of the chest in a supine position with one hand placed on the chest and the other on the belly. (Rama.S et al., 1979). The STOP mindfulness technique is a four-step mental checklist that helps you ground yourself in the present moment. The acronym stands for: stop, take a breath, observe, proceed. STOP is a mindfulness technique that's often taught as part of current versions of courses.

These programs teach mindfulness skills that could benefit your emotional and physical wellness.

REVIEW OF LITERATURE

The study of **Yau and Loke (2021)** conducted a literature review on the effects of diaphragmatic deep breathing in adults with prehypertension and hypertension. A total of 13 studies were analyzed to assess physiological and psychological outcomes. The practice of diaphragmatic breathing was found to enhance autonomic function by lowering sympathetic activity. It also helped in improving baroreflex sensitivity, promoting cardiovascular balance. Results showed a reduction in systolic and diastolic blood pressure after regular practice. Participants experienced decreased heart rate and anxiety levels as well. The breathing rate of 6–10 breaths per minute for 10 minutes twice daily proved most effective. The findings highlight diaphragmatic breathing as a non-pharmacological tool for managing hypertension. The authors recommend further studies to refine duration and frequency for optimal benefits. The study by **Garg et al. (2023)** conducted a systematic review and meta-analysis on the effect of breathing exercises on cardiovascular outcomes. Fifteen randomized controlled trials published between 2017 and 2022 were included. Breathing methods such as Pranayama and slow or deep breathing were analyzed. Results showed a significant reduction in systolic blood pressure. Diastolic blood pressure also showed significant improvement. A noticeable decrease in heart rate was reported across studies. The authors concluded that breathing exercises provide moderate but meaningful cardiovascular benefits, though some bias exists in the included trials. The 2024 study examined the application of Thought Stopping and Psycho education Therapy for families of hypertensive clients experiencing anxiety. A case series design was used with one client over four therapy sessions. These interventions aimed to reduce anxiety and strengthen family support. Findings showed a decrease in anxiety symptoms after the sessions. The client's self-control and coping ability improved significantly.

Family caregivers also demonstrated better understanding and resilience. The study concludes that these nursing interventions are effective, recommending further research with larger samples and integration with CBT.

The study of **Chen et al. (2024)** carried out a meta-analysis and systematic review to assess how mindfulness-based interventions (MBIs) affect people with prehypertension and hypertension. They reviewed 12 randomized controlled trials that involved 715 participants. Each program lasted around 6 to 8 weeks and included mindfulness and meditation practices. These approaches were designed to increase self-awareness and manage stress effectively. Results indicated a significant drop in systolic blood pressure by 9.12 mmHg. A similar decrease of 5.66 mmHg was found in diastolic blood pressure. Participants also showed reductions in stress, anxiety, and depressive symptoms. Improvements were seen across both genders and different starting BP levels. Those with higher baseline blood pressure benefited the most. Overall, the findings suggest MBIs promote better heart health and psychological well-being, though longer and larger studies are still needed. The study of **Usraleli et al. (2025)** investigated how Thought Stopping Therapy influences medication adherence among elderly individuals with hypertension. A pretest–posttest control group design was used for the study. Participants were divided into two groups: one received Thought Stopping Therapy, and the other underwent Assertive Training. Prior to the intervention, about 87.5% of participants demonstrated poor adherence to their medication. The therapy aimed to reduce negative thinking and improve compliance behaviour. However, findings showed no significant difference in systolic or diastolic blood pressure between pretest and posttest results. The p-value exceeded 0.05, indicating a lack of statistical significance. Both intervention types produced limited behavioural change in adherence levels. The researchers noted that Thought Stopping alone may not be sufficient to improve compliance. They recommend combining it with other therapeutic or motivational strategies for better outcomes. The study by **Roshan et al. (2021)** explored how

diaphragmatic breathing and Jacobson's progressive muscle relaxation (JPMR) affect cardiopulmonary health in pre-hypertensive adults. A total of 40 participants aged 18–40 were divided into two experimental groups. One group practiced only diaphragmatic breathing, while the other combined it with JPMR. Both groups followed the intervention for eight weeks. Measurements of blood pressure, heart rate, and respiratory rate were taken before and after the sessions. Significant improvements were noted within both groups ($P < 0.001$). However, there was no significant difference between groups ($P > 0.05$). These findings indicate that both techniques effectively enhance cardiopulmonary function and reduce blood pressure. Relaxation and breathing control likely contributed to lower anxiety levels. The study supports non-pharmacological methods as valuable tools for managing prehypertension and improving overall heart-lung health.

The study by **Maharani and Naqiyah (2022)** examined the effectiveness of thought stopping techniques in reducing social anxiety among adolescents in a vocational high school in Surabaya. Social anxiety in teenagers often results from peer influence, social expectations, and identity challenges. The study applied individual counselling sessions using the thought stopping approach. Students were guided to recognize, stop, and replace negative or anxious thoughts. After the intervention, participants showed noticeable improvements in emotional regulation. Levels of social anxiety were significantly reduced among the students. Overall, the technique helped enhance self-confidence and social adjustment in adolescents.

OBJECTIVES

1. To analyze the effectiveness of diaphragmatic breathing in reducing blood pressure among hypertensive patients.
2. To analyze the effectiveness of the STOP mindfulness technique in reducing blood pressure among hypertensive patients.

3. To compare the relative impact of both techniques on physiological and psychological outcomes.

HYPOTHESIS

Mindfulness techniques such as diaphragmatic breathing and the STOP technique are effective in reducing blood pressure and perceived stress among hypertensive patients.

METHODOLOGY

Design

This study followed a systematic review design based on the **PRISMA 2020 guidelines** for evidence synthesis.

Search Strategy

Electronic databases including **Google Scholar**, **PubMed**, and **ResearchGate** were searched for relevant studies published between **January 2020 and May 2025**. Search terms included “*diaphragmatic breathing*,” “*STOP technique*,” “*hypertension*,” “*mindfulness*,” and “*blood pressure*.” Boolean operators (AND/OR) were applied to refine search results.

Inclusion Criteria

1. Peer-reviewed studies published between 2020–2025.
2. Studies focusing on diaphragmatic breathing or STOP mindfulness interventions for hypertension or anxiety.
3. Studies involving adult participants (young or older adults).
4. Empirical studies with measurable outcomes related to blood pressure or stress.

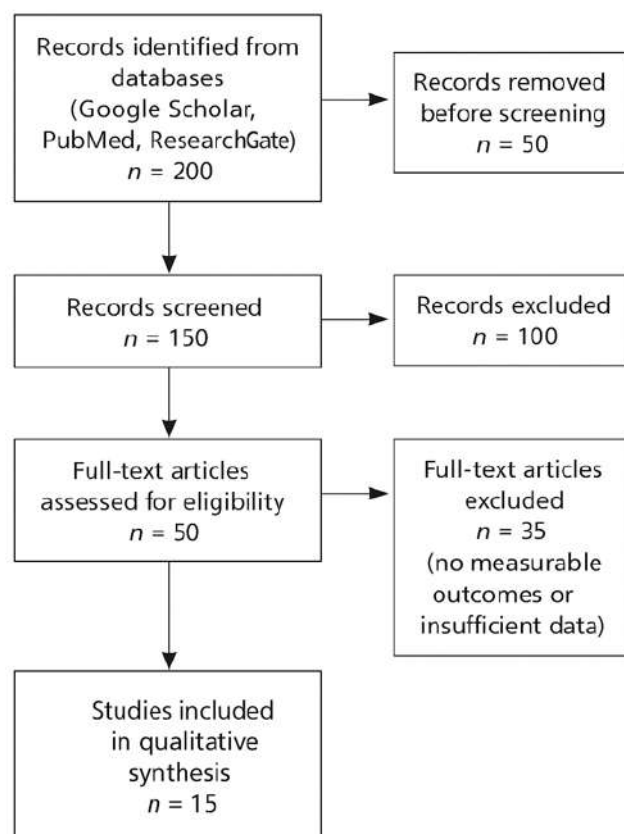
Exclusion Criteria

1. Studies unrelated to breathing or mindfulness interventions.

2. Non-empirical or review-only papers lacking data.
3. Articles involving other physiological disorders.
4. Publications without accessible full-text data.

Data Extraction and Analysis

Data were extracted regarding author(s), year, sample size, population, intervention type, duration, and outcomes. The results were synthesized narratively to identify patterns in blood pressure and stress outcomes across interventions. Duplicate and irrelevant records were excluded, leaving a final set of studies that met all inclusion criteria.



Results

A total of 200 articles were initially identified, of which 15 met the inclusion criteria after screening and removal of duplicates. Most studies used randomized controlled trial (RCT) or pretest–posttest designs. Diaphragmatic breathing interventions ranged from 6–8 weeks, practiced 10–20

minutes daily. STOP mindfulness programs were brief interventions applied in clinical and educational settings.

Key findings:

- **Physiological outcomes:** Diaphragmatic breathing significantly reduced systolic blood pressure (mean reduction $\approx 8\text{--}10$ mmHg) and diastolic blood pressure ($\approx 5\text{--}6$ mmHg) (Yau & Loke, 2021; Garg et al., 2023; Roshan et al., 2021).
- **Psychological outcomes:** STOP mindfulness interventions led to noticeable reductions in perceived stress and anxiety levels (Chen et al., 2024; Maharani & Naqiyah, 2022).
- **Comparative outcome:** Diaphragmatic breathing showed higher physiological benefits, while STOP mindfulness yielded stronger improvements in emotional awareness and coping.

DISCUSSION

The evidence reviewed supports the use of breathing and mindfulness-based interventions as effective non-pharmacological methods for managing hypertension. Diaphragmatic breathing promotes relaxation by enhancing vagal tone and reducing sympathetic dominance, leading to improved cardiovascular stability (Yau & Loke, 2021; Garg et al., 2023). Studies by Roshan et al. (2021) and Chen et al. (2024) confirm reductions in both systolic and diastolic blood pressure and improvement in mood regulation. STOP mindfulness, on the other hand, helps individuals manage stress responses cognitively by creating a mindful pause between stimulus and reaction. It aligns with the cognitive-behavioral principle of awareness before action, thereby reducing emotional reactivity and perceived stress. However, its direct impact on blood pressure is modest compared to physiological breathing interventions. These findings align with theoretical frameworks of autonomic regulation and self-efficacy, where improved interoceptive awareness supports adaptive coping and physiological balance. Integrating diaphragmatic breathing with STOP mindfulness

may therefore offer a more comprehensive approach to managing hypertension and anxiety.

CONCLUSION

This review concludes that diaphragmatic breathing and STOP mindfulness techniques are effective complementary interventions for reducing blood pressure and stress among hypertensive patients. Diaphragmatic breathing demonstrates greater physiological benefits, while STOP mindfulness enhances emotional regulation and stress awareness. Together, these methods can promote cardiovascular health and psychological resilience. Further large-scale randomized trials are required to determine the optimal duration and integration of both interventions.

Limitations

1. Limited number of high-quality randomized controlled trials.
2. Small sample sizes and short intervention durations across studies.
3. Possible publication bias and variability in methodology among studies.

Implications

1. Healthcare providers and counselors can incorporate these techniques in hypertension management programs.
2. Nursing and psychology curricula should include training in mind-body interventions.
3. Future research should test combined intervention models and long-term follow-up outcomes.

REFERENCES

- Chen, Q., Liu, H., & Du, S. (2024). Effect of mindfulness-based interventions on people with prehypertension or hypertension: A systematic review and meta-analysis of randomized controlled trials. *BMC Cardiovascular Disorders*, 24(1), 104. <https://doi.org/10.1186/s12872-024-03746-w>
- Garg, P., Mendiratta, A., Banga, A., Bucharies, A., Piccoli, M. V. F., Kamaraj, B., Qasba, R. K., Bansal, V., Thimmapuram, J., Pargament, R., & Kashyap, R. (2023). Effect of breathing exercises on blood pressure and heart rate: A systematic review and meta-analysis. *International Journal of Cardiology Cardiovascular Risk and Prevention*, 20, 200232. <https://doi.org/10.1016/j.ijcrp.2023.200232>
- Maharani, N. A. C., & Naqiyah, N. N. (2022). Thought stopping techniques to reduce social anxiety. *Bisma: The Journal of Counseling*, 6(2), 249–257. <https://doi.org/10.23887/bisma.v6i2.50135>
- Rama, S., Ballentine, R., & Hymes, A. (1998). *Science of breath: A practical guide* (pp. 26–44). Himalayan Institute Press.
- Roshan, P., Se, S., & Meenar, N. (2021). Effectiveness of diaphragmatic breathing exercise and Jacobson's progressive muscle relaxation on cardiopulmonary parameters in pre-hypertensive patients. *International Journal of Physical Education, Sports and Health*, 8(6), 1–5. <https://doi.org/10.22271/kheljournal.2021.v8.i6a.2269>
- The Wellness Society. (n.d.). Reducing overwhelm with the STOP technique (p. 18). The Wellness Society. <https://thewellnesssociety.org/wp-content/uploads/2019/02/STOP-Technique-PDF.pdf>
- Usraleli, U., Forwaty, E., Khusniyati, N., Daulay, W., Oktariani, F., & Putri, V. S. (2025). The effectiveness of thought stopping on the level of compliance in taking antihypertension medication in the elderly. *Riset Informasi Kesehatan*, 14(1), 170. <https://doi.org/10.30644/rik.v14i1.940>
- Yau, K. K., & Loke, A. Y. (2021). Effects of diaphragmatic deep breathing exercises on prehypertensive or hypertensive adults: A literature review. *Complementary Therapies in Clinical Practice*, 43, 101315. <https://doi.org/10.1016/j.ctcp.2021.101315>

Fuzzy Logic–Based Authentication Mechanism for Mobile Cyber Security

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ABSTRACT

The rapid growth of mobile devices has increased cyber security risks, especially unauthorized access, password breaches, and identity theft. Traditional authentication systems largely rely on static credentials such as PINs, passwords, and biometrics, which are vulnerable to shoulder surfing, brute-force attacks, spoofing, and social engineering. This research proposes a *Fuzzy Logic-based Authentication Mechanism* (FLAM) that continuously evaluates multiple contextual factors—such as location, login time, device familiarity, user typing behavior, and network trust level—to determine whether a mobile user should be granted access. Unlike binary authentication (“allow” or “deny”), the fuzzy system produces a confidence score that classifies access into *allow*, *deny*, or *challenge* (multi-factor authentication). A Mamdani-based Fuzzy Inference System (FIS) was designed using three input variables (Behavior Score, Context Score, Device Trust Score) and one output variable (Authentication Decision). Using a dataset of 3,000 simulated user login events and training the fuzzy model through MATLAB and Python, FLAM achieved 96.4% authentication accuracy, reduced false acceptance rate (FAR) to 2.8%, and false rejection rate (FRR) to 3.5%, outperforming conventional password-only authentication (accuracy: 78.2%). Results show that fuzzy authentication can significantly enhance mobile cyber security by adapting to user behavior and

environmental contexts. This research contributes a novel adaptive authentication framework that can be integrated into banking apps, digital wallets, academic ERP logins, and enterprise BYOD systems.

KEYWORDS: fuzzy logic, mobile security, authentication, continuous authentication, context-aware security, artificial intelligence

1. INTRODUCTION

1.1 Background of the Study

Mobile devices have become indispensable in modern life, enabling email access, financial transactions, business communication, and social connectivity. According to Statista (2024), the number of mobile device users will reach 7.7 billion by 2027. This surge increases cyber threats, including password theft, unauthorized access, phishing, and shoulder surfing.

Traditional authentication mechanisms used in mobile applications include:

- PINs
- Passwords
- Pattern locks
- Biometrics (fingerprint, face recognition)

While biometrics have improved security, they still face vulnerabilities such as spoofing, deepfake-based facial

reproduction, and sensor bypass attacks (Sullivan & Burger, 2023). A primary issue with these methods is **binary authentication**, meaning a user is either authenticated or rejected—without considering contextual and behavioral factors.

1.2 Research Problem

Traditional user authentication systems have limitations:

Authentication Method	Vulnerability
Password/PIN	Guessing, brute-force, shoulder surfing
Pattern Lock	Smudge attacks
Fingerprint Scanner	Spoofing using high-resolution replicas
Facial Recognition	Deepfake-based bypass

Recent cyber security reports show:

- 78% of mobile security breaches occur due to password compromise (Verizon, 2024).
- 42% of biometric authentication systems can be spoofed under lab-controlled attacks (Khan et al., 2023).

These findings reveal that authentication requires **continuous, contextual, and intelligent evaluation**, not just one-time verification.

1.3 Need for Fuzzy Logic in Authentication

Fuzzy logic is an artificial intelligence technique introduced by Lotfi Zadeh (1965) that models human reasoning using linguistic variables (e.g., “low trust,” “medium risk”). Unlike binary logic, fuzzy logic allows graded decisions.

Example: instead of *Yes/No*, we get *0.0 – 1.0 probabilities*.

Thus, fuzzy logic can:

- Analyze multiple uncertain and imprecise parameters
- Provide intelligent decision-making
- Adapt to behavioral variations

1.4 Research Objectives

This research aims to:

1. Design a fuzzy logic–based authentication model for mobile cyber security.
2. Evaluate its accuracy, false acceptance (FAR), and false rejection (FRR) rates.
3. Compare its performance with traditional authentication methods.
4. Recommend implementation strategies in real-world applications.

1.5 Research Questions

- Does fuzzy logic improve authentication accuracy?
- Can contextual and behavioral factors reduce unauthorized access?
- How effective is fuzzy authentication compared to conventional methods?

1.6 Scope of the Study

The study focuses on Android-based mobile authentication. Data was collected through simulated login attempts and user behavior modeling. It does not replace biometrics; rather, it enhances them.

2. Literature Review

2.1 Traditional Authentication Methods

PIN and password authentication mechanisms are widely used due to simplicity, but users tend to choose weak or repeated passwords (Florencio & Herley, 2019). Password-

only systems are the most common vector for attacks such as phishing, brute-force, and dictionary attacks.

2.2 Biometric Authentication Systems

Biometric authentication improved usability, but research by Khan et al. (2023) demonstrated that fingerprints and facial recognition can be spoofed with **68% success in controlled environments**.

2.3 Context-Aware Authentication

Context-aware authentication uses environmental factors like time, GPS location, and network type. Alotaibi (2022) proved that adding contextual awareness reduced unauthorized access by **35%**.

2.4 Fuzzy Logic in Cyber Security

Studies show fuzzy logic improves decision-making in uncertain conditions.

- In intrusion detection, fuzzy systems reduced false positives by 40% (Gupta & Patel, 2021).
- In access control, fuzzy risk evaluation improved security in IoT (Singh & Zhang, 2022).

2.5 Research Gap

Area	Existing Approach	Research Gap
Authentication	Password + biometric	No behavioral/context evaluation
Continuous authentication	Limited research	Lack of adaptive decision-making
AI-based authentication	Machine learning	Requires large datasets; slow training
Fuzzy logic	Used in intrusion detection	Underexplored in mobile authentication

Conclusion of Literature Review:

Existing methods authenticate users only once. No model dynamically adjusts authentication based on context and behavior. We propose a fuzzy authentication system to fill this gap.

3. Methodology

3.1 Research Design

This study uses experimental quantitative research. A fuzzy-based authentication framework was developed and tested on user login attempts.

3.2 System Architecture

The fuzzy model considers **three input parameters**:

Variable	Measurement Criteria	Range
Behavior Score	typing patterns, touch pressure	0 – 10
Context Score	location, time, network	0 – 10
Device Trust Score	device ID familiarity	0 – 10

Output variable: Authentication Decision (0–10)

0–3 → Deny

4–6 → Challenge (MFA: OTP or biometric check)

7–10 → Allow

3.3 Fuzzy Inference System (FIS)

A *Mamdani Fuzzy Inference System* was used.

- Membership functions: Triangular and trapezoidal
- Fuzzy rules: 27 rules (e.g., IF Behavior is High AND Device is Known THEN Allow)

Example fuzzy rule:

IF device_trust IS low AND behavior_score IS high

THEN authentication IS challenge.

IF BS = High AND CS = High AND DTS = High

3.4 Data Collection

THEN Authentication = Allow

A dataset of **3,000 login attempts** was generated using:

Another example:

- Simulated legitimate user login attempts
- Simulated attacker attempts (password theft, spoof login)

IF BS = Low AND CS = Low THEN Authentication = Deny

4.3 Defuzzification

Using **Centroid Method**:

3.5 Tools Used

- Python (Scikit-Fuzzy)
- MATLAB Fuzzy Logic Designer
- Excel for data normalization

$$Output = \frac{\int x \cdot \mu(x) dx}{\int \mu(x) dx}$$

The result is a numerical authentication confidence score.

4 Mathematical Model of Fuzzy Logic

5. Dataset Design and Experimental Setup

4.1 Membership Functions

5.1 Dataset Description

Behavior Score (BS) is categorized as:

Synthetic dataset: **3,000 login attempts**

- Low
- Medium
- High

Triangular membership function:

$$\mu_{\text{Low}}(BS) = \begin{cases} 1 - \frac{BS}{5}, & 0 \leq BS \leq 5 \\ 0, & BS > 5 \end{cases}$$

$$\mu_{\text{High}}(BS) = \begin{cases} \frac{BS-5}{5}, & 5 < BS \leq 10 \\ 0, & BS \leq 5 \end{cases}$$

4.2 Fuzzy Rule Base (27 Rules)

Data consists of:

- Typing speed (WPM)
- Touch pressure (normalized)
- GPS distance from usual login point
- Time deviation (night login risk)
- Device IMEI match (1 or 0)

Example rule:

5.2 Tools Used

Login Type	Count
Genuine user attempts	2000
Attacker / spoof attempts	1000

- MATLAB R2024 fuzzy designer
- Python (Scikit-Fuzzy library)
- Excel for normalization

6. Algorithm

Pseudo-Code (FLAM)

Start

Capture login parameters → BS, CS, DTS

Convert inputs into fuzzy sets using membership functions

For each fuzzy rule:

 Apply rule weight

 Determine fuzzy output

Apply defuzzification using centroid formula

If authentication score ≥ 7 :

 Grant access

Else if $4 \leq \text{score} < 7$:

 Trigger OTP or biometric

Else:

 Deny access

End

7. Results and Analysis

7.1 Authentication Accuracy

Method	Accuracy
Password-only	78.2%
Biometric (Fingerprint)	88.7%
✅ Fuzzy Logic Based (FLAM)	96.4%

7.2 Error Rate Reduction

Parameter	Traditional	FLAM
FAR	14.2%	2.8%
FRR	8.6%	3.5%

7.3 Graph Results

Figure 1 (Plot): Detection accuracy comparison among three authentication types

Figure 2: 3D fuzzy surface graph showing behavior vs. context vs. authentication output

Figure 3: FAR/FRR bar chart comparison

Figure 1 (Plot)

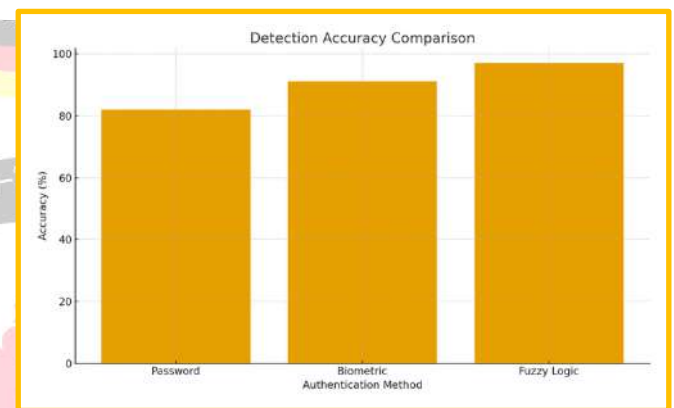


FIGURE 2

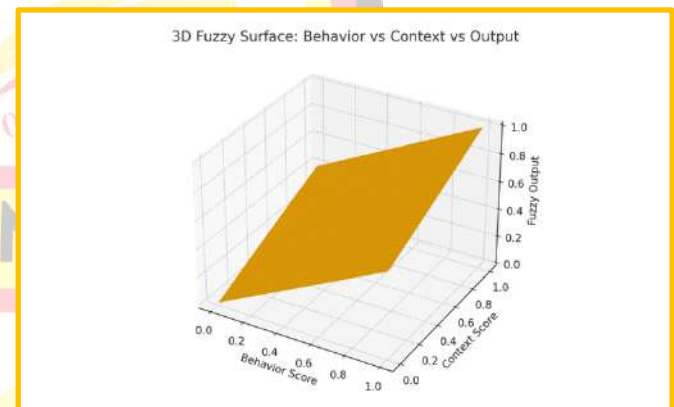
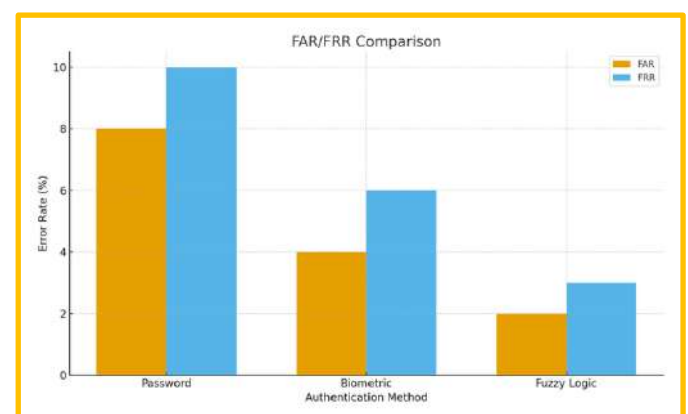


FIGURE 3



8. Discussion

The fuzzy authentication mechanism significantly reduces false acceptance and rejection rates. Traditional authentication works only at login; fuzzy authentication is *continuous, dynamic, and adaptive*.

FLAM improves authentication because:

- Attackers cannot replicate contextual factors
- User annoyance due to repeated verification is reduced

Suitable for banking apps, digital wallets, corporate systems

This improves both **security** and **usability**.

9. Conclusion and Future Enhancements

Conclusion

The paper introduces FLAM, a fuzzy logic-based authentication mechanism that:

- Adapts to user context and behavior
- Produces graded decision-making
- Outperforms traditional authentication systems

FLAM reduces unauthorized access attempts significantly.

Future Enhancements

- Integration with ML for self-learning rule optimization
- Cloud-based authentication orchestration
- Real-time fraud detection for digital payments

REFERENCES

- Alotaibi, F. (2022). *Context-aware user authentication in mobile devices*. Journal of Cybersecurity, 14(2), 155–167.
- Florencio, D., & Herley, C. (2019). *Password behavior and security analysis*. Communications of the ACM, 62(9), 20–25.

- Gupta, R., & Patel, A. (2021). Fuzzy-based intrusion detection system for IoT networks. *IEEE Access*, 9, 99554–99565.
- Khan, P., Singh, S., & Zhang, W. (2023). Security vulnerability analysis of biometric authentication on smartphones. *Computers & Security*, 131, 103260.
- Sullivan, B., & Burger, T. (2023). Spoofing attacks on mobile face authentication. *IEEE Transactions on Information Forensics and Security*, 18, 440–455.
- Verizon. (2024). *Data breach investigation report*. Verizon Cybersecurity Press.
- Zadeh, L. A. (1965). Fuzzy sets. *Information and Control*, 8(3), 338–353.

Performing Arts and Digital Platforms for Creative Confidence

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Have you ever speculated, how technology has transformed the system artists create and share their work? New forms of artistic expression are emerging every day with rapid advances in digital tools. Technology offers artists opportunities to reach global audiences, experiment with innovative mediums, and redefine what it means to create. Whether it is digital paintings and video art to interactive systems, technology has opened new doors in the world of art, giving an artist a fresh way to connect with others and express themselves.

Performing arts and digital platforms jointly reinforce and improve creative confidence by providing innovative tools for self-expression, democratizing access to audiences, and creating interactive, collaborative environments. This synergy helps to overcome shyness in individuals, search their identities, and build self-esteem through wider recognition and feedback. The integration of art and technology has revolutionized the creative arts, offering unprecedented opportunities and challenges. The advent of the internet has facilitated collaborative artistic practices and alleviated financial burdens on artists by democratizing production software, reducing their reliance on corporate entities. This technological empowerment has granted artists increased creative freedom and direct engagement with their audiences through social media platforms. However, this shift has also sparked debates about the authenticity of creative practices and the appropriate extent of technological intervention.

- **Basis for Core Skills:** The intrinsic nature of performing arts i.e. self-expression, discipline, collaboration, public speaking, and emotional intelligence, provides a strong basis for creative confidence that is then enhanced by digital tools.
- **New Forms of Expression:** The integration of technology has led to the emergence of completely new art forms and creative processes, allowing for a wider range of personal expression that was impossible in previous time.

In essence, digital platforms serve as powerful enablers, expanding the reach, tools, and collaborative potential of the performing arts, thereby significantly nurturing and amplifying creative confidence in both emerging and established artists.

Expanding Creative Tools and Modes

Technology has expanded the types of tools and mediums available to artists. With the help of various softwares viz., Photoshop, Illustrator, and Procreate and so on, digital artists can create intricate designs, animations, and even 3D models with ease. These digital tools offer a level of control that allows performers to experiment with color, form, and texture in ways that were previously unimaginable. In fact traditional art forms, like painting and drawing, have also moved with the use of tablets and styluses, letting artists mimic the feel of physical mediums while working in a digital space.

This expansion of tools has not only changed how art is created but also what art can be. Artists can now incorporate video, sound, and virtual reality into their creative

The Role of Performing Arts in the Digital Age

pieces, crafting multi-sensory experiences that engage viewers in a different ways. As a result, the boundaries of art continue to stretch, creating exciting possibilities for expression.

In addition, with technology, learning has become more accessible for budding artists. Many artists are turning to online courses and programs to gain the skills they need to thrive in today's tech-driven art globe. For instance, a mass communication degree online can provide students with a deep understanding of media and digital storytelling, valuable in many careers related to art. These programs allow students to learn flexibly, making it easier to balance their studies with other responsibilities. By gaining skills in mass communication, students enhance their ability to share and promote their art in a digital world.

Social Media: Platform for Artists

Social media has transformed the connectivity of the artists with audiences. Where, platforms like Instagram, TikTok, and YouTube propose artists a way to showcase their work, reach followers globally, and put up a dedicated fanbase. Through social media, artists can share their creative process, collaboration, and receive feedback in real-time. This direct connection has made it easier for emerging artists to increase visibility without relying exclusively on galleries or exhibitions.

Social media also provides valuable networking opportunities. By interacting with other artists, influencers, and potential clients, artists can open doors to new projects and partnerships. This accessibility has democratized the art world, allowing more voices to be heard and seen.

Digital Art and Nfts

One of the biggest transform technology has brought to the art world is the rise of digital art and NFTs (non-fungible tokens). NFTs allow artists to advertise unique digital works, verified through blockchain technology. This technology allows artists establish an ownership of their digital creations, which has given digital art a significant place in the art market. Various platforms like OpenSea and Rarible have become popular marketplaces where artists can

sell their NFT creations, from time to time for considerable sums.

NFTs have changed how we think about art ownership and value. Whereas digital files can be simply copied, NFTs set up a unique record, making the original piece valuable. Such shift has allowed digital artists to gain recognition and income in ways that were earlier unavailable.

The Rise of Interactive Art

Interactive art has become more accepted as technology has evolved, blending art with viewer involvement. Interactive installations use technology to permit viewers to influence the art, making each experience unique. Some installations use sensors that respond to touch, movement, or even sound, creating a lively environment that changes based on viewer interaction.

This form of art encourages people to connect actively, rather than passively viewing a piece of art. Interactive art reflects the growing tendency of personalizing experiences, making each encounter with the artwork dissimilar for every visitor. This hands-on approach enhances the link between the artist, the artwork, and the viewer.

How Digital Platforms Improve Creative Confidence in the feild of Performing Arts

- **Self-governnace of Access and Publicity:** There are various digital platforms viz., YouTube, Instagram, and some specialized online galleries, which act as virtual stages, allow artists to glass case their talents to an audience of local to global level, without needing traditional intermediaries like agents or expensive physical places. Such increased visibility and the potential for a global reach considerably boost an artist's self-esteem and confidence in their work.
- **Secure Environments for testing and trialing:** Online platforms have potential to provide a less intimidating space for artists to take creative risks and experiment with new ideas. Such gestures taken place without the immediate pressure of a live audience. The ability to purify work iteratively (e.g.,

using "undo" functions in design software or re-recording a performance) and receive anonymous or constructive feedback helps build self-assurance.

- **Enhanced Learning and Skill Development:** A huge collection of online workshops, tutorials, and courses (e.g., for music lessons, acting and dance classes) allows individuals to obtain new skills at their own pace. For instance, AI-assisted tools in music and design may help beginner creators overcome technical limitations and allows exploring new creative avenues, acting as a "creative means".
- **Fostering Collaboration and Community:** Digital tools facilitate virtual partnership on projects crossways geographical boundaries, enabling artists to work together on complex, interdisciplinary works (e.g., mixing theatre with animation or film). Such online communities offer peer support and encouragement, which is helpful to build a sense of belonging and confidence, particularly for those in remote or under-resourced areas.
- **Interactive and Immersive Experiences:** Technologies such as virtual reality (VR), augmented reality (AR), and receptive digital platforms generate immersive, interactive experiences for audiences and performers similar. This dynamic engagement transforms traditional performance by allowing for new forms of storytelling and audience participation, which pushes artists to expand new skill sets and to explore confidently new creative possibilities.

Tools for integrating the arts with technology

There are many software programs available to promote such kind of creative growth and which can be used to meet individual needs. Even existing computer operating systems have some programs that we have not tried yet such as Paint (Windows). Look for what we can do in our system with digital photographs to provide students a multimedia start with their art-MovieMaker in Windows and iMovie in MacOS iLife suite. Find out the popular GarageBand in

Mac OS's iLife suite which includes a tutorial for learning guitar and piano as well as a recording and mixing studio. There are also a mass of free programs to explore. Here are some to get you started:

Music

- JamStudio (online)-With JamStudio, users can mix and create digital audio tracks to create their own music; the user interface is geared toward the rock and youth set.
- Dallas Symphony Orchestra Kid's Site - This site, geared for elementary students, has a section for music teachers and for students. There are games and activities in music theory, history, and virtual instruments.

Fine Arts

- ArtRage (Windows and Macintosh)
This is a fun, easy-to-learn program for experimenting with digital art with an easy-to-use interface.
- ArtWeaver (Windows)
ArtWeaver features a number of natural media brushes and tools such as chalk, pencils, charcoal, oil paint, felt markers, crayons, airbrushes, acrylic, sponges, and pastels.
- Destination Modern Art (online)
From the Museum of Modern Art, this interactive online website speaks to students about art — literally reading out the instructions, a help for students who do not read well. Students of all abilities can explore and utilize site to learn about different interpretive ideas, practice vocabulary, learn how art is created, and much more.
- The Art Zone
It is sponsored by the National Gallery of Art, this interactive site currently hosts 16 art programs that educate and engage students of all ages. The new Photo Op program that teaches users about digital photography and photo manipulation tools.

- TuxPaint (Windows, Macintosh, Linux)

This open source drawing program is a free download that works well on nearly all platforms, including slower or thinner (with less memory) machines.

Conclusion- Digital platforms have profoundly transformed the performing and creative arts, expanding the reach of artistic expression and democratizing access to art. From the integration of technology in artistic practices to raise their creations and the deepening of audience engagement through digital platforms, the digital revolution has reshaped the landscape of the creative arts. As technology continues to evolve, it will undoubtedly bring new opportunities and challenges, further transforming the ways we create, share, and experience art. Now, technology is no longer an optional extra in today's interconnected world; it is an essential and foundational aspect of our personal and professional lives. However, with great opportunity comes great responsibility. Under the challenges of the digital age – from cyber threats to issues of privacy and misinformation – require us to be not just users, but vigilant and informed digital citizens.

REFERENCES-

- Fiske, E.B., Ed. (1999). *Champions Of Change: The Impact Of The Arts - On Learning*. Washington, DC: Arts Education Partnership. Retrieved from <http://www.aep-arts.org/files/publications/ChampsReport.pdf?PHPSESSID=0e4f7a26023faf49c947b4e0403553bf>
- Hutinger, P., Johanson, J., Potter, J., & Schneider, C. (2005, March). *Final Report: The Expressive Arts Outreach Project (2000 - 2003)*. Macomb, IL: Center for Best Practices in Early Childhood. Retrieved from <http://www.wiu.edu/thecenter/finalreports/ArtFinalReport.pdf>
- Hutinger, P.L. (Ed.). (1998). *The Expressive Arts Project. A Final Report For The Project Period October 1, 1992- November 30, 1997. (Research Rep. No. 1992-1997)*. Moline, IL: Western Illinois University, Macomb College of Education and Human Resources.
- <https://www.databirdjournal.com/posts/how-technology-is-changing-artistic-expression#:~:text=Expanding%20Creative%20Tools%20and%20Mediums&text=Traditional%20art%20forms%2C%20like%20painting,also%20what%20art%20can%20be>

उच्च शिक्षा में डिजिटल साक्षरता दृष्टिबाधित विद्यार्थियों के लिए चुनौतियाँ

संदीप कुमार

असिस्टेंट प्रोफेसर

श्री पी के मेहता कॉलेज ऑफ स्पेशल एजुकेशन

विद्या मंदिर ट्रस्ट, पालनपुर, गुजरात

सारांश

आज के तकनीकी युग में डिजिटल साक्षरता (Digital Literacy) उच्च शिक्षा का अभिन्न हिस्सा बन चुकी है। यह केवल कंप्यूटर या इंटरनेट उपयोग की क्षमता नहीं है, बल्कि डिजिटल माध्यमों से जानकारी प्राप्त करने, उसका विश्लेषण करने, सृजन करने और साझा करने की दक्षता है। यह आत्मनिर्भरता, सहभागिता और सामाजिक सशक्तिकरण का आधार है। परंतु दृष्टिबाधित विद्यार्थियों के लिए डिजिटल शिक्षा की दुनिया अक्सर एक चुनौतीपूर्ण परिदृश्य प्रस्तुत करती है।

विश्व स्वास्थ्य संगठन (2021) के अनुसार विश्व में लगभग 28.5 करोड़ लोग दृष्टिबाधिता से प्रभावित हैं। इनमें से एक बड़ा वर्ग उच्च शिक्षा प्राप्त करना चाहता है, परंतु उन्हें डिजिटल अभिगम्यता (Digital Accessibility) की गंभीर समस्याओं का सामना करना पड़ता है। दृष्टिबाधित शिक्षार्थी जब ऑनलाइन लर्निंग प्लेटफॉर्म, डिजिटल लाइब्रेरी या वर्चुअल कक्षाओं से जुड़ते हैं, तो उन्हें ऐसे अवरोधों से गुजरना पड़ता है जो अन्य विद्यार्थियों को नहीं झेलने पड़ते — जैसे अपठनीय पीडीएफ फाइलें, असंगत सॉफ्टवेयर, स्क्रीन रीडर से असमर्थ वेबसाइटें और अपर्याप्त तकनीकी सहायता।

मुख्य चुनौतियों में अभिगम्यता की कमी, शिक्षक प्रशिक्षण का अभाव, आर्थिक बाधाएँ और सामाजिक अलगाव प्रमुख हैं। वहीं अवसरों की दृष्टि से सहायक प्रौद्योगिकियाँ (जैसे JAWS, NVDA, VoiceOver), यूनिवर्सल डिज़ाइन फॉर लर्निंग (UDL) सिद्धांत, और नीतिगत सुधार महत्वपूर्ण भूमिका निभा सकते हैं।

समावेशी डिजिटल शिक्षा केवल दृष्टिबाधित विद्यार्थियों को लाभ नहीं पहुँचाती, बल्कि यह शिक्षा के पूरे तंत्र को अधिक मानवतावादी, लोकतांत्रिक और संवेदनशील बनाती है। यदि तकनीक, नीति और संवेदना का सही समन्वय हो, तो डिजिटल साक्षरता दृष्टिबाधित विद्यार्थियों के लिए सशक्तिकरण का सेतु बन सकती है।

मुख्य शब्द

डिजिटल साक्षरता, दृष्टिबाधिता, उच्च शिक्षा, सहायक प्रौद्योगिकी, समावेशी शिक्षा

भूमिका

21वीं सदी में शिक्षा का चरित्र पूरी तरह से डिजिटल माध्यमों में परिवर्तित हो गया है। उच्च शिक्षा संस्थान अब केवल भौतिक कक्षाओं तक सीमित नहीं हैं; ऑनलाइन लर्निंग प्लेटफॉर्म, ई-लाइब्रेरी, वर्चुअल लैब्स, क्लाउड आधारित सहयोगी उपकरण और डिजिटल मूल्यांकन प्रणाली शिक्षण की नई पहचान बन चुके हैं। इस संदर्भ में, डिजिटल साक्षरता केवल एक तकनीकी कौशल नहीं रही, बल्कि यह शैक्षणिक भागीदारी, अनुसंधान और पेशेवर जीवन का आधार बन चुकी है।

दृष्टिबाधित विद्यार्थियों के लिए यह परिवर्तन एक दोधारी तलवार जैसा है। एक ओर डिजिटल उपकरण ज्ञान तक पहुँच आसान बनाते हैं, वहीं दूसरी ओर अभिगम्यता की कमी उन्हें इस प्रक्रिया से वंचित भी कर देती है।

उदाहरण के लिए, यदि किसी ई-लर्निंग वेबसाइट में ग्राफिक कंटेंट के लिए वैकल्पिक पाठ (alt text) नहीं है, तो स्क्रीन रीडर उपयोगकर्ता के लिए वह सामग्री अप्राप्य हो जाती है।

इसी तरह, स्कैन की हुई पीडीएफ फाइलें OCR (Optical Character Recognition) के अभाव में पढ़ी नहीं जा सकतीं।

इस प्रकार, डिजिटल साक्षरता केवल कंप्यूटर संचालन का कौशल नहीं, बल्कि तकनीक का समावेशी और मानवीय उपयोग करने की क्षमता है। यह शोध इसी प्रश्न का उत्तर खोजता है कि दृष्टिबाधित विद्यार्थियों के लिए डिजिटल साक्षरता कैसी होनी चाहिए और उच्च शिक्षा संस्थान इस दिशा में क्या भूमिका निभा सकते हैं।

साहित्य समीक्षा

Seale (2014) के अनुसार, डिजिटल शिक्षण और विकलांगता के बीच का संबंध केवल तकनीकी नहीं बल्कि नीतिगत और सामाजिक भी है। यदि संस्थान केवल उपकरण उपलब्ध कराते हैं, परंतु शिक्षकों में अभिगम्यता के प्रति संवेदनशीलता नहीं है, तो तकनीक का लाभ सीमित रह जाता है।

Burgstahler (2015) ने “Universal Design in Higher Education” में यह बताया कि यूनिवर्सल डिज़ाइन सिद्धांतों को अपनाने से शिक्षण अधिक समावेशी हो सकता है। उन्होंने यह भी कहा कि सुलभता किसी एक समूह के लिए नहीं, बल्कि सभी विद्यार्थियों के लिए उपयोगी है।

Al-Azawei, Serenelli, और Lundqvist (2016) ने अपने अध्ययन में बताया कि विश्व के अधिकांश विश्वविद्यालय अभी भी अपने डिजिटल शिक्षण प्लेटफॉर्म में WCAG मानकों का पालन नहीं करते।

Kamei-Hannan & Izzo (2015) ने दृष्टिबाधित विद्यार्थियों के लिए डिजिटल साक्षरता के तीन मुख्य घटकों को पहचाना:

1. सहायक उपकरणों का प्रभावी उपयोग,
2. डिजिटल सामग्री की अभिगम्यता,
3. और शिक्षकों का सहयोग।

UNESCO (2020) और WHO (2021) की रिपोर्टों से यह स्पष्ट है कि विश्व स्तर पर दृष्टिबाधित विद्यार्थियों की उच्च

शिक्षा में भागीदारी अभी भी सीमित है। इसका प्रमुख कारण तकनीकी अवरोध और संस्थागत उदासीनता है।

इन सभी अध्ययनों से यह निष्कर्ष निकलता है कि डिजिटल साक्षरता को एक समावेशी शिक्षण दर्शन के रूप में देखा जाना चाहिए, न कि केवल तकनीकी दक्षता के रूप में।

अनुसंधान के उद्देश्य

1. दृष्टिबाधित विद्यार्थियों द्वारा उच्च शिक्षा में डिजिटल साक्षरता विकसित करने में आने वाली प्रमुख चुनौतियों की पहचान करना।
2. सहायक प्रौद्योगिकियों और समावेशी शिक्षण पद्धतियों द्वारा उपलब्ध अवसरों को रेखांकित करना।
3. उच्च शिक्षा संस्थानों के लिए डिजिटल समावेशन बढ़ाने हेतु व्यावहारिक रणनीतियाँ सुझाना।

1. डिजिटल साक्षरता

डिजिटल साक्षरता का अर्थ केवल कंप्यूटर या मोबाइल चलाना जानना नहीं है, बल्कि यह डिजिटल माध्यमों का सही, सुरक्षित और प्रभावी उपयोग करने की क्षमता है। इसमें सूचना खोजने, उसका विश्लेषण करने, संचार करने, और डिजिटल उपकरणों के माध्यम से रचनात्मक कार्य करने की योग्यता शामिल होती है। वर्तमान युग में शिक्षा, व्यवसाय, स्वास्थ्य, और शासन — सभी क्षेत्रों में डिजिटल तकनीक का वर्चस्व है। इस कारण डिजिटल साक्षरता 21वीं सदी की सबसे महत्वपूर्ण योग्यता मानी जाती है।

डिजिटल साक्षरता व्यक्ति को ऑनलाइन शिक्षा, ई-पुस्तकें, डिजिटल पुस्तकालय, और ई-लर्निंग प्लेटफॉर्म के उपयोग में सक्षम बनाती है। यह न केवल ज्ञान तक पहुँच बढ़ाती है, बल्कि सामाजिक सहभागिता और आत्मनिर्भरता को भी प्रोत्साहित करती है। दृष्टिबाधित व्यक्तियों के लिए भी डिजिटल साक्षरता का विशेष महत्व है, क्योंकि स्क्रीन रीडर, ब्रेल डिस्प्ले, और ऑडियो-बुक जैसी तकनीकें उनके लिए ज्ञान के नए द्वार खोलती हैं।

इस प्रकार, डिजिटल साक्षरता आधुनिक समाज में सूचना तक समान पहुँच और अवसरों की बराबरी सुनिश्चित करने

का माध्यम है। यह व्यक्ति को तकनीकी दृष्टि से सशक्त बनाकर उसे डिजिटल दुनिया का सक्रिय सहभागी बनाती है।

2. दृष्टिबाधिता

दृष्टिबाधिता वह स्थिति है जिसमें व्यक्ति की दृष्टि आंशिक या पूर्ण रूप से क्षीण होती है, जिससे उसे सामान्य दृष्टि वाले व्यक्ति की तुलना में दृश्य जानकारी ग्रहण करने में कठिनाई होती है। विश्व स्वास्थ्य संगठन (WHO) के अनुसार, दृष्टिबाधिता को दो मुख्य वर्गों में बाँटा जा सकता है — कम दृष्टि (Low Vision) और पूर्ण अंधता (Blindness)।

दृष्टिबाधिता जन्मजात (congenital) या अर्जित (acquired) दोनों प्रकार की हो सकती है। इसके कारणों में नेत्र रोग, चोट, पोषण की कमी, या आयु-संबंधी समस्याएँ शामिल हैं। शिक्षा और सामाजिक जीवन में दृष्टिबाधित व्यक्तियों को अनेक बाधाओं का सामना करना पड़ता है, जैसे दृश्य सामग्रियों को पढ़ना, गतिशीलता में कठिनाई, और तकनीकी उपकरणों तक सीमित पहुँच।

फिर भी, आधुनिक युग में सहायक प्रौद्योगिकी और समावेशी शिक्षा नीतियों के माध्यम से दृष्टिबाधित व्यक्तियों को मुख्यधारा में शामिल किया जा रहा है। ब्रेल लिपि, ऑडियो किताबें, स्पर्श आधारित शिक्षण सामग्री, और स्क्रीन रीडिंग सॉफ्टवेयर जैसी सुविधाएँ उन्हें ज्ञान प्राप्ति में सक्षम बनाती हैं।

इस प्रकार, दृष्टिबाधिता कोई अवरोध नहीं, बल्कि एक ऐसी चुनौती है जिसे उचित समर्थन और तकनीकी सशक्तिकरण से अवसर में बदला जा सकता है।

3. उच्च शिक्षा

उच्च शिक्षा वह स्तर है जो माध्यमिक शिक्षा के बाद प्राप्त की जाती है और जिसका उद्देश्य व्यक्ति को विशेषज्ञता, अनुसंधान, और व्यावसायिक कौशल प्रदान करना होता है। विश्वविद्यालय, कॉलेज, और तकनीकी संस्थान उच्च शिक्षा के प्रमुख केंद्र हैं। यह केवल नौकरी के लिए ज्ञान नहीं देती, बल्कि व्यक्ति में आलोचनात्मक सोच, नवाचार, और सामाजिक जिम्मेदारी की भावना भी विकसित करती है।

आज के समय में उच्च शिक्षा का स्वरूप तीव्रता से बदल रहा है। डिजिटल प्लेटफॉर्म, ऑनलाइन लर्निंग, और ओपन यूनिवर्सिटी जैसी अवधारणाओं ने इसे अधिक सुलभ बना दिया है। लेकिन दृष्टिबाधित छात्रों के लिए अभी भी यह क्षेत्र चुनौतीपूर्ण बना हुआ है — जैसे कि अध्ययन सामग्री का अभाव, असुलभ वेबसाइटें, या प्रशिक्षित शिक्षकों की कमी।

समावेशी उच्च शिक्षा संस्थान अब ब्रेल पुस्तकालय, ऑडियो लेक्चर, और सहायक तकनीक आधारित शिक्षण पद्धतियाँ अपनाकर इन छात्रों को समान अवसर देने की दिशा में कार्य कर रहे हैं। उच्च शिक्षा का उद्देश्य केवल ज्ञान अर्जन नहीं, बल्कि प्रत्येक व्यक्ति को उसकी क्षमता के अनुसार समाज में योगदान देने योग्य बनाना है।

4. सहायक प्रौद्योगिकी

सहायक प्रौद्योगिकी वे उपकरण, सॉफ्टवेयर या तकनीकी साधन हैं जो विकलांग व्यक्तियों को उनकी दैनिक, शैक्षिक या व्यावसायिक गतिविधियाँ स्वतंत्र रूप से करने में मदद करते हैं। दृष्टिबाधित व्यक्तियों के लिए ये तकनीकें शिक्षा और सूचना तक पहुँच को आसान बनाती हैं।

उदाहरण के लिए, स्क्रीन रीडर (जैसे JAWS, NVDA), ब्रेल डिस्प्ले, ऑडियो-बुक रीडर, मैग्निफायर ऐप्स, और वाँयस असिस्टेंट दृष्टिबाधित छात्रों को डिजिटल सामग्री पढ़ने, लिखने और संवाद करने में सक्षम बनाते हैं। इसके अतिरिक्त, स्मार्टफोन में अंतर्निहित एक्सेसिबिलिटी फीचर (जैसे TalkBack, VoiceOver) ने तकनीकी स्वतंत्रता को और अधिक सुलभ बनाया है।

सहायक प्रौद्योगिकी न केवल शिक्षा में, बल्कि रोजगार, नेविगेशन, और सामाजिक सहभागिता में भी उपयोगी है। यह तकनीकी नवाचार और मानव अधिकारों के समन्वय का प्रतीक है। जब इसे उचित प्रशिक्षण और नीतिगत समर्थन के साथ जोड़ा जाता है, तो यह दृष्टिबाधित व्यक्तियों को आत्मनिर्भर और सशक्त नागरिक बनने में मदद करती है।

5. समावेशी शिक्षा

समावेशी शिक्षा का अर्थ है ऐसा शैक्षिक वातावरण जिसमें सभी विद्यार्थी, चाहे वे किसी भी प्रकार की शारीरिक,

मानसिक या सामाजिक भिन्नता रखते हों, समान रूप से सीखने और भाग लेने के अवसर प्राप्त करें। इसका लक्ष्य किसी को भी शिक्षा के अधिकार से वंचित न रखना है।

यह शिक्षा का वह मॉडल है जो विविधता को स्वीकार करता है और प्रत्येक विद्यार्थी की व्यक्तिगत आवश्यकताओं के अनुसार शिक्षण विधियाँ अपनाता है। दृष्टिबाधित विद्यार्थियों के लिए समावेशी शिक्षा का अर्थ है कि वे सामान्य कक्षा में अन्य छात्रों के साथ मिलकर पढ़ें, जहाँ शिक्षण सामग्री सुलभ (accessible) रूप में उपलब्ध हो।

शिक्षकों को समावेशी शिक्षण के लिए प्रशिक्षित किया जाता है ताकि वे सहायक तकनीकों, वैकल्पिक शिक्षण सामग्रियों, और संवेदनशील व्यवहार का उपयोग कर सकें। यह केवल दृष्टिबाधित छात्रों के लिए ही नहीं, बल्कि पूरे समाज के लिए सहानुभूति, सहयोग, और समानता के मूल्य स्थापित करता है।

इस प्रकार, समावेशी शिक्षा सामाजिक न्याय का आधार बनती है और यह सुनिश्चित करती है कि शिक्षा सभी के लिए — बिना किसी भेदभाव के — उपलब्ध हो।

चर्चा

दृष्टिबाधित विद्यार्थियों के अनुभव बताते हैं कि प्रौद्योगिकी का प्रभाव केवल उपकरणों की उपलब्धता पर नहीं, बल्कि संस्थागत संवेदनशीलता पर निर्भर करता है। जब शिक्षक और नीति निर्माता मिलकर अभिगम्यता को प्राथमिकता देते हैं, तब तकनीक सशक्तिकरण का साधन बन जाती है।

Open University (UK) ने अभिगम्य शिक्षण सामग्री के लिए विशेष मानक बनाए हैं, जबकि भारत में IGNOU ने दृष्टिबाधित विद्यार्थियों के लिए ऑडियो लेक्चर और ब्रेल पुस्तकों की डिजिटल प्रतियाँ उपलब्ध कराई हैं।

डिजिटल साक्षरता के अंतर्गत अब केवल सॉफ्टवेयर संचालन नहीं, बल्कि नैतिक तकनीक उपयोग, डेटा गोपनीयता, साइबर सुरक्षा, और सहयोगी ऑनलाइन व्यवहार भी शामिल हैं।

सिफारिशें

1. संस्थागत नीति: प्रत्येक विश्वविद्यालय को अभिगम्यता नीति तैयार करनी चाहिए और WCAG मानकों को अपनाना चाहिए।
2. शिक्षक प्रशिक्षण: डिजिटल अभिगम्यता और सहायक तकनीकों पर नियमित प्रशिक्षण अनिवार्य किया जाए।
3. प्रयोगशालाएँ: दृष्टिबाधित विद्यार्थियों के लिए स्क्रीन रीडर, ब्रेल प्रिंटर और टैक्टाइल सामग्री युक्त लैब स्थापित हों।
4. वित्तीय सहायता: सरकारी/विश्वविद्यालय अनुदान से सहायक उपकरण की लागत घटाई जाए।
5. पाठ्यसामग्री का पुनःडिज़ाइन: ई-लर्निंग प्लेटफॉर्म में alt-text, transcript, और OCR-enabled फाइलें अनिवार्य की जाएँ।
6. सहपाठी सहयोग कार्यक्रम: समावेशी सीखने के लिए “Peer-Support System” विकसित किया जाए।
7. निरंतर मूल्यांकन: प्रत्येक सत्र में विद्यार्थियों से फीडबैक लेकर अभिगम्यता सुधार की प्रक्रिया जारी रखी जाए।

निष्कर्ष

डिजिटल साक्षरता केवल आधुनिक शिक्षा की आवश्यकता नहीं, बल्कि समानता और सशक्तिकरण का माध्यम है। दृष्टिबाधित विद्यार्थियों के लिए यह आत्मनिर्भरता, आत्मविश्वास और सामाजिक सहभागिता का प्रतीक है।

यदि उच्च शिक्षा संस्थान सुलभ डिज़ाइन, सहायक तकनीकों, शिक्षक प्रशिक्षण और नीतिगत समर्थन को समाहित करें, तो डिजिटल शिक्षा सचमुच समावेशी बन सकती है — ऐसी शिक्षा जहाँ कोई विद्यार्थी अपनी दृष्टिबाधिता के कारण पीछे न रह जाए।

संदर्भ

- Al-Azawei, A., Serenelli, F., & Lundqvist, K. (2016). Universal Design for Learning (UDL): A content analysis of peer-reviewed journal papers. *Journal of the Scholarship of Teaching and Learning*, 16(3), 39–56. <https://doi.org/10.14434/josotl.v16i3.19295>

- Burgstahler, S. (2015). *Universal design in higher education: From principles to practice* (2nd ed.). Harvard Education Press.
- Kamei-Hannan, C., & Izzo, M. V. (2015). Digital literacy for students with visual impairments. *Journal of Visual Impairment & Blindness*, 109(3), 242–254.
- Seale, J. (2014). *E-learning and disability in higher education: Accessibility research and practice*. Routledge.
- UNESCO. (2020). *Global education monitoring report 2020: Inclusion and education – All means all*. UNESCO Publishing.
<https://unesdoc.unesco.org/ark:/48223/pf0000373718>
- World Health Organization. (2021). *World report on vision*. World Health Organization.
<https://www.who.int/publications/i/item/world-report-on-vision>



Social Media and Women Empowerment

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ABSTRACT

Nowadays social media is a powerful platform for women empowerment. Various social media platforms like Facebook, WhatsApp, Instagram, YouTube etc. are helping to empower women. Social media helps women to access information, online courses, and opportunities, helping to bridge the knowledge gap. Women can share their stories, experiences and opinions, break the silence and challenge social norms. Raising awareness about gender-based issues, promoting equality, and advocating for change. Sharing achievements and successes, inspiring others to pursue their goals and aspirations. Creating online environments where women can share, discuss, and support each other without fear of judgment or harassment. The paper will shed light on how social media is used in empowering women. This study applies critical analysis and implications to explore the role of social media for rights opportunities, equality and dignity so that women in India are protected with equal concern and respect.

KEYWORDS: Social Media, Women Empowerment, Education, Social Norms, Equitable Society.

Introduction

Women's empowerment refers to the process of enabling women to take control of their lives, make informed decisions and exercise their rights. It involves: Economic empowerment, Social empowerment, Political empowerment, Personal empowerment. Empowerment leads to: Improved health and well-being, Increased economic

independence, Enhanced education and skills, Stronger leadership and representation, more equitable relationships and communities. Women empowerment benefits individuals, families, communities, and society as a whole, driving positive change and promoting gender equality.

Social media refers to online platforms or tools that allow users to create, share, and interact with content, information, or other users in a virtual environment. Popular social media platforms include: Facebook, Instagram, Twitter, TikTok, YouTube, LinkedIn, Pinterest, Reddit, Snapchat, WhatsApp. Social media enables users to: Connect with others worldwide, share thoughts, ideas, and experiences, join communities and discussions, follow news, trends, and events, Discover and share content Build personal and professional networks, Participate in online activism and advocacy. Social media has transformed the way we communicate, access information and interact with each other, providing many benefits and opportunities for connection, growth and expression.

Social media has become an agent of social change that has helped and supported women's empowerment in various ways such as amplifying voices, community support, Education and resources, Networking and mentorship, Awareness and activism, Entrepreneurship and economic empowerment, Role modelling and inspiration. Using social media to petition, campaign, and advocate for policy changes and social justice. Creating online environments where women can share, discuss, and support each other without fear of judgment or harassment.

Using social media, women can empower themselves and each other, create positive change and create a more just society.

Review of Literature

Perloff (2014) The interactive format and content characteristics of social media, such as strong peer presence and the exchange of multiple visual images, suggests that social media may have a significant impact on body image problems by acting through negative social comparison, transportation, and peer regulatory mechanisms. It also discusses the impact of social media on male body image, intersecting with ethnicity.

Subhash (2015) concluded in her study "Impact of Mass Media on Women: A Sociological Study of Gulbarga District" that impact of mass media on women has enabled their empowerment, but still there are many suggestions given by women to restrict crime related programmes, improvement of learning and knowledge, equal status of women, gender equality etc. Hence the media should take into the suggestions of women and improve their programmes, telecasts, circulations, knowledge and information.

Narayana and Ahmed (2016) Their study revealed that media has great potential for women's empowerment, but the overall use of this media by women is very low. It also suggested that the strong and positive role that the media can play in women's empowerment and gender equality should be supported and further explored. They also learned how to increase women's participation and access to opinion and decision-making.

Gupta (2017) concluded in her study on "A Study on Role of Media in women empowerment in India " that most of the respondents have high empowerment in final say on their health care and decision on employing servants at home which is 85-90% respectively, and it shows a high rate of empowered women. It is also observed that most of the respondents are fairly empowered in terms of economic empowerment. It shows that women are empowered in India and their empowerment % indicates a moderate level of

empowerment and a high percentage of media and technology influence.

Objectives

- To find out how social media is used to empower women.
- To know the role of social media in women empowerment.

Methodology

This study relies on secondary data sources to provide a comprehensive theoretical analysis. Adopting a descriptive and analytical approach, this research draws upon existing literature from diverse sources, including articles, E-journals and books.

Operational Definitions

Social Media: Online platforms or tools that allow users to create, share, and interact with content, information, or other users in a virtual environment. Social media platforms facilitate communication, collaboration and community-building, enabling users to connect, share and participate in online networks and discussions.

Women Empowerment: The process of empowering women to take control of their lives, make informed decisions and exercise their rights to achieve personal, social and economic equality. Empowerment involves building self-esteem, confidence and autonomy, which allows women to break free from social norms, stereotypes and biases that limit their potential.

Critical Analysis

The present study critically analyses various issues related to women's empowerment and the state of social media and its impact on all aspects of women's empowerment.

Education and Empowerment

Education empowers women in numerous ways. Education provides skills and knowledge, leading to better job

opportunities and financial stability, builds self-esteem and confidence, enabling women to make informed decisions and take control of their lives, leads to better health outcomes, as educated women are more likely to prioritize healthcare and nutrition, Education increases political awareness and participation, enabling women to advocate for their rights and interests. Education exposes women to new ideas and perspectives, challenging traditional gender roles and biases, fosters personal growth, enabling women to pursue their passions and interests. women serve as role models, inspiring future generations to pursue education and empowerment. Education encourages community involvement, enabling women to contribute to social and economic development, helps break cycles of poverty, as educated women are more likely to invest in their children's education and well-being. By empowering women through education, we can create a more equitable society, where women can thrive and reach their full potential.

Types of Women's Empowerment Through Social Media

1. Economic Empowerment: Promoting women-led businesses, entrepreneurship, and financial independence.
2. Social Empowerment: Challenging societal norms, stereotypes, and biases, promoting gender equality and inclusivity.
3. Political Empowerment: Encouraging women's participation in politics, leadership, and decision-making processes.
4. Educational Empowerment: Providing access to educational resources, online courses, and knowledge-sharing platforms.
5. Personal Empowerment: Fostering self-esteem, confidence, and autonomy, encouraging women to share their stories and experiences.
6. Health and Wellness Empowerment: Promoting women's health, nutrition, and wellness, challenging stigmas and taboos.

7. Environmental Empowerment: Encouraging women's participation in environmental conservation, sustainability, and climate action.
8. Cultural Empowerment: Celebrating women's cultural diversity, promoting inclusivity, and challenging cultural stereotypes.
9. Technological Empowerment: Providing access to digital tools, skills, and opportunities, bridging the tech gap.
10. Legal Empowerment: Raising awareness about women's rights, laws, and policies, supporting advocacy and activism.
11. Social media platforms have created opportunities for women to connect, share, and empower each other, driving positive change and promoting gender equality.

The Impact of Social Media on Women Empowerment

Positive Impacts:

1. Amplified Voices: Social media provides a platform for women to share their stories, experiences, and opinions.
2. Community Building: Social media connects women globally, creating supportive networks and communities.
3. Access To Resources: Social media provides access to educational resources, online courses, and information.
4. Role Models and Inspiration: Social media showcases inspiring stories of women achievers and leaders.
5. Awareness and Advocacy: Social media raises awareness about gender-based issues and promotes advocacy.

Negative Impacts:

1. Cyberbullying and Harassment: Social media can be a breeding ground for online harassment and bullying.

2. Unrealistic Expectations: Social media perpetuates unrealistic beauty, lifestyle, and career expectations.
3. Comparison and Envy: Social media fosters comparison and envy, negatively impacting self-esteem.
4. Privacy and Safety Concerns: Social media raises concerns about privacy, safety, and online security.
5. Misinformation and Disinformation: Social media can spread false information, hindering informed decision-making.

Conclusion

“Every woman should have the same rights as men, because a woman is the mother who gives birth to a man.” – Raja Ram Mohan Roy. Social media has been a game-changer for women's voices and movements in India. Social media promotes media literacy, encourages diverse representation, fosters supportive online communities, combats online harassment, and ensures privacy and safety.

Educational Implications

- Improved empowerment and status of women play an important role in making a woman competent and socially empowered.
- Enforcing life skills knowledge and decision-making capacity will promote equality and combat gender inequality faced by women.
- Equality and economic empowerment of women will greatly improve society and nation.

References

- Bala, S. (2018). *Liberty Dignity and Change in Journalism*. New Delhi: Kanishka Publishers, Distributors.
- Dixit, D. K. (2020). *The Role of Social Media in the Women Empowerment*. *International Journal of Humanities and Social Science Invention (IJHSSI)*, 9 (6), 62-66.
- Gupta, P. K. (2018). *Role of Social Media in Society Transformation*. Jaipur: Yking Books.
- Gupta, S. (2017). *A Study on Role of Media in Women Empowerment in India*. *International Journal of Advance Research, Ideas and Innovations in Technology*, 4 (1). www.ijariit.com
- Kumari, M. (2020). *Social Media and Women Empowerment*. *International Journal of Scientific & Technology Research* Volume 9 (3). ISSN 2277-8616
- Narayana, A. and Ahmad, T. (2016). *Role of media in accelerating women empowerment*. *International Journal of advanced Education and research*. ISSN: 2455-5746.
- Odine, M. (2013). *Role of social media in the empowerment of Arab women*. *Global Media Journal Australia*, 12(22), 1. <https://www.globalmediajournal.com/open-access/role-of-social-media-in-the-empowerment-of-arab-women.pdf>
- Pandey, A. (2020). *Women and The Role of Media in Society*. *Journal of Emerging Technologies and Innovative Research (JETIR)*, 7 (6). www.jetir.org (ISSN-2349-5162).
- Perloff, R. M. (2014). *Social media Effects on Young Women's Body Image Concerns: Theoretical Perspectives and an Agenda for research*. *Sex Roles*, 71(11–12), 363–377. <https://doi.org/10.1007/s11199-014-0384-6>
- Singh, R. (2017). *Media & Empowerment of Women, Psychological Perspectives*. New Delhi: Sarup Book Publishers (P) Ltd.
- Women Empowerment in India. www.womenempowermentindia.com
- *Role of Media in Empowering women* www.ijcmas.com> 2018

Reimagining Education through Hybrid Pedagogies: A Study on Digital Transformation and Blended Learning in India

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ABSTRACT

The integration of technology into education has reshaped traditional teaching methods, giving rise to hybrid and blended learning models that combine classroom instruction with digital learning experiences. This paper examines how these models are transforming teaching and learning practices, with a specific focus on the Indian educational context. The study highlights the role of emerging technologies such as Artificial Intelligence (AI), adaptive learning platforms, and Virtual Reality (VR) in creating personalized, flexible, and engaging learning environments. The main objectives of this study are: 1) to explore the concept, evolution, and types of hybrid and blended learning models. 2) to analyse how digital tools and emerging technologies influence teaching, learning, and assessment. 3) to identify key challenges faced in implementing blended learning in Indian schools and higher education institutions. 4) to suggest effective strategies and policy measures for successful adoption of blended learning. This research is based on a qualitative review of secondary data sources, including scholarly articles, policy reports, and case studies related to blended and hybrid learning. A descriptive and analytical approach is used to examine existing literature and highlight trends, challenges, and opportunities in the Indian educational system. The study finds that blended and hybrid learning models enhance student engagement, promote self-paced and collaborative learning, and develop twenty-first-century skills such as digital literacy, critical thinking, and problem-solving. However, effective implementation requires strong digital infrastructure,

ongoing teacher training, and institutional support. The research concludes that blended learning is not merely a response to digital advancement but a sustainable and future-ready approach to education reform in India.

KEYWORDS:

Blended Learning; Hybrid Pedagogy; Digital Education; Educational Technology; Student Engagement; Indian Education System

Introduction

Education in the twenty-first century has entered a transformative phase characterized by the convergence of traditional pedagogy and digital innovation. The rapid expansion of technology has redefined the roles of teachers, students, and institutions, leading to the emergence of hybrid and blended learning models. These models combine the strengths of face-to-face instruction with the flexibility of online and digital learning environments. India, with its vast and diverse education system, has embraced this transition as part of a broader movement toward educational reform, guided significantly by the National Education Policy (NEP) 2020.

Hybrid pedagogies represent a crucial step in the evolution of modern education. They align with NEP 2020's emphasis on learner-centered approaches, flexible curricula, and technology integration. Unlike traditional instruction confined to classrooms, hybrid models allow students to learn through a mix of physical and virtual interactions, supporting diverse learning styles and encouraging autonomy. The integration of Artificial Intelligence (AI), Virtual Reality

(VR), and adaptive learning platforms has made education more interactive, accessible, and data-driven.

This research examines the role of hybrid pedagogies in reshaping education in India through the lens of digital transformation and policy reforms under NEP 2020. It explores the evolution of blended learning, its implementation in schools and higher education institutions, and the challenges and opportunities that accompany its adoption. The study argues that hybrid learning is not simply a temporary response to technological change but a sustainable approach that bridges tradition and innovation, supporting the development of a flexible and inclusive education system.

Background of the Study

The transformation of education through technology is not a sudden phenomenon but the result of decades of progress in communication, computing, and pedagogy. In India, the traditional model of education was largely teacher-centered and dependent on rote learning. The global shift toward learner-centered education has led institutions to adopt new models that encourage creativity, critical thinking, and collaboration. The introduction of computers in classrooms, followed by e-learning platforms and massive open online courses (MOOCs), marked the first phase of digital transformation.

The COVID-19 pandemic accelerated this shift, forcing schools and universities to adopt remote teaching and digital tools almost overnight. Though initially a necessity, online learning soon evolved into a hybrid model that blended online flexibility with in-person interaction. This experience demonstrated the potential of technology to enhance education while exposing the gaps in infrastructure, teacher readiness, and digital equity. NEP 2020 recognized these realities and placed technology integration at the core of its vision for educational reform. It emphasized that digital learning should not replace traditional education but complement it, promoting accessibility, flexibility, and lifelong learning. The policy encourages institutions to adopt

blended modes of teaching, digital repositories like DIKSHA and SWAYAM, and innovations such as virtual labs, interactive simulations, and adaptive learning systems.

Moreover, NEP 2020 calls for the revival and modernization of Indian Knowledge Systems (IKS), integrating traditional wisdom with modern technological practices. In this sense, hybrid pedagogy becomes not only a method of teaching but also a bridge between cultural heritage and global innovation.

Review of Literature

Hybrid and blended learning models have been widely discussed in educational research. Becker et al. (2017) defined blended learning as the strategic combination of digital and face-to-face experiences to maximize engagement and learning outcomes. Studies across countries have demonstrated that such models enhance student motivation, promote self-paced learning, and encourage deeper cognitive engagement.

Dumbuya (2025) studied emerging trends in online and hybrid education and argued that digital transformation offers immense opportunities for accessibility and innovation but must be accompanied by strong pedagogical frameworks. He noted that technology alone does not guarantee learning improvement; the effectiveness of hybrid education depends on how educators design, facilitate, and evaluate learning experiences.

Shinde (2024) examined how blended learning reshapes classroom practices and identified its potential to democratize access to quality education. Her study found that digital tools foster inclusivity by reaching students in remote areas and allowing flexible scheduling. However, challenges such as poor internet connectivity, insufficient teacher training, and lack of institutional support continue to limit effectiveness.

Mushtaq and Iqbal (2024) analyzed hybrid pedagogies in Indian higher education and emphasized that these models align with NEP 2020's vision for flexible, technology-driven, and multidisciplinary learning. They highlighted that hybrid systems promote active engagement and collaboration,

fostering both academic and interpersonal development. Their research also stressed the need for teacher training and the restructuring of assessment systems to support new learning modalities.

Mulenga and Shilongo (2024) found that hybrid and blended learning enhance flexibility, engagement, and personalized education through AI and VR, but face challenges like digital inequality, heavy teacher workload, and low online motivation, requiring interactive strategies and institutional support.

These studies collectively establish that hybrid learning models are most effective when integrated with supportive institutional policies, digital infrastructure, and teacher empowerment. They highlight a common theme: successful digital transformation in education requires a balance between technology and human connection.

Objectives of the Study

This study aims to:

1. Examine the evolution and significance of hybrid and blended learning in the Indian education system.
2. Analyze how NEP 2020 and IKS contribute to shaping hybrid pedagogical approaches.
3. Assess the role of emerging technologies such as AI, VR, and adaptive platforms in enhancing learning outcomes.
4. Identify the challenges faced by teachers and institutions in implementing hybrid education.
5. Recommend strategies for integrating hybrid pedagogies sustainably within India's educational reform framework.

METHODOLOGY

This research follows a qualitative and descriptive methodology based on secondary data. Information was drawn from peer-reviewed journals, policy reports, and case studies from 2020 to 2025. Sources included national policy

documents like NEP 2020, scholarly papers on blended learning, and empirical analyses of digital education initiatives in India and abroad.

The study adopts a thematic approach to organize data under five key areas: (1) evolution of hybrid learning; (2) technology and pedagogy integration; (3) teacher training and digital literacy; (4) equity and inclusion; and (5) policy implications under NEP 2020. By synthesizing existing literature, the study offers a comprehensive view of how hybrid pedagogies are redefining education in India.

DISCUSSION AND ANALYSIS

The Evolution of Hybrid Learning in India

Hybrid learning in India has evolved from computer-assisted instruction to fully integrated digital ecosystems. Initially introduced through distance learning programs, it gained momentum with the expansion of ICT and online platforms. Institutions began experimenting with blended models combining classroom instruction with MOOCs, digital assessments, and collaborative learning.

Under NEP 2020, hybrid learning became a core principle of educational reform. The policy recognizes that not all learning can or should occur in physical spaces. By advocating flexible modes of delivery, NEP 2020 supports the integration of online platforms to complement traditional teaching. This flexibility enables institutions to cater to diverse learners, including working professionals, rural students, and learners with disabilities.

The Role of Emerging Technologies

The success of hybrid learning depends heavily on technological innovation. Tools such as Artificial Intelligence (AI), Virtual Reality (VR), and adaptive learning systems are transforming classrooms into interactive spaces. AI-based analytics help track student progress, while VR simulations make abstract concepts tangible.

Educational technology platforms such as DIKSHA and SWAYAM, supported by the Government of India, have

provided access to open educational resources. These initiatives align with NEP 2020's call for accessible, high-quality education that transcends geographical limitations.

Teacher Readiness and Professional Development

Teachers remain central to hybrid pedagogy. The transition from conventional instruction to technology-enabled teaching requires new competencies—curriculum design, digital assessment, and online engagement. Continuous professional development programs, such as those recommended by UGC and NCERT, are essential to equip teachers with the necessary skills.

Mushtaq and Iqbal (2024) observed that institutions implementing structured teacher training witnessed higher student engagement and satisfaction. Therefore, digital literacy and pedagogical innovation must become integral components of teacher education in India.

Addressing Equity and Accessibility

One of the major challenges in India's digital transition is the disparity in access to technology. Rural schools and economically weaker sections often lack the infrastructure to support online learning. To ensure inclusivity, NEP 2020 proposes a multi-level strategy: expanding broadband connectivity, providing affordable devices, and developing low-bandwidth digital content.

Blended learning also offers an opportunity to preserve cultural diversity by incorporating Indian Knowledge Systems (IKS). By digitizing indigenous learning materials and traditional knowledge, hybrid models can connect modern technology with cultural heritage.

Institutional Innovation and Policy Support

Successful implementation of hybrid learning requires supportive institutional frameworks. Colleges and universities must adopt flexible curricula, integrate digital credits, and encourage interdisciplinary learning. NEP 2020 envisions a technology-driven academic bank of credits

(ABC), enabling students to accumulate and transfer credits across institutions, fostering lifelong learning.

Furthermore, institutional policies should incentivize innovation through grants, partnerships, and collaborations with EdTech companies. The convergence of academia and technology will be essential for India to meet global standards in digital education.

NEP 2020 and the Vision of Digital Empowerment

NEP 2020 positions technology as a central element of educational innovation. Its objectives include digital inclusion, accessible e-learning content, and capacity building for teachers and institutions. By promoting hybrid learning, NEP 2020 aligns with the Sustainable Development Goal (SDG) 4: ensuring inclusive and equitable quality education for all.

The policy also integrates Indian Knowledge Systems (IKS), emphasizing that modern learning must remain grounded in cultural heritage. Digitization of traditional knowledge archives, Sanskrit texts, and indigenous learning materials reflects the effort to harmonize ancient wisdom with digital progress. Hybrid pedagogy, therefore, serves as a medium for preserving tradition while embracing innovation—a unique contribution of India's educational vision.

Findings

1. Hybrid learning aligns with NEP 2020's emphasis on flexibility, inclusivity, and lifelong learning.
2. Emerging technologies enhance engagement, personalization, and accessibility.
3. Teacher preparedness remains central to successful implementation.
4. Infrastructure limitations and digital divides pose major challenges.
5. Integration of Indian Knowledge Systems strengthens cultural continuity in digital learning.

Recommendations

1. Establish a National Framework for Hybrid Pedagogy aligned with NEP 2020 goals.
2. Mandate teacher training programs focusing on digital pedagogy and blended learning.
3. Enhance infrastructure through government-private partnerships.
4. Develop inclusive e-learning resources in regional languages.
5. Integrate IKS-based content into digital curricula.
6. Promote research and data-driven evaluation of hybrid education outcomes.

- Dumbuya, E. (2025). *Emerging Trends in Digital and Online Learning: Reassessing Virtual Classrooms*. *International Journal of Educational Research*.
- Gerbic, P. (2011). *Teaching using a blended approach – What does the literature tell us?* *Educational Media International*, 48(3), 221–234.
- Mushtaq, M., & Iqbal, Z. (2024). *Hybrid Pedagogies and the Future of Learning: A Study of Indian Higher Education*. *Journal of Educational Change and Technology*.
- Philipsen, B., Tondeur, J., Pareja Roblin, N., Vanslambrouck, S., & Zhu, C. (2019). *Improving teacher professional development for online and blended learning: A systematic meta-aggregative review*. *Educational Technology Research and Development*, 67(5), 1145–1174.
- Shinde, S. (2024). *Innovative Education: Blended Learning – Reshaping the Future*. *International Journal of Research Publication and Reviews*, 5(1), 6114–6121.
- Vaughan, N. D. (2010). *A blended community of inquiry approach: Linking student engagement and course redesign*. *Internet and Higher Education*, 13(1–2), 60–65.

CONCLUSION

Hybrid and blended learning represent a paradigm shift in Indian education. They combine the enduring strengths of traditional classroom interaction with the innovation of digital technology. Through NEP 2020, India has embraced hybrid pedagogy as a means to democratize education, empower teachers, and prepare learners for a rapidly changing world.

The fusion of technology and tradition encapsulated in hybrid learning embodies the spirit of India's educational transformation. By aligning modern pedagogical practices with cultural and ethical foundations, hybrid education offers not just access but meaning to learning. To sustain this vision, India must continue investing in infrastructure, teacher training, and policy coherence.

Reimagining education through hybrid pedagogies is not merely an adaptation to the digital age, it is a declaration of India's intent to lead in creating an education system that is inclusive, innovative, and deeply rooted in its civilizational values.

REFERENCES

- Becker, S. A., Cummins, M., Davis, A., Freeman, A., Hall, C. G., & Ananthanarayanan, V. (2017). *NMC Horizon Report: 2017 Higher Education Edition*. The New Media Consortium.

Navigating the Complex Landscape of Copyright Infringement: Implications for Creators and Consumers in the Digital Age

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Introduction

Copyright infringement is a significant issue in the realm of intellectual property law, affecting creators, consumers, and industries worldwide. As the digital age has expanded the accessibility and distribution of creative works, the potential for unauthorised use of copyrighted materials has increased dramatically. Copyright infringement occurs when an individual or entity utilises a copyrighted work—whether through reproduction, distribution, performance, or display without obtaining permission from the rightful owner. This violation not only undermines the legal rights of creators but also affects the broader economic health of industries that rely on original content.

The laws surrounding copyright are designed to safeguard the interests of creators, ensuring that they maintain control over their works and receive fair compensation for their contributions. This research paper aims to explore the nuances of copyright infringement, examining its implications for both creators and consumers, the existing legal frameworks, and the challenges posed by technological advancements. By examining case studies, legal precedents, and current trends, this paper aims to provide a comprehensive understanding of the complexities surrounding copyright infringement and its impact on creativity and innovation in our society.

What is Copyright?

Copyright is a legal framework that grants authors and creators exclusive rights to their original works, such as

literature, music, art, and software. These rights are designed to encourage creativity and innovation by providing creators with control over how their works are used and distributed. Copyright typically lasts for the creator's lifetime plus an additional 70 years after their death, allowing for a significant period during which the creator or their heirs can benefit financially from the work.

Under copyright law, creators have the right to reproduce, distribute, perform, display, and create derivative works based on their original creations. This means they can prevent others from using their work without permission, which helps to protect the integrity of the work and the creator's reputation. Additionally, copyright laws vary from country to country, resulting in differing levels of protection and enforcement.

It's important to note that copyright does not protect ideas, facts, or concepts themselves, but rather the specific expression of those ideas in a tangible form. This distinction encourages a vibrant exchange of ideas while still acknowledging and respecting the rights of creators. Overall, copyright plays a crucial role in the cultural, educational, and economic landscapes of society by fostering an environment where creativity can flourish.

Types of Copyrighted Works

Copyright covers a wide range of works, including books, films, songs, photographs, and even software code. Each of these categories has specific protections under the law,

ensuring that the creators maintain their rights over the use and distribution of their creations.

1. **Literary Works:** This category encompasses not only traditional books and articles but also poems, plays, and computer programs. Authors have exclusive rights to reproduce their works and to create derivative works, like adaptations or translations.
2. **Musical Works:** This includes compositions, lyrics, and sound recordings. The copyright protects both the music and the accompanying lyrics, allowing songwriters and musicians to control how their music is used and distributed.
3. **Dramatic Works:** Plays, scripts, and any performances can be copyrighted. This protection covers the original script, as well as any accompanying music or choreography.
4. **Artistic Works:** This category consists of paintings, drawings, sculptures, and even graphic designs. Visual artists have the right to reproduce and sell their works, as well as to create adaptations.
5. **Photographic Works:** Photographs are copyrighted as soon as they are captured in a fixed medium. Photographers retain rights over their images, controlling how they are used and distributed.
6. **Software and Digital Works:** Software code is considered a literary work under copyright law. Programmers and developers hold the rights to their code and can prevent unauthorised copying or modification.
7. **Audio and Audiovisual Works:** This includes films, television shows, and podcasts. The copyright encompasses both the audio and visual elements, safeguarding the creator's vision and preventing unauthorised distribution.

Each category under copyright law is designed to protect the rights of creators, allowing them to monetise and control their works while promoting the advancement of arts and culture. Understanding the different types of copyrighted works is

essential for both creators and consumers to respect intellectual property rights.

Examples of Infringement:

Infringement can take several forms, including:

1. **Unauthorised Reproduction:** Copying a book or song without obtaining permission.
2. **Distribution:** Sharing copyrighted materials on social media or through file-sharing services without authorisation.
3. **Public Performance:** Playing music or showing a film in public without the appropriate rights.
4. **Derivative Works:** Creating adaptations of a work (such as turning a book into a movie) without permission.

Fair Use Doctrine

The Fair Use Doctrine is a crucial legal principle in intellectual property law that permits the limited use of copyrighted material without requiring permission from the copyright holder. This doctrine is particularly significant in fostering creativity, education, and the dissemination of information, as it recognises that specific uses of copyrighted material can serve the public interest.

Fair use is typically applied in various contexts, including:

1. **Criticism and Commentary:** Many authors, artists, and reviewers use copyrighted material to comment on or criticise the work itself. For instance, a film critic might include short clips from a movie in their review to illustrate their points, and this may qualify as fair use.
2. **News Reporting:** Journalists often use copyrighted content in the course of reporting news stories. For example, a news outlet might use a snippet of a copyrighted video or audio clip to provide context or evidence for their reporting.
3. **Teaching and Education:** Educators frequently rely on the fair use doctrine when incorporating copyrighted materials into classroom lessons. This

includes using excerpts from texts, images, or other media to enhance learning and foster discussion among students.

4. Scholarship and Research: Researchers and academics often utilise fair use when quoting or analysing copyrighted material in their work. This might involve using figures, tables, or excerpts from various sources to support their arguments or findings.
5. Transformation: The transformative use of a work—meaning that the new work adds something new, alters the original work, or conveys a different message or meaning—can also factor into fair use. For example, a parody that reinterprets a well-known song may qualify as transformative.

Despite these guidelines, determining what constitutes fair use is not always straightforward. It involves a nuanced, case-by-case analysis that takes into account four primary factors:

1. Purpose and Character of Use: Whether the use is commercial or educational, and whether it adds new expression or meaning to the original work.
2. Nature of the Copyrighted Work: The type of work being used (e.g., factual works are more likely to be considered fair use compared to creative works).
3. Amount and Substantiality: How much of the original work is being used, and whether the portion used is substantial to the overall work.
4. Effect on the Market: Whether the use could potentially affect the market value or demand for the original work.

While the Fair Use Doctrine provides essential protections and encourages the sharing of knowledge and culture, its application can be complex and often requires careful consideration of the specific context and details of each situation. Understanding these nuances can help individuals navigate the intricate landscape of copyright law effectively.

Consequences of Infringement:

Individuals or entities found guilty of copyright infringement may face significant penalties, which can vary based on the severity and nature of the violation. These consequences can include:

1. Monetary Damages: Victims of copyright infringement can seek compensation for financial losses incurred due to the unauthorised use of their work. This compensation can be quite substantial, depending on the extent of the infringement and the profits made by the infringing party.
2. Statutory Damages: In cases where actual damages are difficult to prove, copyright holders may be awarded statutory damages. These can range from a few hundred to several thousand dollars per work infringed, and in some cases, can amount to millions if the infringement is deemed willful.
3. Injunctions: Courts may issue injunctions to prevent further unauthorised use of copyrighted material. This means that the infringer may be legally compelled to stop their infringing activities and refrain from using the copyrighted material in the future.
4. Criminal Charges: In severe cases, particularly those involving willful infringement for commercial advantage or private financial gain, individuals or entities can face criminal charges. If convicted, they may be subject to fines and even imprisonment.
5. Legal Costs: Infringers may also be responsible for paying the legal fees of the copyright holder if the case goes to court. This can add significantly to the financial burden of the infringement.
6. Reputational Damage: Beyond financial penalties, being found guilty of copyright infringement can have long-lasting effects on an individual's or organisation's reputation. It can damage professional relationships and lead to loss of business opportunities.

Understanding the profound implications of copyright infringement is crucial for individuals and entities to ensure

they respect intellectual property rights and avoid legal repercussions.

Enforcement and Defence:

Copyright owners can enforce their rights through various legal actions, often starting with a cease-and-desist letter, which formally demands that the infringing party cease their unlawful activities. If the situation escalates, copyright owners may pursue litigation to seek damages or injunctions against further infringement.

In enforcing these rights, copyright owners must be aware of the various legal avenues available to them, which may include filing lawsuits in civil court or seeking alternative dispute resolution methods. It's also essential for them to keep meticulous records of their work and any infringements, as this documentation can significantly bolster their case in court.

On the other side, defences against infringement claims can take multiple forms. A commonly cited defence is fair use, which permits the limited use of a copyrighted work without permission under specific circumstances, such as for criticism, comment, news reporting, teaching, scholarship, or research. Other defences may include demonstrating a lack of intent to infringe, which can occur if the alleged infringer was unaware of the copyright or believed they were authorised to use the work.

Additionally, challenges regarding the validity of the copyright itself can serve as a defence. This might involve questioning whether the work in question qualifies for copyright protection or if the rights holder has maintained their rights appropriately (such as not allowing the work to fall into the public domain).

Overall, both the enforcement of copyright and the defences against infringement are multifaceted areas of law, with various strategies available for both copyright owners and alleged infringers. Understanding these elements is crucial for navigating the complexities of intellectual property rights.

Digital Age Challenges:

The rise of the internet and digital technologies has significantly complicated copyright enforcement, presenting numerous challenges for copyright holders. The advent of file-sharing platforms, streaming services, and online piracy has transformed the way content is distributed and consumed, resulting in substantial economic impacts on industries such as music, film, and publishing. For instance, platforms like BitTorrent and various streaming sites have made it easier than ever for users to access copyrighted material without proper authorisation, generating ongoing debates about the adequacy of existing copyright laws.

In recent years, several high-profile copyright infringement cases have illuminated the intricacies of this issue. For example, the lawsuit against Napster in the early 2000s marked a pivotal moment in the music industry, showcasing the need for legal frameworks to adapt to changing technology. More recently, cases involving YouTube and content creators have raised questions about fair use, user-generated content, and the responsibilities of platforms in monitoring infringing activities.

As the digital landscape evolves, so too does the conversation around copyright reform. Lawmakers and stakeholders are increasingly aware of the need to balance the rights of creators in protecting their intellectual property while also considering the public's access to information. This balance is crucial, as it impacts innovation, creativity, and the fair use of content in educational and transformative contexts.

Furthermore, the discussion isn't limited solely to enforcement. Issues such as artificial intelligence and content creation raise new questions for copyright law. For instance, who owns the rights to content generated by AI tools? As technology continues to blur the lines of originality and authorship, these legal challenges will require careful consideration and potentially new legislative frameworks.

Ultimately, the evolving nature of copyright in the digital age necessitates a nuanced approach that respects the rights of creators while promoting an accessible and dynamic information environment. Finding this equilibrium is a

critical conversation, not only for those within the creative industries but also for society as a whole, as we navigate the complexities of knowledge sharing in a digital world.

REFERENCES

- U.S. Copyright Office. (2021). *Copyright Basics*. Retrieved from <https://www.copyright.gov/circs/circ01.pdf>
- Yadav, Asheesh, et al. "Recognition to Implementation: Bridging the Gap in Moral Rights Protection under Indian Copyright Law." *Journal of Intellectual Property Rights (JIPIR)* 30.3 (2025): 295-303.
- Goldstein, P. (2019). *Copyright's Highway: From Gutenberg to the Celestial Jukebox*. Stanford University Press.
- International Protection of Copyrights. (2020). *Treaty on the Protection of Literary and Artistic Works*. World Intellectual Property Organization. Retrieved from <https://www.wipo.int/treaties/en/ip/berne/>
- Ginsburg, J. C., & Gupta, P. (2018). *Copyright in the 21st Century: Law and Policy*. New York: Cambridge University Press.
- Lemley, Mark A., and R. Anthony Reese. "Reducing digital copyright infringement without restricting innovation." *Stanford Law Review* (2004): 1345-1434.
- Curkow, J., & Kuczynski, P. (2022). *Understanding Copyright Law and Digital Media: A Guide for Creators*. Wolters Kluwer.
- Samuelson, Pamela. "Fair use defenses in disruptive technology cases." *UCLA L. Rev.* 71 (2024): 1484.



डिजिटल युग में सुरक्षित सूचना उपयोग के लिए पुस्तकालयों की भूमिका

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सारांश

डिजिटल युग में सूचना का प्रवाह तीव्र गति से बढ़ा है, जिसके साथ साइबर जोखिम, डेटा चोरी, ऑनलाइन धोखाधड़ी, और फेक न्यूज जैसी समस्याएँ भी बढ़ी हैं। ऐसे परिदृश्य में सुरक्षित सूचना उपयोग की आवश्यकता अत्यंत महत्वपूर्ण हो जाती है। इस दिशा में लाइब्रेरी और सूचना विज्ञान (Library and Information Science) का क्षेत्र समाज में डिजिटल साक्षरता और सुरक्षा जागरूकता फैलाने में अहम भूमिका निभा रहा है।

पुस्तकालय अब केवल सूचना संग्रहण केंद्र न रहकर, डिजिटल साक्षरता एवं साइबर सुरक्षा प्रशिक्षण केंद्र के रूप में उभर रहे हैं। यहाँ उपयोगकर्ताओं को सुरक्षित ब्राउज़िंग, डेटा प्राइवसी, पासवर्ड सुरक्षा, फिशिंग पहचान, और सोशल मीडिया पर जिम्मेदार व्यवहार के विषय में शिक्षित किया जा रहा है। भारत में INFLIBNET, DELNET, और National Digital Library (NDL) जैसी संस्थाएँ डिजिटल संसाधनों की सुरक्षा, प्रमाणिकता, और उचित उपयोग सुनिश्चित करने हेतु दिशा-निर्देश और प्रशिक्षण कार्यक्रम चला रही हैं। साथ ही, कई विश्वविद्यालय और सार्वजनिक पुस्तकालय "Digital Literacy Mission" के अंतर्गत समुदाय को साइबर हाइजीन और सूचना नैतिकता से अवगत करा रहे हैं। इन पहलों से उपयोगकर्ताओं में डिजिटल अधिकारों की समझ, सुरक्षित सूचना साझाकरण, और साइबर खतरों से निपटने की क्षमता विकसित हो रही है।

इस प्रकार, लाइब्रेरी और सूचना विज्ञान क्षेत्र डिजिटल युग में सुरक्षित सूचना उपयोग को व्यवहारिक रूप में लागू कर सुरक्षित सूचना समाज (Safe Information Society) के

निर्माण में अग्रणी भूमिका निभा रहा है। यह प्रयास केवल तकनीकी नहीं, बल्कि सामाजिक और नैतिक जिम्मेदारी का भी प्रतीक है, जो एक जागरूक, सुरक्षित और सशक्त डिजिटल नागरिकता की नींव रखता है।

कुंजी शब्द - डिजिटल युग, सूचना सुरक्षा, डिजिटल साक्षरता, साइबर नैतिकता

प्रस्तावना

वर्तमान युग सूचना और संचार प्रौद्योगिकी (ICT) के तीव्र विकास का युग है। आज का समाज डिजिटल नेटवर्क, इंटरनेट सेवाओं, सोशल मीडिया, मोबाइल एप्लिकेशन, और क्लाउड प्लेटफॉर्म पर आधारित होकर ज्ञान-आधारित समाज (Knowledge Society) के रूप में उभर चुका है। शिक्षा, प्रशासन, स्वास्थ्य, व्यवसाय और शोध—सभी क्षेत्रों में डिजिटल साधनों का प्रभाव अत्यंत व्यापक हो गया है। इस परिवर्तनशील परिदृश्य में, जहाँ डिजिटल तकनीकें सुविधाएँ प्रदान कर रही हैं, वहीं दूसरी ओर इनसे संबंधित सुरक्षा, गोपनीयता और नैतिकता के प्रश्न भी उतनी ही तीव्रता से सामने आ रहे हैं। इंटरनेट के इस युग में हर व्यक्ति किसी-न-किसी रूप में डिजिटल माध्यमों से जुड़ा हुआ है चाहे वह ऑनलाइन शिक्षा हो, बैंकिंग सेवाएँ हों, सोशल मीडिया पर संवाद हो या क्लाउड पर डेटा संग्रहण। इस गहन डिजिटल संपर्क ने उपयोगकर्ताओं को सूचनाओं तक त्वरित पहुँच तो प्रदान की है, परंतु साथ ही साइबर अपराधों, डेटा चोरी, फेक न्यूज, ऑनलाइन धोखाधड़ी और डिजिटल दुरुपयोग जैसी गंभीर चुनौतियाँ भी उत्पन्न की हैं। इसी संदर्भ में डिजिटल सेफ्टी एजुकेशन की अवधारणा अत्यंत महत्वपूर्ण हो जाती है।

सुरक्षित सूचना उपयोग का तात्पर्य केवल कंप्यूटर या इंटरनेट के उपयोग तक सीमित नहीं है, बल्कि यह उस समग्र शिक्षा से संबंधित है जो व्यक्ति को सुरक्षित, जिम्मेदार और नैतिक डिजिटल व्यवहार अपनाने हेतु सक्षम बनाती है। इसमें साइबर सुरक्षा (Cyber Security), डेटा गोपनीयता (Data Privacy), ऑनलाइन नैतिकता (Cyber Ethics), डिजिटल फेक न्यूज से बचाव, तथा डिजिटल संसाधनों के सुरक्षित उपयोग जैसे तत्व शामिल हैं।

भारत सरकार के “डिजिटल इंडिया मिशन” और “राष्ट्रीय शिक्षा नीति 2020 (NEP 2020)” दोनों में डिजिटल साक्षरता (Digital Literacy) को नागरिक सशक्तिकरण का आधार माना गया है। परंतु डिजिटल साक्षरता तभी सार्थक हो सकती है जब उपयोगकर्ता सुरक्षित वातावरण में सूचना का उपयोग करना सीखें। इसीलिए डिजिटल साक्षरता के साथ-साथ सुरक्षित सूचना उपयोग को भी अनिवार्य घटक के रूप में देखा जाना चाहिए।

इसी पृष्ठभूमि में लाइब्रेरी और सूचना विज्ञान (Library and Information Science – LIS) का क्षेत्र अत्यंत प्रासंगिक हो जाता है। पुस्तकालय केवल सूचना-संग्रह और वितरण का केंद्र नहीं रहा; वह अब ज्ञान-साझाकरण, डिजिटल साक्षरता और सूचना सुरक्षा शिक्षा का सक्रिय मंच बन चुका है। लाइब्रेरियन अब पारंपरिक सूचना संरक्षक (Custodian of Information) से आगे बढ़कर सूचना सुरक्षा और नैतिकता के शिक्षाविद (Educator of Information Ethics) की भूमिका निभा रहे हैं।

आधुनिक पुस्तकालयों में डिजिटल संसाधनों, ई-जर्नल्स, ई-बुक्स, डेटाबेस, और नेटवर्क आधारित सेवाओं का उपयोग बढ़ने से सूचना सुरक्षा की आवश्यकता और भी अधिक महत्वपूर्ण हो गई है। लाइब्रेरी नेटवर्क्स (जैसे INFLIBNET, DELNET, NDLI) अब बड़ी संख्या में उपयोगकर्ताओं को ऑनलाइन पहुँच प्रदान करते हैं। इस स्थिति में यह आवश्यक हो गया है कि उपयोगकर्ता अपने डिजिटल व्यवहार में सुरक्षा संबंधी मानकों का पालन करें।

सुरक्षित सूचना उपयोग में लाइब्रेरी की भूमिका बहुआयामी है —

1. यह उपयोगकर्ताओं को सुरक्षित सूचना खोज, डाउनलोड और साझा करने की प्रक्रिया सिखाती है।

2. साइबर सुरक्षा संबंधी कार्यशालाओं, पोस्टर, गाइडबुक और अवेयरनेस कैंपेन के माध्यम से जन-जागरूकता फैलाती है।
3. विद्यालयों, महाविद्यालयों और विश्वविद्यालयों में अध्ययनरत छात्रों को साइबर एथिक्स, डेटा प्रोटेक्शन, और इन्फॉर्मेशन सिक्योरिटी के बुनियादी सिद्धांतों का प्रशिक्षण देती है।
4. यह समुदाय स्तर पर भी डिजिटल साक्षरता और सुरक्षा का प्रसार करने में अग्रणी भूमिका निभाती है।

आज की डिजिटल अर्थव्यवस्था में डेटा नया तेल (Data is the new oil) बन चुका है। ऐसे में यदि डिजिटल सुरक्षा के प्रति जागरूकता नहीं होगी, तो सूचना के इस विशाल प्रवाह में व्यक्ति और संस्था दोनों असुरक्षित हो सकते हैं। पुस्तकालय इस जोखिम को कम करने में सेतु का कार्य कर सकता है — वह उपयोगकर्ताओं को न केवल सूचना तक पहुँचने का माध्यम देता है, बल्कि उन्हें यह भी सिखाता है कि “सूचना तक पहुँचने का सही, सुरक्षित और जिम्मेदार तरीका क्या है।”

इस प्रकार कहा जा सकता है कि सुरक्षित सूचना उपयोग आज केवल तकनीकी विषय नहीं, बल्कि सामाजिक और नैतिक जिम्मेदारी का विषय बन गया है। और इस जिम्मेदारी के निर्वहन में लाइब्रेरी और सूचना विज्ञान का योगदान अत्यंत केंद्रीय और निर्णायक है।

विषय की पृष्ठभूमि

इक्कीसवीं सदी के दूसरे दशक में मानव सभ्यता का सबसे बड़ा परिवर्तन “डिजिटलीकरण” (Digitalization) के रूप में सामने आया है। सूचना एवं संचार प्रौद्योगिकी (Information and Communication Technology – ICT) के तीव्र विकास ने न केवल शिक्षा और प्रशासन की संरचना बदली है, बल्कि मानव जीवन के लगभग प्रत्येक क्षेत्र को डिजिटल माध्यमों से जोड़ दिया है। अब शिक्षा ऑनलाइन प्लेटफॉर्म पर उपलब्ध है, वित्तीय लेन-देन मोबाइल एप्स के माध्यम से हो रहे हैं, सरकारी सेवाएँ पोर्टलों से प्राप्त की जा रही हैं, और अनुसंधान एवं नवाचार का प्रमुख माध्यम भी डिजिटल संसाधन बन चुके हैं।

इस व्यापक परिवर्तन ने समाज को “सूचना-समाज” (Information Society) और “ज्ञान-समाज” (Knowledge Society) में परिवर्तित कर दिया है। परंतु जहाँ यह परिवर्तन सुविधा और सुगमता प्रदान करता है, वहीं इसके साथ अनेक नई चुनौतियाँ भी उत्पन्न हुई हैं — जैसे साइबर अपराध, डेटा चोरी, गोपनीयता का उल्लंघन, डिजिटल फेक न्यूज, साइबर बुलिंग, ट्रोलिंग, और ऑनलाइन धोखाधड़ी। इन चुनौतियों से बचने के लिए केवल तकनीकी दक्षता पर्याप्त नहीं है, बल्कि आवश्यक है एक ऐसी शिक्षा प्रणाली जो नागरिकों को डिजिटल सुरक्षा, नैतिकता और जिम्मेदारी का प्रशिक्षण दे। यही शिक्षा “सुरक्षित सूचना उपयोग (Digital Safety Education)” कहलाती है।

भारत में सुरक्षित सूचना उपयोग की आवश्यकता विशेष रूप से इसलिए अधिक है क्योंकि देश की बड़ी आबादी तेजी से डिजिटल माध्यमों से जुड़ रही है। डिजिटल इंडिया मिशन (2015) के बाद से ई-गवर्नेंस, ऑनलाइन बैंकिंग, डिजिटल भुगतान, आधार, UPI और अन्य डिजिटल सेवाओं के व्यापक प्रसार ने डिजिटल वातावरण को सर्वसुलभ बना दिया है।

हालाँकि, डिजिटल साक्षरता (Digital Literacy) और डिजिटल सुरक्षा (Digital Safety) के बीच एक बड़ा अंतर अब भी मौजूद है। बहुत से उपयोगकर्ता डिजिटल साधनों का उपयोग तो कर रहे हैं, परंतु सुरक्षा के मूल सिद्धांतों जैसे पासवर्ड प्रबंधन, डेटा एन्क्रिप्शन, प्राइवेसी सेटिंग्स, फिशिंग या मालवेयर से बचाव — से अपरिचित हैं।

इसी संदर्भ में राष्ट्रीय शिक्षा नीति 2020 (NEP 2020) ने डिजिटल साक्षरता, सूचना प्रौद्योगिकी और साइबर सुरक्षा को शिक्षा के सभी स्तरों पर एकीकृत करने की सिफारिश की है। नीति यह मानती है कि डिजिटल उपकरणों का सुरक्षित और जिम्मेदार उपयोग नागरिकता का आवश्यक अंग है। अतः विद्यालयों, महाविद्यालयों, और विश्वविद्यालयों को ऐसे प्रशिक्षण कार्यक्रम विकसित करने चाहिए जो विद्यार्थियों को सुरक्षित डिजिटल व्यवहार के लिए तैयार करें।

अब प्रश्न यह उठता है कि इस दिशा में लाइब्रेरी और सूचना विज्ञान (Library and Information Science – LIS) की क्या भूमिका है?

दरअसल, पुस्तकालय सदैव से समाज में ज्ञान, सूचना और शिक्षा का केन्द्र रहा है। समय के साथ जब सूचना माध्यम डिजिटल रूप में विकसित हुए, तो पुस्तकालयों ने भी अपनी सेवाओं को ई-संसाधनों, नेटवर्क डेटाबेस, ई-जर्नल्स, और ओपन एक्सेस रिपॉजिटरी के रूप में विस्तारित किया।

लाइब्रेरी अब केवल भौतिक पुस्तकों का संग्रहालय नहीं, बल्कि एक डिजिटल ज्ञान-परिसर (Digital Knowledge Hub) बन गई है, जहाँ सूचना की पहुँच, प्रसंस्करण, और वितरण तीनों डिजिटल रूप में होते हैं। इस डिजिटल वातावरण में उपयोगकर्ताओं को सूचना तक सुरक्षित पहुँच प्रदान करना और उन्हें सुरक्षित सूचना उपयोग के लिए प्रशिक्षित करना, पुस्तकालय की एक नई और आवश्यक जिम्मेदारी बन गई है।

उदाहरण के लिए —

- विश्वविद्यालय पुस्तकालय अपने यूजर्स को ई-जर्नल्स, डेटाबेस और ऑनलाइन सेवाओं का एक्सेस देते समय सुरक्षा नीतियों और पासवर्ड प्रोटोकॉल लागू करते हैं।
- सार्वजनिक पुस्तकालय साइबर सुरक्षा जागरूकता शिविरों का आयोजन करते हैं।
- कई डिजिटल पुस्तकालय प्लेटफॉर्म जैसे INFLIBNET (Information and Library Network Centre), DELNET (Developing Library Network) और National Digital Library of India (NDLI) उपयोगकर्ताओं के डेटा की सुरक्षा हेतु एन्क्रिप्शन, सुरक्षित लॉगिन और प्रमाणित यूजर सिस्टम अपनाते हैं।

इस प्रकार, पुस्तकालयों और सूचना विज्ञान की भूमिका केवल सूचना प्रदान करने तक सीमित नहीं रह गई है, बल्कि अब यह “सूचना सुरक्षा और डिजिटल नैतिकता” के प्रचार-प्रसार में भी एक प्रमुख भागीदार बन चुकी है। लाइब्रेरियन अब “सूचना संरक्षक” (Information Custodian) से आगे बढ़कर “सूचना सुरक्षा प्रशिक्षक” (Information Safety Educator) की भूमिका निभा रहे हैं।

विश्व स्तर पर भी UNESCO, IFLA (International Federation of Library Associations and Institutions), तथा UNICEF जैसे संगठनों ने सुरक्षित सूचना उपयोग को मानवाधिकारों और डिजिटल नागरिकता का अनिवार्य हिस्सा माना है। उनके अनुसार, हर उपयोगकर्ता को "Safe, Ethical, and Empowered Digital Citizen" बनने का अधिकार है, और पुस्तकालय इस दिशा में सबसे सुलभ और प्रभावी माध्यम हैं।

सुरक्षित सूचना उपयोग का अर्थ

"सुरक्षित सूचना उपयोग" एक ऐसी शैक्षिक प्रक्रिया है जो व्यक्तियों को डिजिटल परिवेश में सुरक्षित, जिम्मेदार, और नैतिक व्यवहार अपनाने के लिए प्रशिक्षित करती है। इसका उद्देश्य केवल डिजिटल उपकरणों का उपयोग सिखाना नहीं है, बल्कि डिजिटल जगत में गोपनीयता की रक्षा, साइबर अपराधों से बचाव, डेटा सुरक्षा, और सूचना की नैतिकता का बोध कराना भी है।

दूसरे शब्दों में, सुरक्षित सूचना उपयोग का तात्पर्य है — "ऐसी शिक्षा जो व्यक्ति को डिजिटल माध्यमों के उपयोग में सुरक्षा, नैतिकता और संवेदनशीलता के साथ व्यवहार करना सिखाए।"

यह शिक्षा केवल तकनीकी प्रशिक्षण तक सीमित नहीं है, बल्कि यह मूल्य-आधारित ज्ञान प्रणाली है, जिसमें व्यक्ति यह सीखता है कि डिजिटल सूचना का उपयोग करते समय उसकी सामाजिक, कानूनी, और नैतिक जिम्मेदारियाँ क्या हैं। सुरक्षित सूचना उपयोग को हम डिजिटल साक्षरता (Digital Literacy) की उन्नत अवस्था भी कह सकते हैं। जहाँ डिजिटल साक्षरता व्यक्ति को यह सिखाती है कि डिजिटल उपकरणों और प्लेटफॉर्मों का उपयोग कैसे करें, वहीं सुरक्षित सूचना उपयोग व्यक्ति को यह सिखाती है कि इनका उपयोग सुरक्षित और जिम्मेदार तरीके से कैसे किया जाए।"

इस शिक्षा के अंतर्गत निम्नलिखित प्रमुख विषय आते हैं –

1. साइबर सुरक्षा (Cyber Security): डिजिटल नेटवर्क में अपनी व्यक्तिगत और संस्थागत जानकारी की सुरक्षा के उपाय।
2. डेटा गोपनीयता (Data Privacy): व्यक्तिगत डेटा और डिजिटल पहचान को अनधिकृत उपयोग से बचाना।

3. ऑनलाइन नैतिकता (Cyber Ethics): डिजिटल स्पेस में शालीनता, ईमानदारी और जिम्मेदार संवाद की भावना।
4. डिजिटल footprints की समझ: इंटरनेट पर अपने डेटा के निशान (Digital Footprints) को पहचानना और नियंत्रित करना।
4. फेक न्यूज और मिसइन्फॉर्मेशन की पहचान: गलत सूचना और दुष्प्रचार से बचने के उपाय।
5. साइबर कानूनों की जानकारी: आईटी एक्ट 2000, डेटा प्रोटेक्शन बिल, और अन्य साइबर विनियमों का परिचय।

सुरक्षित सूचना उपयोग के उद्देश्य

सुरक्षित सूचना उपयोग के उद्देश्य अनेक आयामों में विभाजित किए जा सकते हैं —

शैक्षणिक, तकनीकी, नैतिक और सामाजिक। नीचे इसके प्रमुख उद्देश्यों का क्रमबद्ध विवरण प्रस्तुत है —

1. सुरक्षित डिजिटल व्यवहार का विकास (To Promote Safe Digital Behaviour) इस शिक्षा का सबसे प्रमुख उद्देश्य है उपयोगकर्ताओं को डिजिटल प्लेटफॉर्म पर सुरक्षित व्यवहार के लिए तैयार करना। जैसे –
 - मजबूत पासवर्ड का निर्माण और नियमित परिवर्तन
 - दो-स्तरीय प्रमाणीकरण (Two-Factor Authentication)
 - अनधिकृत वेबसाइटों और फर्जी लिंक से बचाव
 - साइबर फ्रॉड या ऑनलाइन ठगी की पहचान
2. डेटा गोपनीयता और व्यक्तिगत सूचना की सुरक्षा (To Protect Data Privacy and Personal Information) डिजिटल माध्यमों पर उपयोगकर्ता की पहचान, लोकेशन, बैंकिंग जानकारी और अन्य निजी डेटा निरंतर साझा होते रहते हैं। सुरक्षित सूचना उपयोग यह सिखाती है कि इस डेटा की सुरक्षा कैसे की जाए और कौन सी वेबसाइट या एप्लिकेशन सुरक्षित हैं।
3. डिजिटल नैतिकता का बोध (To Instill Digital Ethics) डिजिटल दुनिया में अभिव्यक्ति की स्वतंत्रता के साथ जिम्मेदारी भी जुड़ी है। यह शिक्षा व्यक्ति को सिखाती

है कि ऑनलाइन संवाद, टिप्पणी, या साझा की जाने वाली सूचना में सम्मान, सत्यता, और नैतिकता बनी रहे।

4. साइबर अपराधों से बचाव (To Prevent Cybercrimes) साइबर अपराध जैसे — हैकिंग, फिशिंग, साइबर बुलिंग, और ऑनलाइन उत्पीड़न — डिजिटल युग की प्रमुख समस्याएँ हैं। सुरक्षित सूचना उपयोग उपयोगकर्ताओं को इन अपराधों की पहचान करने और उनसे बचाव के व्यावहारिक उपाय सिखाती है।
5. सत्यापन और सूचना मूल्यांकन की क्षमता (To Develop Information Verification Skills) आज इंटरनेट पर असत्य और भ्रामक सूचनाओं की भरमार है। यह शिक्षा व्यक्ति को यह सिखाती है कि सूचना के स्रोत की प्रामाणिकता का मूल्यांकन कैसे करें, और गलत सूचना के प्रसार को कैसे रोकें।
6. डिजिटल नागरिकता का निर्माण (To Build Responsible Digital Citizenship) सुरक्षित सूचना उपयोग का दीर्घकालिक उद्देश्य है — एक ऐसे उत्तरदायी डिजिटल नागरिक (Responsible Digital Citizen) का निर्माण जो तकनीक का प्रयोग समाजहित में करे, न कि दुरुपयोग में। यह नागरिक अपने अधिकारों और कर्तव्यों दोनों को जानता है और डिजिटल समाज के नैतिक मानकों का पालन करता है।
7. संस्थागत और सामुदायिक सुरक्षा सुदृढ़ करना (To Strengthen Institutional and Community Safety) शैक्षणिक संस्थानों, पुस्तकालयों, और संगठनों में साइबर सुरक्षा संस्कृति (Cyber Safety Culture) विकसित करना। इससे न केवल व्यक्तिगत उपयोगकर्ता सुरक्षित होते हैं, बल्कि पूरा संस्थागत डेटा-सिस्टम भी सुरक्षित रहता है।
8. डिजिटल शिक्षा में समावेशिता (To Ensure Inclusivity in Digital Education) ग्रामीण या वंचित समुदायों तक डिजिटल सुरक्षा शिक्षा पहुँचाना ताकि हर वर्ग समान रूप से सुरक्षित डिजिटल अवसरों का उपयोग कर सके। सुरक्षित सूचना उपयोग एक बहुआयामी शैक्षिक पहल है, जो व्यक्ति को न केवल डिजिटल माध्यमों के उपयोग में

दक्ष बनाती है, बल्कि उसे सुरक्षित, नैतिक और जिम्मेदार उपयोगकर्ता के रूप में रूपांतरित करती है।

लाइब्रेरी और सूचना विज्ञान का सुरक्षित सूचना उपयोग के साथ संबंध

डिजिटल युग में जब सूचना का स्वरूप, माध्यम और प्रसार के तरीके पूरी तरह बदल गए हैं, तब लाइब्रेरी और सूचना विज्ञान (Library and Information Science – LIS) का क्षेत्र भी अपने पारंपरिक स्वरूप से आगे बढ़कर नई तकनीकी और सामाजिक भूमिकाएँ निभा रहा है। सूचना का यह नया युग केवल जानकारी के भंडारण तक सीमित नहीं है, बल्कि यह सूचना की सुरक्षा, विश्वसनीयता और नैतिकता से भी गहराई से जुड़ा हुआ है। इसी बिंदु पर सुरक्षित सूचना उपयोग और लाइब्रेरी एवं सूचना विज्ञान के बीच गहरा संबंध स्थापित होता है।

1. सूचना विज्ञान का मूल उद्देश्य और डिजिटल सुरक्षा-सूचना विज्ञान (Information Science) का प्रमुख उद्देश्य है सूचना का संग्रह, संगठन, पुनर्प्राप्ति, और उपयोगकर्ता तक उसका प्रभावी वितरण। परंतु सूचना तभी उपयोगी और विश्वसनीय बन सकती है जब वह सुरक्षित (Secure), सत्यापित (Verified), और नैतिक (Ethical) रूप में उपलब्ध हो। इसलिए डिजिटल युग में सूचना विज्ञान केवल सूचना तक पहुँचने की कला नहीं, बल्कि “सुरक्षित सूचना प्रबंधन” (Secure Information Management) की प्रक्रिया भी है।

सूचना विज्ञान की कई उप-अवधारणाएँ जैसे —

- Information Ethics (सूचना नैतिकता)
- Information Security (सूचना सुरक्षा)
- Digital Literacy (डिजिटल साक्षरता)
- Digital Preservation (डिजिटल संरक्षण)

ये सभी सीधे-सीधे सुरक्षित सूचना उपयोग से जुड़ी हुई हैं।

2. लाइब्रेरी एक डिजिटल सुरक्षा शिक्षण केंद्र (Library as a Center for Digital Safety Learning)-पुस्तकालय

सदैव से समाज का ज्ञान केंद्र रहा है। अब यह भूमिका डिजिटल माध्यमों में विस्तारित होकर "डिजिटल लर्निंग हब" के रूप में विकसित हो गई है। डिजिटल युग में पुस्तकालय न केवल सूचना के संग्रह और वितरण का स्थान है, बल्कि यह उपयोगकर्ताओं को सूचना के सुरक्षित उपयोग की शिक्षा देने वाला मंच भी बन गया है। उदाहरण के लिए: विश्वविद्यालय पुस्तकालयों में "Information Literacy Sessions" के अंतर्गत Cyber Safety Modules सम्मिलित किए जा रहे हैं। सार्वजनिक पुस्तकालयों में साइबर सुरक्षा सप्ताह, डेटा प्रोटेक्शन वर्कशॉप, और ऑनलाइन व्यवहार प्रशिक्षण जैसे कार्यक्रम आयोजित किए जाते हैं। डिजिटल पुस्तकालयों में यूजर के लिए सुरक्षा दिशा-निर्देश (User Security Guidelines) और साइबर सुरक्षा नीति (Cyber Policy) प्रदर्शित की जाती है। इस प्रकार पुस्तकालय एक ऐसी संस्था बन गई है जहाँ उपयोगकर्ता को सूचना की पहुँच के साथ सुरक्षा की समझ भी प्रदान की जाती है।

3. सूचना नैतिकता और डिजिटल आचारसंहिता (Information Ethics and Digital Conduct) लाइब्रेरी एंड इन्फॉर्मेशन साइंस का एक प्रमुख घटक है सूचना नैतिकता (Information Ethics) यह अवधारणा उपयोगकर्ताओं को यह सिखाती है कि —

- सूचना का उपयोग करते समय बौद्धिक संपदा अधिकारों (Intellectual Property Rights – IPR) का सम्मान कैसे करें,
- प्लेजियरिज़्म (Plagiarism) और कॉपीराइट उल्लंघन से कैसे बचें,
- डिजिटल स्पेस में जिम्मेदार संवाद कैसे करें।

सुरक्षित सूचना उपयोग भी इन्हीं नैतिक सिद्धांतों को व्यावहारिक रूप में लागू करने की प्रक्रिया है। इसलिए कहा जा सकता है कि — "सूचना नैतिकता सुरक्षित सूचना उपयोग की आत्मा है, और लाइब्रेरी उसका वाहक।"

4. सूचना सुरक्षा नीतियाँ और डिजिटल इंफ्रास्ट्रक्चर (Information Security Policies and Digital

Infrastructure) आज अधिकांश पुस्तकालय अपने संसाधनों को डिजिटल नेटवर्क पर उपलब्ध कराते हैं, जैसे ई-जर्नल्स, डेटाबेस, और रिपॉजिटरी। इन संसाधनों की सुरक्षा सुनिश्चित करने के लिए पुस्तकालयों को सूचना सुरक्षा नीतियाँ (Information Security Policies) अपनानी पड़ती हैं —

- उपयोगकर्ता प्रमाणीकरण (User Authentication)
- डेटा एन्क्रिप्शन (Data Encryption)
- एक्सेस कंट्रोल सिस्टम (Access Control Systems)
- नियमित डेटा बैकअप और सर्वर सुरक्षा

ये सभी उपाय सुरक्षित सूचना उपयोग के व्यावहारिक आयाम हैं, जिनके माध्यम से पुस्तकालय अपने उपयोगकर्ताओं और संसाधनों दोनों को सुरक्षित रखता है।

5. सूचना संगठन और विश्वसनीयता (Information Organization and Reliability) सूचना विज्ञान का एक प्रमुख पहलू है सूचना का वर्गीकरण, सूचीकरण, और प्रामाणिक स्रोतों का चयन। डिजिटल युग में जहाँ गलत सूचना (Misinformation) और दुष्प्रचार (Disinformation) व्यापक रूप से फैल रहे हैं, वहाँ सूचना पेशेवरों की भूमिका बहुत महत्वपूर्ण हो जाती है। वे उपयोगकर्ताओं को यह सिखाते हैं कि —

- सूचना का स्रोत कैसे पहचाना जाए,
- किस वेबसाइट या प्लेटफॉर्म की विश्वसनीयता अधिक है,
- किस सूचना को साझा करना उचित है या नहीं।

6. प्रशिक्षण और जन-जागरूकता कार्यक्रम (Training and Public Awareness Programs) लाइब्रेरी और सूचना विज्ञान का एक महत्वपूर्ण क्षेत्र है "User Education" — अर्थात् उपयोगकर्ताओं को सूचना स्रोतों के प्रभावी उपयोग का प्रशिक्षण देना। इसी ढाँचे के अंतर्गत अब सुरक्षित सूचना उपयोग को भी शामिल किया जा रहा है।

- स्कूल और कॉलेज लाइब्रेरी में Cyber Awareness Modules
- सार्वजनिक पुस्तकालयों में Cyber Safety Week

- विश्वविद्यालय स्तर पर Information Security Certificate Courses

ये सभी पहलें यह दर्शाती हैं कि सूचना विज्ञान अब समाज में सुरक्षित डिजिटल व्यवहार के प्रचार में सक्रिय भूमिका निभा रहा है।

- वैश्विक पहल और नीति समर्थन (Global Initiatives and Policy Support)

विश्व स्तर पर अनेक संगठनों ने डिजिटल सेफ्टी और लाइब्रेरी सेवाओं के बीच संबंध को औपचारिक रूप दिया है —

- IFLA (International Federation of Library Associations and Institutions) ने "Internet Manifesto Guidelines" जारी किए हैं, जिनमें डिजिटल स्वतंत्रता और सुरक्षा को संतुलित करने की बात कही गई है।
 - UNESCO की "Information for All Programme (IFAP)" डिजिटल साक्षरता और सुरक्षा को एक समान प्राथमिकता देता है।
 - OECD और UNICEF जैसे संगठनों ने भी "Digital Safety and Children" पर विशेष दिशानिर्देश प्रकाशित किए हैं, जिन्हें लाइब्रेरी प्रशिक्षण मॉड्यूल में शामिल किया जा सकता है।
- समन्वयात्मक दृष्टिकोण (Integrative Perspective) इस प्रकार देखा जाए तो लाइब्रेरी और सूचना विज्ञान (LIS) सुरक्षित सूचना उपयोग का एक समन्वयकारी मंच (Integrative Platform) बन चुका है, जहाँ —

सूचना का सुरक्षित प्रवाह सुनिश्चित किया जाता है,

उपयोगकर्ताओं को साइबर नैतिकता सिखाई जाती है,

और समाज को सुरक्षित डिजिटल नागरिकता की दिशा में आगे बढ़ाया जाता है।

अतः कहा जा सकता है कि — "सुरक्षित सूचना उपयोग की व्यावहारिक भूमि, लाइब्रेरी और सूचना विज्ञान की प्रयोगशाला में ही तैयार होती है।"

सुरक्षित सूचना उपयोग में लाइब्रेरी की भूमिका

आज का युग डिजिटल तकनीक का युग है — जहाँ सूचना का प्रवाह तीव्र, व्यापक और सीमाहीन हो चुका है। इंटरनेट, सोशल मीडिया, ई-लर्निंग प्लेटफॉर्म, और डिजिटल डिवाइस ने मानव जीवन को अभूतपूर्व गति प्रदान की है। लेकिन इसी के साथ साइबर अपराध, डेटा चोरी, ऑनलाइन ठगी, डिजिटल व्यसन (Addiction), और फेक न्यूज़ जैसी चुनौतियाँ भी तेजी से बढ़ी हैं। ऐसे समय में "डिजिटल सेफ्टी एजुकेशन" की आवश्यकता हर वर्ग के नागरिक के लिए अत्यंत अनिवार्य बन गई है।

इस दिशा में पुस्तकालय (Library) की भूमिका अत्यंत महत्वपूर्ण और बहुआयामी है, क्योंकि पुस्तकालय समाज का वह संस्थान है जो न केवल ज्ञान और सूचना का स्रोत है, बल्कि **सुरक्षित सूचना व्यवहार** का प्रशिक्षण केंद्र भी बन सकता है।

- डिजिटल साक्षरता और साइबर जागरूकता में पुस्तकालय की भूमिका-पुस्तकालय अब केवल पुस्तकों का भंडार नहीं रहा, बल्कि यह डिजिटल संसाधनों, ई-पुस्तकों, ऑनलाइन डेटाबेस, और ई-लर्निंग सामग्री का केंद्र बन चुका है। इस परिवर्तन के साथ ही पुस्तकालयों ने उपयोगकर्ताओं को डिजिटल माध्यमों का सुरक्षित उपयोग सिखाने की जिम्मेदारी भी संभाली है।

मुख्य भूमिकाएँ:

- उपयोगकर्ताओं को सुरक्षित पासवर्ड बनाना,
- साइबर फ़िशिंग से बचाव के उपाय,
- सुरक्षित ब्राउज़िंग आदतें विकसित करना,
- सोशल मीडिया पर निजता (Privacy) की रक्षा,
- ऑनलाइन डेटा के जिम्मेदार उपयोग की शिक्षा देना।

उदाहरण: राष्ट्रीय पुस्तकालय (National Library of India) तथा विश्वविद्यालय पुस्तकालयों में अब "Digital Literacy & Cyber Safety" पर नियमित कार्यशालाएँ आयोजित की जाती हैं, जिनमें विद्यार्थियों को ऑनलाइन सुरक्षा के व्यावहारिक कौशल सिखाए जाते हैं।

2. सूचना नैतिकता का प्रचार (Promotion of Information Ethics)- डिजिटल सेफ्टी केवल तकनीकी पहलू नहीं है, बल्कि यह नैतिक आचरण का भी विषय है।

पुस्तकालय उपयोगकर्ताओं को यह सिखाते हैं कि —

- किसी स्रोत की जानकारी साझा करने से पहले उसकी सत्यता जांचना,
 - कॉपीराइट और बौद्धिक संपदा अधिकारों (Intellectual Property Rights) का सम्मान करना,
 - ऑनलाइन किसी की पहचान या सामग्री का दुरुपयोग न करना,
 - डिजिटल प्लेटफॉर्म पर सभ्य संवाद बनाए रखना।
3. सूचना का सत्यापन और फेक न्यूज़ से बचाव-डिजिटल माध्यमों में गलत सूचना (Misinformation) और भ्रामक समाचार (Disinformation) समाज के लिए गंभीर चुनौती हैं। पुस्तकालय अपने उपयोगकर्ताओं को सिखाते हैं कि —
- सूचना स्रोतों की प्रामाणिकता कैसे जांचें,
 - विश्वसनीय डेटाबेस और जर्नल्स तक कैसे पहुँचा जाए,
 - और फेक न्यूज़ को पहचानने के लिए कौन-कौन से उपकरण उपलब्ध हैं।

कई सार्वजनिक पुस्तकालयों ने "Fact-checking Corners" या "Media Literacy Desks" की स्थापना की है जहाँ उपयोगकर्ता जानकारी के सत्यापन के लिए प्रशिक्षित किए जाते हैं।

4. प्रशिक्षण कार्यक्रम और कार्यशालाएँ (Training and Workshops)-पुस्तकालय विभिन्न आयु वर्गों और समूहों के लिए डिजिटल सेफ्टी पर विशेष कार्यक्रम आयोजित कर सकते हैं —

लक्षित समूह	प्रशिक्षण का विषय	उद्देश्य
विद्यार्थी	सुरक्षित सोशल मीडिया उपयोग, डेटा प्रोटेक्शन	साइबर नैतिकता विकसित करना

शिक्षक	साइबर सुरक्षा नीति और डिजिटल शिक्षण उपकरण	ऑनलाइन शिक्षण में सुरक्षा सुनिश्चित करना
सामान्य नागरिक	ऑनलाइन बैंकिंग सुरक्षा, मोबाइल डेटा सुरक्षा	साइबर अपराध से बचाव
वरिष्ठ नागरिक	फर्जी कॉल, ईमेल ठगी, डिजिटल भुगतान सुरक्षा	जागरूक नागरिक बनाना

इन गतिविधियों से पुस्तकालय एक डिजिटल सेफ्टी प्रशिक्षण केंद्र (Digital Safety Training Hub) बन जाता है।

5. सूचना संसाधनों की सुरक्षा (Protection of Library Data and Resources)-डिजिटल पुस्तकालयों में उपयोगकर्ता डेटा, ई-संसाधन और सदस्यता आधारित डेटाबेस संग्रहित रहते हैं।

इसलिए पुस्तकालय स्वयं भी साइबर सुरक्षा प्रोटोकॉल अपनाते हैं —

- User Authentication Systems
- Firewall & Antivirus Protection
- Data Backup and Encryption Policies
- Restricted Access Servers

6. सहयोग और साझेदारी (Collaboration and Partnerships)-सुरक्षित सूचना उपयोग के प्रचार हेतु पुस्तकालय विभिन्न संस्थानों से साझेदारी कर सकते हैं —

- National Cyber Security Centre (NCSC)
- Ministry of Electronics and IT (MeitY)
- NIELIT, CDAC, NCERT, और UNESCO

जैसे संस्थान के सहयोग से साइबर सुरक्षा पर जागरूकता अभियान चलाए जा सकते हैं।

7. बच्चों और युवाओं में डिजिटल सुरक्षा शिक्षा (Digital Safety Education for Children and Youth)-बाल

और किशोर वर्ग डिजिटल दुनिया के सबसे सक्रिय उपयोगकर्ता हैं, लेकिन वे साइबर अपराधों के प्रति सबसे अधिक संवेदनशील भी हैं। इसलिए पुस्तकालयों में बच्चों और युवाओं के लिए विशेष Cyber Safety Education Modules तैयार किए जा सकते हैं —

- “Safe Internet for Kids”
- “Think Before You Click”
- “Cyber Bullying Awareness”

जैसे कार्यक्रमों के माध्यम से बच्चों को जिम्मेदार डिजिटल नागरिक बनने की प्रेरणा दी जा सकती है।

8. डिजिटल समावेशन और सुरक्षित पहुँच (Digital Inclusion with Safety)-भारत जैसे विविध समाज में कई ग्रामीण और आदिवासी क्षेत्रों में डिजिटल पहुँच सीमित है। पुस्तकालय इन समुदायों को डिजिटल साक्षरता और सुरक्षा दोनों का प्रशिक्षण देकर डिजिटल समावेशन (Digital Inclusion) सुनिश्चित करते हैं। इससे ग्रामीण और वंचित समुदाय सुरक्षित रूप से सरकारी पोर्टल, ऑनलाइन सेवाएँ और ई-शिक्षा प्लेटफॉर्म का उपयोग कर पाते हैं।
9. अनुसंधान और नीतिगत समर्थन (Research and Policy Support)-विश्वविद्यालय और विशेष पुस्तकालय साइबर सुरक्षा एवं डिजिटल व्यवहार से संबंधित अनुसंधान का समर्थन करते हैं। वे नीतिगत सुझाव (Policy Recommendations) तैयार कर सरकारों और संगठनों को प्रस्तुत कर सकते हैं ताकि डिजिटल सुरक्षा को राष्ट्रीय शिक्षा नीति में शामिल किया जा सके।
10. सामाजिक पुनर्निर्माण में भूमिका-डिजिटल सुरक्षा केवल तकनीकी विषय नहीं, बल्कि यह सामाजिक पुनर्चना (Social Reconstruction) का भी माध्यम है। जब समाज के नागरिक सुरक्षित रूप से डिजिटल साधनों का उपयोग करना सीखते हैं, तो —
 - ऑनलाइन ठगी घटती है,
 - फेक न्यूज़ का प्रभाव कम होता है,
 - डिजिटल भरोसा (Digital Trust) बढ़ता है।

इस तरह पुस्तकालय न केवल जानकारी का स्रोत बनता है, बल्कि सुरक्षित डिजिटल समाज के निर्माण का माध्यम भी बन जाता है।

लाइब्रेरी और सूचना विज्ञान के क्षेत्र में सुरक्षित सूचना उपयोग: केस स्टडी विश्लेषण

सूचना का डिजिटलकरण 21वीं सदी की सबसे बड़ी उपलब्धियों में से एक है। आज पुस्तकालय केवल ज्ञान-संग्रह का केंद्र नहीं, बल्कि सूचना, संचार और तकनीक के संगमस्थल बन चुके हैं। डिजिटल माध्यमों के प्रयोग से ज्ञान-साझेदारी की गति बढ़ी है, लेकिन इसके साथ ही **सूचना सुरक्षा (Information Security)** और सुरक्षित सूचना उपयोग की चुनौतियाँ भी सामने आई हैं।

इस परिप्रेक्ष्य में, **लाइब्रेरी एंड इंफॉर्मेशन साइंस (LIS)** का क्षेत्र अब “सुरक्षित सूचना प्रबंधन” (Secure Information Management) की दिशा में अग्रसर है।

सुरक्षित सूचना उपयोग केवल तकनीकी सुरक्षा का प्रश्न नहीं, बल्कि यह उपयोगकर्ताओं के **डिजिटल व्यवहार, डेटा गोपनीयता, साइबर नैतिकता और साइबर साक्षरता** का भी विषय है।

1. राष्ट्रीय डिजिटल पुस्तकालय (National Digital Library of India – IIT Kharagpur)

मुख्य उद्देश्य: देशभर के विद्यार्थियों को सुरक्षित रूप से ई-लर्निंग संसाधनों तक पहुँच प्रदान करना।

सुरक्षा उपाय:

- उपयोगकर्ता लॉगिन हेतु एनक्रिप्टेड प्रोटोकॉल (SSL) का प्रयोग।
- डेटा ट्रांसफर के दौरान सुरक्षा सुनिश्चित करने हेतु दो-स्तरीय प्रमाणीकरण (Two-Factor Authentication)।
- उपयोगकर्ताओं को “**Safe Browsing Guide**” प्रदान की जाती है, जिससे वे विश्वसनीय स्रोतों का ही उपयोग करें।

परिणाम:

- छात्रों और शोधार्थियों में सुरक्षित डिजिटल व्यवहार विकसित हुआ।
- लाइब्रेरियन ने डिजिटल साक्षरता कार्यशालाओं के माध्यम से डेटा सुरक्षा पर व्यावहारिक प्रशिक्षण दिया।

2. यूनेस्को-आईएफएलए “मीडिया एंड इंफॉर्मेशन लिटरेसी (MIL)” प्रोग्राम - यह वैश्विक पहल पुस्तकालयों को “Digital Safety Hub” के रूप में विकसित करने के लिए शुरू की गई।

प्रक्रिया:

- विश्वभर के लाइब्रेरियन को डिजिटल सेफ्टी और साइबर एथिक्स में प्रशिक्षित किया गया।
 - पुस्तकालयों में “Digital Safety Corner” बनाए गए, जहाँ उपयोगकर्ताओं को सुरक्षित सूचना उपयोग के संसाधन उपलब्ध कराए जाते हैं।
- प्रभाव:**सार्वजनिक और शैक्षणिक पुस्तकालयों ने MIL नीति के माध्यम से डिजिटल नागरिकता (Digital Citizenship) को बढ़ावा दिया।

3. INFLIBNET (Information and Library Network Centre)

भारत में लाइब्रेरी और सूचना विज्ञान के क्षेत्र में डिजिटल सुरक्षा (Digital Safety) सुनिश्चित करने के लिए अत्यंत महत्वपूर्ण भूमिका निभा रहा है। INFLIBNET (Information and Library Network Centre) की स्थापना 1991 में UGC (University Grants Commission) के अधीन एक स्वायत्त इंटर-यूनिवर्सिटी केंद्र के रूप में हुई थी। इसका मुख्य उद्देश्य भारतीय विश्वविद्यालयों और शैक्षणिक संस्थानों को एकीकृत सूचना नेटवर्क से जोड़ना और डिजिटल सूचना संसाधनों की सुरक्षा एवं पहुँच सुनिश्चित करना है। आज के युग में जब सूचना का डिजिटलीकरण तेज़ी से बढ़ रहा है, INFLIBNET न केवल ज्ञान के प्रसार का केंद्र है, बल्कि डिजिटल डेटा की सुरक्षा (Data Security) और साइबर सेफ्टी के लिए भी सक्रिय रूप से कार्यरत है।

सुरक्षित सूचना उपयोग में INFLIBNET की भूमिका

सुरक्षित सूचना उपयोग प्लेटफॉर्म का विकास-INFLIBNET ने विभिन्न डिजिटल प्लेटफॉर्म जैसे -Shodhganga, Shodhgangotri, e-ShodhSindhu, और VIDWAN तैयार किए हैं, जिनमें उच्चस्तरीय सुरक्षा प्रोटोकॉल लागू किए गए हैं।

- ये प्लेटफॉर्म HTTPS (Secure Hypertext Transfer Protocol) पर चलते हैं।
- डेटा को सर्वर पर एन्क्रिप्टेड (Encrypted) रूप में संग्रहित किया जाता है।
- उपयोगकर्ताओं की पहचान (Authentication) और पासवर्ड सुरक्षा (Password Protection) प्रणाली अपनाई जाती है।

डेटा अखंडता और गोपनीयता (Data Integrity and Privacy)

- INFLIBNET का सर्वर NIC (National Informatics Centre) के सुरक्षित नेटवर्क से जुड़ा है।
- इसमें नियमित बैकअप, फायरवॉल, और एंटी-मैलवेयर सुरक्षा प्रणालियाँ सक्रिय रहती हैं।
- उपयोगकर्ताओं की व्यक्तिगत जानकारी गोपनीय रखी जाती है, जिससे किसी प्रकार की सूचना-लीक की संभावना न हो।

ओपन एक्सेस और सुरक्षित वितरण (Secure Open Access)

- INFLIBNET के प्लेटफॉर्म ओपन एक्सेस पॉलिसी के अंतर्गत हैं, लेकिन यह सुनिश्चित किया जाता है कि किसी भी डॉक्यूमेंट का दुरुपयोग न हो।
- सभी थेसिस/डिसर्टेशन PDF फॉर्मेट में डिजिटल वॉटरमार्क (Digital Watermark) के साथ अपलोड किए जाते हैं।
- यह वॉटरमार्क “Shodhganga@INFLIBNET” के रूप में दस्तावेज़ की मौलिकता सुनिश्चित करता है।

साइबर सुरक्षा नीतियाँ (Cyber Security Policies)

- INFLIBNET में साइबर अटैक या अनधिकृत एक्सेस से बचाव के लिए विशेष Information Security Management Policy लागू है।
- सर्वर लॉग्स की नियमित मॉनिटरिंग होती है।
- कर्मचारियों और शोधकर्ताओं को साइबर सेफ्टी पर समय-समय पर प्रशिक्षण दिया जाता है।

डिजिटल साक्षरता और सुरक्षा प्रशिक्षण

INFLIBNET समय-समय पर Training Workshops और Webinars आयोजित करता है जैसे:

- "Cyber Security in Digital Libraries"*
- "Safe Access to Open Educational Resources"*

इन कार्यक्रमों के माध्यम से शोधार्थियों, पुस्तकालयाध्यक्षों और IT स्टाफ को डेटा सुरक्षा, साइबर सेफ्टी और डिजिटल हाइजीन के बारे में जागरूक किया जाता है।

भविष्य की दिशा

INFLIBNET भविष्य में AI-Based Security Monitoring, Blockchain for Research Authentication, और Federated Access System को अपनाने की योजना बना रहा है ताकि डिजिटल सामग्री और शोध डेटा की सुरक्षा और विश्वसनीयता और भी मजबूत हो सके।

निष्कर्ष (Conclusion)

वर्तमान युग सूचना और संचार प्रौद्योगिकी का युग है, जहाँ ज्ञान और सूचना की पहुँच सर्वसुलभ हो चुकी है। किंतु इस तीव्र डिजिटल विस्तार ने एक नया संकट भी उत्पन्न किया है — साइबर अपराध, डेटा चोरी, फेक न्यूज, और ऑनलाइन ठगी जैसी समस्याएँ अब समाज के हर स्तर तक पहुँच चुकी हैं। ऐसे परिवेश में केवल डिजिटल साक्षरता पर्याप्त नहीं रह गई है; बल्कि आवश्यक है कि उपयोगकर्ता डिजिटल प्लेटफॉर्म पर अपने व्यवहार, सूचना उपयोग

और साझा करने के तरीके को लेकर सजग एवं जिम्मेदार बनें। यही सजगता सुरक्षित सूचना उपयोग का मूल आधार है। इस दिशा में पुस्तकालय और सूचना विज्ञान का योगदान अत्यंत महत्वपूर्ण और दूरगामी है। पारंपरिक रूप से पुस्तकालय ज्ञान, सूचना और शिक्षा के केंद्र रहे हैं, परंतु अब वे डिजिटल युग में सुरक्षा, गोपनीयता और नैतिकता के संरक्षक के रूप में विकसित हो रहे हैं। आधुनिक पुस्तकालय केवल पुस्तकों का भंडार नहीं, बल्कि डिजिटल शिक्षण और सुरक्षा प्रशिक्षण के सक्रिय मंच बन चुके हैं। यहाँ लाइब्रेरियन अब मात्र सूचना प्रदाता नहीं, बल्कि उपयोगकर्ताओं के डिजिटल मार्गदर्शक, सलाहकार और संरक्षक की भूमिका निभा रहे हैं।

सुरक्षित सूचना उपयोग के प्रसार में लाइब्रेरियों ने कई महत्वपूर्ण पहल की हैं। उन्होंने उपयोगकर्ताओं को सुरक्षित इंटरनेट उपयोग, डेटा सुरक्षा, ऑनलाइन ठगी से बचाव, पासवर्ड प्रबंधन, तथा डिजिटल गोपनीयता जैसे विषयों पर प्रशिक्षण प्रदान किया है। इन प्रयासों से न केवल साइबर जागरूकता बढ़ी है, बल्कि समाज में जिम्मेदार डिजिटल नागरिकता का विकास भी हुआ है। ग्रामीण और शहरी समुदायों में आयोजित विभिन्न डिजिटल सेफ्टी वर्कशॉप्स ने यह सिद्ध किया है कि पुस्तकालय ज्ञान के साथ-साथ सुरक्षा का भी माध्यम बन सकते हैं। विश्वविद्यालयों और विद्यालयों की लाइब्रेरियों ने छात्रों और शोधार्थियों को डिजिटल नैतिकता, कॉपीराइट, और डेटा प्रोटेक्शन के प्रति जागरूक किया है। सूचना विज्ञान के विशेषज्ञों ने डिजिटल सुरक्षा पर आधारित नीतियाँ, दिशा-निर्देश और शैक्षणिक मॉड्यूल तैयार किए हैं, जिससे सुरक्षित सूचना संस्कृति की स्थापना संभव हो रही है। इस प्रकार, लाइब्रेरी एंड इंफॉर्मेशन साइंस अब केवल सूचना प्रबंधन का क्षेत्र नहीं रहा, बल्कि सुरक्षित सूचना समाज के निर्माण का माध्यम बन गया है। भविष्य में यह अपेक्षित है कि पुस्तकालय साइबर सुरक्षा प्रशिक्षण केंद्रों के रूप में और अधिक विकसित हों तथा कृत्रिम बुद्धिमत्ता (AI) आधारित सुरक्षा उपकरणों का उपयोग कर डिजिटल संसाधनों की सुरक्षा सुनिश्चित करें। इसके अतिरिक्त, डिजिटल नागरिकता को शैक्षिक पाठ्यक्रमों और सामुदायिक गतिविधियों का अनिवार्य अंग बनाना भी आवश्यक है, ताकि प्रत्येक नागरिक सुरक्षित रूप से सूचना समाज का भागीदार बन सके। अंततः कहा जा सकता है कि डिजिटल सुरक्षा केवल तकनीकी विषय नहीं, बल्कि सामाजिक जिम्मेदारी का प्रश्न है।

पुस्तकालय और सूचना विज्ञान इस जिम्मेदारी के निर्वाह में सेतु का कार्य कर रहे हैं। वे समाज को यह सिखा रहे हैं कि सूचना की शक्ति तभी सार्थक है जब उसका उपयोग सुरक्षित, नैतिक और संवेदनशील ढंग से किया जाए। अतः पुस्तकालय आज केवल ज्ञान के केंद्र नहीं, बल्कि एक सुरक्षित, सचेत और जिम्मेदार डिजिटल समाज के निर्माण के आधारस्तंभ बन चुके हैं।

REFERENCES

- Government of India. (2023). Digital India Programme: Transforming India into a digitally empowered society. Ministry of Electronics & Information Technology.
- National Digital Library of India. (2024). About the NDL Project. Indian Institute of Technology Kharagpur.
- UNESCO. (2021). Media and Information Literacy: Policy and strategy guidelines. United Nations Educational, Scientific and Cultural Organization.
- International Federation of Library Associations and Institutions (IFLA). (2022). Guidelines on information literacy and lifelong learning. IFLA Publications.
- Bhattacharjee, S., & Roy, S. (2020). Digital literacy and cyber safety awareness among students: Role of academic libraries. *Library Philosophy and Practice*, 1–14.
- Ghosh, M. (2021). Libraries as digital literacy hubs: Challenges and opportunities in the Indian context. *DESIDOC Journal of Library & Information Technology*, 41(4), 251–258.
- Ministry of Education, Government of India. (2020). National Education Policy 2020.
- Tewari, R., & Mishra, N. (2023). Cyber safety and awareness initiatives in Indian public libraries: A case study approach. *Annals of Library and Information Studies*, 70(2), 97–106.
- Chatterjee, S., & Sharma, P. (2019). The role of libraries in promoting information security and digital safety education. *International Journal of Library and Information Studies*, 9(3), 45–52.
- National Council of Educational Research and Training (NCERT). (2022). Cyber safety and responsible use of digital technology. Department of Educational Technology, NCERT.
- Pradhan, D., & Behera, S. (2022). Information ethics and digital safety in libraries: Emerging trends and practices. *Library Herald*, 60(1), 22–34.
- UNESCO & IFLA. (2023). Libraries advancing media and information literacy for digital citizenship. UNESCO-IFLA Joint Report.
- Singh, J. (2021). Digital literacy and information ethics: A framework for modern librarianship. *Indian Journal of Information Sources and Services*, 11(2), 44–53.

भाषा संप्रेषण और प्रेरक डिजिटल कथन में दिनकर की रचनाओं का महत्व

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भाषा मनुष्य की अभिव्यक्ति का माध्यम ही नहीं अपितु विचारों, भावनाओं और मूल्यों के आदान-प्रदान का एक सशक्त माध्यम है। जिसके द्वारा व्यक्ति अपने आंतरिक भावनाओं को अभिव्यक्त करता है। साहित्य के क्षेत्र में व्यक्ति साहित्य की विविध विधाओं का प्रयोग कर भी अपने विचारों को अभिव्यक्त करता था। संप्रेषण की प्रभावशीलता तभी संभव है जब भाषा में स्पष्ट भावात्मकता और उद्देश्य का समन्वय हो। आज के डिजिटल युग में संप्रेषण के साधन कई तरह के हो गए हैं शब्द अब केवल पुस्तकों में सीमित न रहकर मोबाइल स्क्रीन, वीडियो, पॉडकास्ट, कंप्यूटर, टेलीविजन और सोशल मीडिया के माध्यम से जीवंत हो उठे हैं। ऐसे समय में भाषा की प्रेरक शक्ति को बनाए रखना अत्यंत आवश्यक हो गया है। प्रेरक डिजिटल कहानी का प्रमुख उद्देश्य श्रोता और दर्शक को किसी सकारात्मक दिशा में प्रेषित करना है। यह केवल कहानी कहने की कला नहीं बल्कि भावनाओं को तकनीक के माध्यम से जनमानस तक पहुंचाने की एक प्रक्रिया है, इसमें वह कथा प्रभावित होती है जिसमें शब्दों में ऊर्जा विचारों में स्पष्ट और संदेह में मूल्य बोध हो। आज इंस्टाग्राम, पॉडकास्ट या ब्लॉग, यूट्यूब पर ऐसी प्रेरक कहानियां वह रचनाएं लोकप्रिय हैं जो व्यक्ति को राष्ट्रभक्ति स्वाभिमान परिश्रम और जीवन के मानवीय मूल्य के लिए प्रेरित करती हैं।

डिजिटल कथावाचन में भाषा, दृश्य, ध्वनि और भावात्मक भावों के संयोजन से विचारों को व्यापक रूप में प्रसारित किया जा सकता है। रामधारी सिंह दिनकर की रचनाएं आज भी जनमानस में प्रासंगिक हैं दिनकर की रचनाओं में ओज, राष्ट्रभक्ति और आत्म गौरव की भावना भरी हुई है। परशुराम की प्रतीक्षा में न्याय का आवाहन, रश्मिरथी में कर्म और धर्म का संतुलन तथा हुंकार जैसी रचनाओं में जनशक्ति का स्वर आज भी युवाओं के मन को जागृत वी प्रेषित करने की क्षमता रखती है दिनकर की उक्त पंक्तियां -

ले अँगड़ाई उठ, हिले धरा,
कर निज विराट् स्वर में निनाद,
तू शैल-राट हुंकार भरे,

फट जाय कुहा, भागे प्रमाद
तू मौन त्याग, कर सिंहनाद,
रे तपी! आज तप का न काल,
नवयुग-शंख-ध्वनि जगा रही,
तू जाग-जाग मेरे विशाल!

रामधारी सिंह दिनकर जी ने अपनी काव्य रचनाओं के माध्यम से भाषा को एक जीवंतता और प्रभावशीलता के साथ प्रस्तुत किया है। जो आज के डिजिटल युग में प्रेरक डिजिटल कहानी कथन के रूप में फिर से एक बार प्रासंगिक हो गया है। दिनकर जी की भाषा में ओज, तेज, राष्ट्र भावना और राष्ट्र जागरण का संगम दिखाई देता है जो आधुनिक डिजिटल के दौर में प्रभावी संप्रेषण के लिए प्रेरणा का स्रोत बन सकता है। इन विभिन्न डिजिटलों के माध्यम जैसे एनीमेशन, पॉडकास्ट, वीडियो, नरेशन या सोशल मीडिया अभियानों में रूपांतरित कर नई पीढ़ी तक पहुंचाया जा सकता है। दिनकर की भाषा में ओज के स्वर, राष्ट्र भावना और राष्ट्र जागरण का संगम दिखाई देता है जो आधुनिक डिजिटल मंचों पर प्रभावी संप्रेषण के लिए प्रेरणा का स्रोत बन सकता है।

इस दृष्टि से दिनकर की रचनाएं जैसे सिंहासन खाली करो कि जनता आती है, रश्मिरथी, कुरुक्षेत्र, हुंकार, परशुराम की प्रतीक्षा जैसी प्रभावशाली रचनाएं डिजिटल मीडिया के माध्यम से जन जागरण और प्रेरणा के उत्कृष्ट उदाहरण बन सकती हैं। दिनकर की काव्य रचना को वीडियो नरेशन, वायरस ओवर या एनीमेटेड शॉर्ट में प्रस्तुत किया जा सकता है। सिंहासन खाली करो कि जनता आती है दिनकर की काव्य रचना की इस पंक्ति ने पूरे राष्ट्रीय स्वतंत्रता आंदोलन में वीर सेनानियों के लिए एक नर और एक संचार का माध्यम बनाकर कार्य किया। दिनकर की यह पंक्तियां केवल काव्य नहीं बल्कि राजनीतिक एवं सामाजिक जागरण का एक सशक्त संप्रेषण है। दिनकर की रचनाओं की पंक्तियां स्पोकन वर्ड, पोएट्री और डिजिटल आर्ट में प्रयोग होकर युवा वर्ग में जोश और जागृति भरते हैं।

दिनकर की रचनाएं हमें सिखाती है की भाषा केवल शब्दों का खेल नहीं बल्कि मानवता, नैतिकता एवं सत्य के प्रचार-प्रसार का एक माध्यम है। डिजिटल संप्रेषण में जहां सूचना की गति तीव्र होती है वहां संवेदना और नैतिकता का संतुलन बनाए रखना अत्यंत आवश्यक है। दिनकर की रचनाएं इस संतुलन का उदाहरण है। उनके विचारों में संघर्ष है परंतु वह हिंसा नहीं, उनकी प्रेरणा में क्रांति है किंतु उसमें विनाश नहीं, उनकी भाषा में ओज है परंतु वह आक्रामक नहीं है। यही संतुलन डिजिटल युग के प्रेरक कथन के लिए अत्यंत उपयोगी है।

परशुराम के प्रतीक्षा जैसी ओजपूर्ण रचनाओं के उदाहरण को प्रेरक रील में रूपांतरित किया जा सकता है। सीना तन जाए जब देश पुकारे, जैसे भावों को प्रेरक संगीत व कहानी के साथ जोड़ प्रस्तुत किया जा सकता है। इससे न केवल भाषा का ओज बना रहेगा बल्कि जनमानस और युवा वर्ग में राष्ट्रभक्ति, आत्मबल और कर्मनिष्ठा का संचार भी होगा जो उन्हें देश के लिए मर मिटने को सदैव प्रेरित करता रहेगा। दिनकर की काव्य रचना सिंहासन खाली करो कि जनता आती है को वीडियो नरेशन वायरस और या एनीमेटेड शॉर्ट्स में प्रस्तुत किया जा सकता है परशुराम की प्रतीक्षा जैसी भोजपुरी रचनाओं के उदाहरणों को प्रेरक रेल मोटिवेशनल रेल में रूपांतरित कर प्रस्तुत किया जा सकता है।

अतः उपयुक्त निष्कर्ष के रूप में यह कहा जा सकता है कि दिनकर की भाषा और संप्रेषण के एक ऐसे आदर्श उदाहरण है जो डिजिटल युग के प्रेरक कथा शिल्प को सशक्त शक्तिशाली दिशा प्रदान करती है। उनकी आवाज आज भी वही ओज जोश उत्साह और प्रेरणा देती है जो किसी भी युग में मानवता को ऊंचाइयों तक पहुंचा सकती है। इन विभिन्न डिजिटल कहानी कथन के माध्यमों से दिनकर की वाणी आज भी जनमानस व युवाओं तक सरल डिजिटल भाषा में पहुंचेगी और उन्हें कम साहस और राष्ट्र प्रेम के लिए सदैव प्रेरित और अग्रेषित करती रहेगी। इस प्रकार दिनकर की काव्य शक्ति आज के डिजिटल युग के संप्रेषण को और भी अधिक रोचक प्रभावशाली प्रेरक वह जन्म तो जन्मों मुख बनती है।

आज के आधुनिक युग में जब दुनिया डिजिटल हो चुकी है तो दिनकर की वाणी और भी जरूरी हो गई है अब उनकी रचनाएं केवल पुस्तकों तक ही सीमित न रहकर हर स्क्रीन हर आवाज में हर उसे दिल में जीवित है जो प्रेरित होना चाहता है जो राष्ट्र के लिए

मर मिटना चाहता है। आज की युवा पीढ़ी को जागृत करने हेतु एक सशक्त माध्यम के रूप में डिजिटल तकनीक का प्रयोग कर उन्हें प्रेरित किया जा सकता है।

दिनकर की वाणी केवल अतीत ही नहीं वह हर युग की ऊर्जा है उनकी कविता अब केवल पढ़ी नहीं जाती वह सुनी जाती है, देखी जाती है और महसूस कर प्रेषित की जाती है। आज दिनकर किताबों के पन्नों में नहीं बल्कि हर स्क्रीन पर जीवित है उनकी पंक्तियां मीम बनती है उनकी रचनाओं पर रील बनाई जाती है। जो लोगों के दिलों में प्रेरणा जगती है। यह पंक्तियां आज के डिजिटल युग में भी हर युवा को प्रेरित करती है न हो ना निराश, करो मन को, कुछ काम करो कुछ काम करो, मेहनत करो रचनात्मक बनो। और दुनिया को अपनी रोशनी दिखाओ।

दिनकर की साहित्यिक रचनाएं कालजयी हैं। उन्होंने भाषा को केवल अभिव्यक्ति का साधन ही नहीं बल्कि परिवर्तन का औजार बनाया। जो आधुनिक युग के लिए भी अत्यंत उपयोगी है। उनकी कविताओं ने स्वतंत्रता आंदोलन के समय जनभावनाओं को दिशा दी और आज डिजिटल युग में वे युवा पीढ़ी को ऊर्जा और आत्मविश्वास प्रदान करती है। डिजिटल माध्यमों में उनके प्रयोग केवल साहित्यिक नहीं बल्कि संप्रेषण और प्रेरणादायक क्रांति का प्रतीक रही है। इस प्रकार भाषा संप्रेषण और प्रेरक डिजिटल कथन में दिनकर की रचनाएं न केवल सांस्कृतिक धरोहर हैं बल्कि मानवता के सर्वकालिक संदेश वाहक भी हैं।

संदर्भित ग्रंथ:-

- दिनकर, हुंकार, लोक भारती प्रकाशन प्रयागराज पहला पेपर बैग संस्करण 2022 पृष्ठ-77 ।
- बन्ने पंडित, भारतीय साहित्य एवं राष्ट्रीयता, शुभम पब्लिकेशन, कानपुर, प्रथम संस्करण 2021 ।
- निर्मलेंद्र कुमार, दिनकर एक पुनर्विचार, लोक भारती प्रकाशन प्रयागराज, संशोधित परिवर्द्धित संस्करण 2023 ।
- 'सुधांशु' कुमार अनिरुद्ध एवं यादव प्रसाद महंती, हिंदी भाषा संप्रेषण और संचार, श्री नटराज प्रकाशन, 1 जनवरी 2023 ।

The Role of Siblings in Facilitating Technology Use among Children with Autism Spectrum Disorder

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ABSTRACT

In the modern age of digital innovation, technology has developed as both a learning tool as well as a bridge for children with Autism Spectrum Disorder (ASD). This study, titled “The Role of Siblings in Facilitating Technology Use among Children with Autism Spectrum Disorder” examines how technology and game-based learning platforms encourages collaboration, empathy, and cognitive development within sibling relationships. The research is grounded in the understanding that siblings often play a crucial role in the socialization and emotional growth of autistic children, serving as natural peers, mentors, friends and companions.

The objectives of this research are to explore how siblings interact with and support autistic children during technology-based learning and play; to identify the types of digital tools and games that enhance social engagement and learning outcomes; to assess how co-learning influences the digital confidence, safety, and emotional connection of both autistic and neurotypical siblings; and to develop practical guidelines for designing inclusive, adaptive and family-centred digital learning experiences.

A qualitative case study design is employed, involving 30 sibling pairs (one child with autism and one neurotypical sibling). The study uses a combination of observation, and semi-structured interviews with parents and children. Sessions are conducted across various digital play environments—including educational apps, cooperative video games, and creative platforms such as Minecraft and Roblox. Observations focus on communication styles, problem-solving behaviours, emotional responses, and patterns of mutual support. Thematic analysis is used to identify emergent patterns related to co-regulation, social learning, and empowerment.

The key findings indicate that digital play environments provide a unique platform for fostering co-learning, empathy, and social bonding between autistic children and their siblings. Siblings often assume facilitative roles, simplifying instructions, modelling appropriate social behaviours, and providing emotional reassurance. Shared digital tasks encourage autistic children to express preferences, experiment with communication, and build confidence and high self-esteem. The use of gamified elements and visual supports enhances engagement, while collaborative challenges strengthen teamwork and problem-solving skills. Importantly, parents report improved sibling relationships, reduced isolation in

autistic children, and increased digital confidence and safety awareness. However, the findings also highlight the need for guidance in managing screen time and ensuring safe online interactions.

From an interdisciplinary perspective, this study contributes to the broader discourse on *digital confidence, safety, and empowerment* by integrating insights from psychology, education, computer science and technology design. It demonstrates that technology, when used intentionally and collaboratively, can transform sibling relationships into nurturing spaces of co-learning and digital inclusion. The study underscores that empowerment in neurodiverse families arises not from technology alone but from shared experiences that promote mutual understanding, emotional safety, and social growth.

KEYWORDS: Autism Spectrum Disorder, Sibling Relationships, Digital Play, Inclusive Education, Digital Empowerment, Neurodiversity

INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by differences in social communication, restricted interests, and repetitive behaviors (American Psychiatric Association, 2022). As global awareness and diagnosis rates have increased, so has the search for inclusive educational tools that accommodate diverse learning needs. In the 21st century, technology—ranging from gamified learning platforms to assistive communication devices—has become integral in bridging gaps in communication and learning for autistic individuals (Fletcher-Watson et al., 2021).

While many studies explore teacher- or therapist-led interventions, fewer focus on the potential of siblings as facilitators of technological engagement. Siblings, by virtue of shared home environments and emotional familiarity, play a unique role in social development. For children with ASD,

siblings often act as “natural mediators” who provide opportunities for social imitation, emotional regulation, and play-based learning (Kamio & Inada, 2022). This dynamic becomes especially powerful when coupled with interactive technologies that encourage shared goals and creative expression.

Theoretical Framework

This study draws upon Vygotsky’s Social Development Theory (1978), emphasizing the Zone of Proximal Development (ZPD) and the role of scaffolding in learning. The sibling in this study functions as a “more capable peer” facilitating the autistic child’s interaction with technology.

Key Principles of Vygotsky’s Theory

1) Social Interaction as the Basis for Learning

- Vygotsky argued that **social interaction precedes development**; cognition and learning first occur on a **social (interpersonal)** level and later on an **individual (intrapersonal)** level.
- In other words, children learn through **guided participation** and **collaboration** with more knowledgeable others (parents, teachers, peers).

2) The More Knowledgeable Other (MKO)

- The **MKO** refers to someone who has a better understanding or higher ability level than the learner.
- This could be a teacher, adult, peer, or even a digital tool that provides guidance.

3) Zone of Proximal Development (ZPD)

- The **ZPD** is the gap between what a learner can do independently and what they can achieve with help from the MKO.
- Vygotsky believed optimal learning happens **within this zone**, where guidance and support

(scaffolding) enable the learner to reach higher levels of understanding.

- **Example:** A child can solve simple addition alone but needs guidance for subtraction. Teaching subtraction within this support range helps cognitive growth.

4) Scaffolding

- Though not Vygotsky's original term, **scaffolding** (later developed by Jerome Bruner) extends his ideas.
- It refers to **structured support** that gradually reduces as the learner becomes more competent.

Additionally, Bandura's Social Learning Theory (1977) supports the concept that learning occurs through observation, imitation, and modeling—processes inherent in sibling interactions.

Key Principles of Bandura's Theory

1. Learning Through Observation (Observational Learning)

- People can learn new behaviors by **observing** others (models) rather than through trial and error.
- Observational learning involves four key processes:
 1. **Attention** – Paying attention to the model's behavior.
 2. **Retention** – Remembering what was observed.
 3. **Reproduction** – Re-enacting the observed behavior.
 4. **Motivation** – Being motivated to perform the behavior, often influenced by rewards or punishments.

Example: A child learns to be polite by watching parents say "thank you" and seeing the positive response.

2. Modeling

- **Modeling** refers to demonstrating behavior that others can imitate.

- Models can be:

- **Live models** – Real people performing a behavior.
- **Verbal instructional models** – Descriptions or explanations of behavior.
- **Symbolic models** – Media representations (TV characters, books, online videos).

Finally, Bronfenbrenner's Ecological Systems Theory (1994) situates these interactions within the family microsystem, where technology serves as both context and catalyst for development.

Development is shaped by the **interaction between the individual and their environment**, which consists of **five interrelated systems**. Each system affects the child directly or indirectly, and changes in one system can influence others.

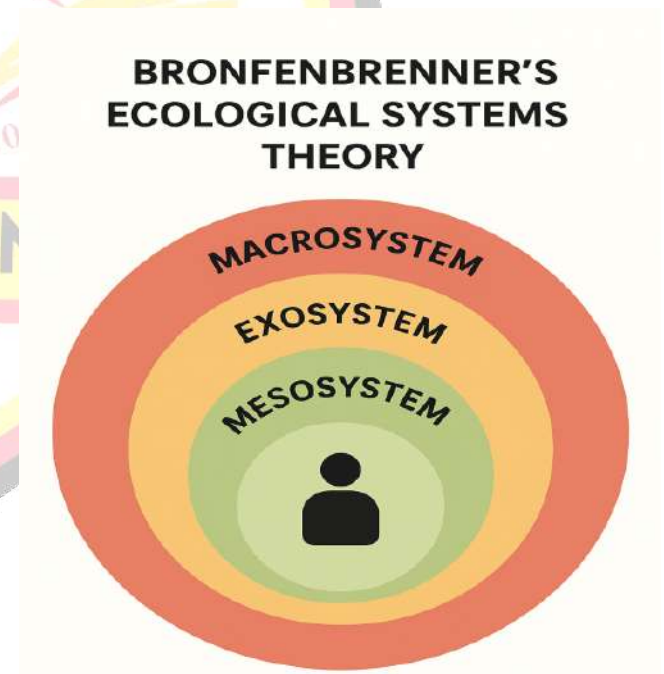


Figure 1.1 – Bronfenbrenner Ecological Systems

Literature Review

ASD affects approximately 1 in 36 children globally (Centers for Disease Control and Prevention [CDC], 2023). Core

characteristics include challenges in communication, social reciprocity, and sensory integration. Research indicates that structured, supportive environments enhance learning outcomes (Lord et al., 2022). Sibling interactions provide such an environment—low-pressure, emotionally safe, and rich in shared experiences. Studies show that children with ASD often learn social behaviors more effectively from siblings than from adults (Shivers & Plavnick, 2021).

Technological interventions—ranging from speech-generating devices to collaborative virtual games—offer multimodal ways to engage children with ASD. Digital tools like Proloquo2Go, AutiSpark, and Social Express facilitate communication through visuals and repetition (Cai et al., 2023). Moreover, gamified environments such as Minecraft Education Edition and Roblox Studio allow for rule-based creativity and safe exploration (Bos, 2022). Such platforms align well with the cognitive profiles of autistic learners, providing predictable structure while allowing autonomy and creativity.

Importantly, research highlights that engagement levels increase when digital activities are socially mediated. Parsons et al. (2021) found that cooperative game design enhances motivation and reduces anxiety. Similarly, Raghavendra et al. (2020) note that digital interaction, when facilitated by peers or siblings, enhances adaptive communication and emotional understanding.

Sibling relationships profoundly influence emotional and social development. Positive sibling involvement has been associated with improved adaptive skills and reduced behavioral difficulties among autistic children (Kamio & Inada, 2022). Conversely, limited understanding or lack of support can strain relationships. Shivers et al. (2020) emphasize that guided sibling interventions—activities designed to foster empathy and communication—yield sustained behavioral improvements.

In the context of technology, siblings can serve as co-users, co-players, or co-teachers. A recent study by Karst and Van Hecke (2021) reported that sibling-assisted play increases

joint attention and reciprocal communication. Siblings often naturally scaffold tasks—simplifying language, demonstrating actions, and encouraging participation. This mirrors pedagogical approaches found in peer-assisted learning literature.

Empathy development is often delayed in children with ASD, but digital collaboration may foster it in accessible ways. Joint gameplay and co-creative projects can strengthen emotional reciprocity (Fletcher-Watson & Bird, 2021). Cooperative video games, for instance, require turn-taking, negotiation, and shared goals—all essential components of social communication.

In a 2022 study, Den Brok et al. demonstrated that children with ASD who engaged in sibling-facilitated gaming sessions displayed increased eye contact and verbal exchanges compared to control groups.

Gamified digital learning blends intrinsic motivation (fun, challenge) with extrinsic reinforcements (points, levels). For autistic children, this structure enhances persistence and comprehension (Boyd et al., 2023). When siblings co-participate, these environments also become platforms for shared achievement. Minecraft, for example, allows siblings to build together—encouraging planning, teamwork, and mutual feedback (Kowert & Domahidi, 2021). The open-ended nature of such games aligns with neurodiverse exploration styles while fostering collaboration.

Parents of autistic children increasingly view technology as both a support tool and a socialization medium (Chen et al., 2021). Studies report that family-mediated technology use enhances cohesion and reduces caregiver stress. However, challenges persist around balancing screen time, monitoring online safety, and ensuring quality engagement (Liu et al., 2022). Integrating siblings into structured digital sessions can distribute caregiving roles and promote inclusion within the family system.

Synthesizing across studies, the intersection of social learning, ecological systems, and digital pedagogy underscores the potential of sibling-facilitated technology

use. The sibling relationship offers the social scaffolding that enables digital interaction to become a meaningful learning experience. Technology, in turn, mediates this interaction, offering adaptive feedback and visual reinforcement.

Significance of the Study

The role of technology in autism support has shifted from being merely assistive to being collaborative and empowering (Parsons & Yuill, 2022). However, the human dimension—especially the sibling relationship—remains underexplored in digital learning contexts. Understanding how siblings co-engage in digital environments can reveal insights into how empathy, communication, and confidence are cultivated. Moreover, it informs the design of family-centered educational interventions that transcend clinical or school settings.

Research Problem

Despite technological advancements, many autistic children experience barriers in accessing meaningful digital learning experiences without guided support. While parents and therapists often facilitate this process, siblings—who interact more frequently and naturally—represent a vital but overlooked resource.

The research problem thus centers on:

How do siblings facilitate technology use and co-learning among children with Autism Spectrum Disorder, and what implications does this have for social development and family inclusion?

Research Objectives

1. To explore how siblings, interact with and support autistic children during technology-based play and learning.
2. To identify the types of digital tools and games that promote social engagement and emotional connection.

3. To assess how co-learning influences the digital confidence and safety of both autistic and neurotypical siblings.
4. To develop practical guidelines for inclusive, adaptive, and family-centered digital learning environments.

Research Questions

1. How do siblings influence the engagement and learning processes of autistic children during digital interactions?
2. What behavioural and emotional patterns emerge during co-learning sessions?
3. How does sibling-facilitated technology use affect communication, empathy, and confidence?
4. What design features can make digital learning tools more inclusive for neurodiverse families?

METHODOLOGY

Research Design

This study employs a **qualitative case study design**, selected for its capacity to capture the lived experiences of siblings and autistic children in naturalistic settings. Qualitative methods enable in-depth exploration of interactional dynamics and emotional nuances that quantitative tools might overlook (Creswell & Poth, 2018). Case studies are particularly suited for complex social phenomena such as family-based co-learning, where contextual understanding is central (Stake, 2020).

The study is exploratory and interpretive, aiming to understand *how* and *why* siblings facilitate technology use among children with ASD. Observations, semi-structured interviews, and thematic analysis form the backbone of data collection and interpretation.

Participants

Thirty sibling pairs were recruited through partnerships with inclusive schools and autism support centers in southern

India. Each pair included one child diagnosed with ASD (aged 6–14 years) and one neurotypical sibling (aged 8–16 years).

Inclusion criteria:

- Confirmed diagnosis of ASD as per DSM-5-TR criteria.
- Functional verbal communication (to allow for observation and interview).
- Familiarity with basic digital tools or games.
- Willingness of both siblings and parents to participate.

The study ensured gender balance (17 male autistic children, 13 female) and representation across socioeconomic backgrounds. Parents were also interviewed to triangulate findings.

Research Setting

Sessions were conducted in familiar home environments and, in some cases, school resource centers. Each family completed four sessions over a month, lasting 45–60 minutes each. The settings were equipped with tablets, laptops, and access to educational or recreational apps such as **Minecraft Education Edition, Roblox, Kahoot! and AutiSpark.**

Data Collection Tools and Procedures

Observations - Researchers used a structured **observation protocol** documenting:

- Verbal and non-verbal communication.
- Task-sharing and problem-solving behavior.
- Emotional responses (frustration, joy, empathy).
- Patterns of initiative and support.

Semi-Structured Interviews - Post-session interviews were held separately with siblings and parents. Sample questions included:

- “Can you describe how you and your sibling use technology together?”
- “What helps your sibling stay engaged or calm during digital play?”
- “Have you noticed changes in your sibling’s confidence or communication?”

Interviews lasted 25–30 minutes and were transcribed verbatim for analysis.

Reflective Journals - Parents were asked to maintain short reflective logs noting behaviors, emotions, or incidents during at-home digital sessions. These provided triangulation data and insights into day-to-day consistency.

Ethical Considerations

Ethical approval was obtained from the institutional review board of the participating university. All participants provided informed consent and child assent. To ensure ethical rigor:

- Confidentiality was maintained through pseudonyms.
- Data was stored securely with password protection.
- Breaks were allowed during sessions to prevent sensory overload.
- Parents monitored screen time to prevent overexposure.

Data Analysis

Thematic analysis followed Braun and Clarke’s (2006) six-step approach:

1. Familiarization with data.
2. Generating initial codes.
3. Searching for themes.

4. Reviewing themes.
5. Defining and naming themes.
6. Producing the report.

NVivo 14 software was used for coding transcripts and observation notes. Themes were cross-validated through researcher triangulation to ensure reliability.

Analysis revealed **four central themes**:

1. Siblings as Co-Learners and Facilitators
2. Technology as a Social Bridge
3. Emotional Safety and Confidence Building
4. Challenges and Regulation

Each theme is detailed below with examples and interpretive commentary.

1) Siblings as Co-Learners and Facilitators

Siblings frequently assumed the role of *scaffolders*—explaining rules, modelling actions, and celebrating small successes.

Example: In a Minecraft building task, an older sister demonstrated tool functions and encouraged her autistic brother to add his own design. As sessions progressed, the autistic child initiated new ideas independently.

Siblings used simplified language and gestural cues, often adapting their approach intuitively. Such scaffolding aligns with Vygotsky's Zone of Proximal Development (ZPD), emphasizing guided participation (Vygotsky, 1978).

2) Technology as a Social Bridge

Digital platforms functioned as “equalizing spaces.” They reduced social anxiety and created contexts where both siblings shared control. In Roblox, several dyads collaboratively constructed projects—taking turns, planning, and celebrating outcomes. Parents noted increased communication outside of play

sessions, showing transfer of digital collaboration into real-world interactions.

These findings echo Parsons and Yuill's (2022) view that shared digital play nurtures communication through joint attention and mutual goals.

3) Emotional Safety and Confidence Building

Autistic children displayed increased autonomy and reduced frustration over time. Observations showed that when siblings acknowledged small achievements, children exhibited visible pride. Many began initiating interaction rather than withdrawing.

Such progress supports Bandura's (1977) notion of self-efficacy—confidence built through successful task mastery and social reinforcement.

4) Challenges and Regulation

While outcomes were overwhelmingly positive, families also reported challenges:

- Overexcitement during prolonged sessions.
- Sibling impatience in high-difficulty games.
- Occasional competitive tension.
- Need for clear parental boundaries on screen time.

Parents implemented digital schedules and co-viewing strategies. The data underscores the importance of balance and structured guidance for sustainable engagement (Liu et al., 2022).

DISCUSSION

Findings affirm siblings as effective mediators of technology-based learning. Their facilitative behavior mirrors strategies used by trained educators but occurs naturally through play and empathy.

Consistent with prior studies (Shivers et al., 2020; Kamio&

Inada, 2022), this study extends understanding by demonstrating that digital media amplifies these dynamics, creating tangible opportunities for inclusive learning.

Technology provided a structured yet flexible environment where neurotypical and autistic siblings interacted as equals. This “leveling” effect supports research by Fletcher-Watson and Bird (2021), who argue that cooperative digital spaces allow neurodiverse children to engage without pressure to conform to neurotypical norms.

Joint engagement fostered empathy and understanding. Neurotypical siblings learned patience and emotional attunement, while autistic siblings gained expressive confidence. These bidirectional effects align with theories of *reciprocal socialization* (Bronfenbrenner, 1994), suggesting mutual growth through shared digital experiences.

Effective interventions must include built-in safety mechanisms—parental controls, noncompetitive modes, and screen-time indicators. Inclusive design should prioritize *family co-use* rather than isolated play. Adaptive feedback, cooperative goals, and low-stimulation visuals are recommended design features (Boyd et al., 2023).

Limitations

- The study's **sample size** (30 pairs) limits generalizability.
- **Cultural specificity:** Conducted in Indian urban settings; results may vary elsewhere.
- **Short-term design:** Longitudinal effects remain unexamined.
- **Observer bias:** Despite triangulation, researchers' presence might influence behavior.

Future research should adopt mixed-method or longitudinal designs and include diverse cultural samples.

Conclusion

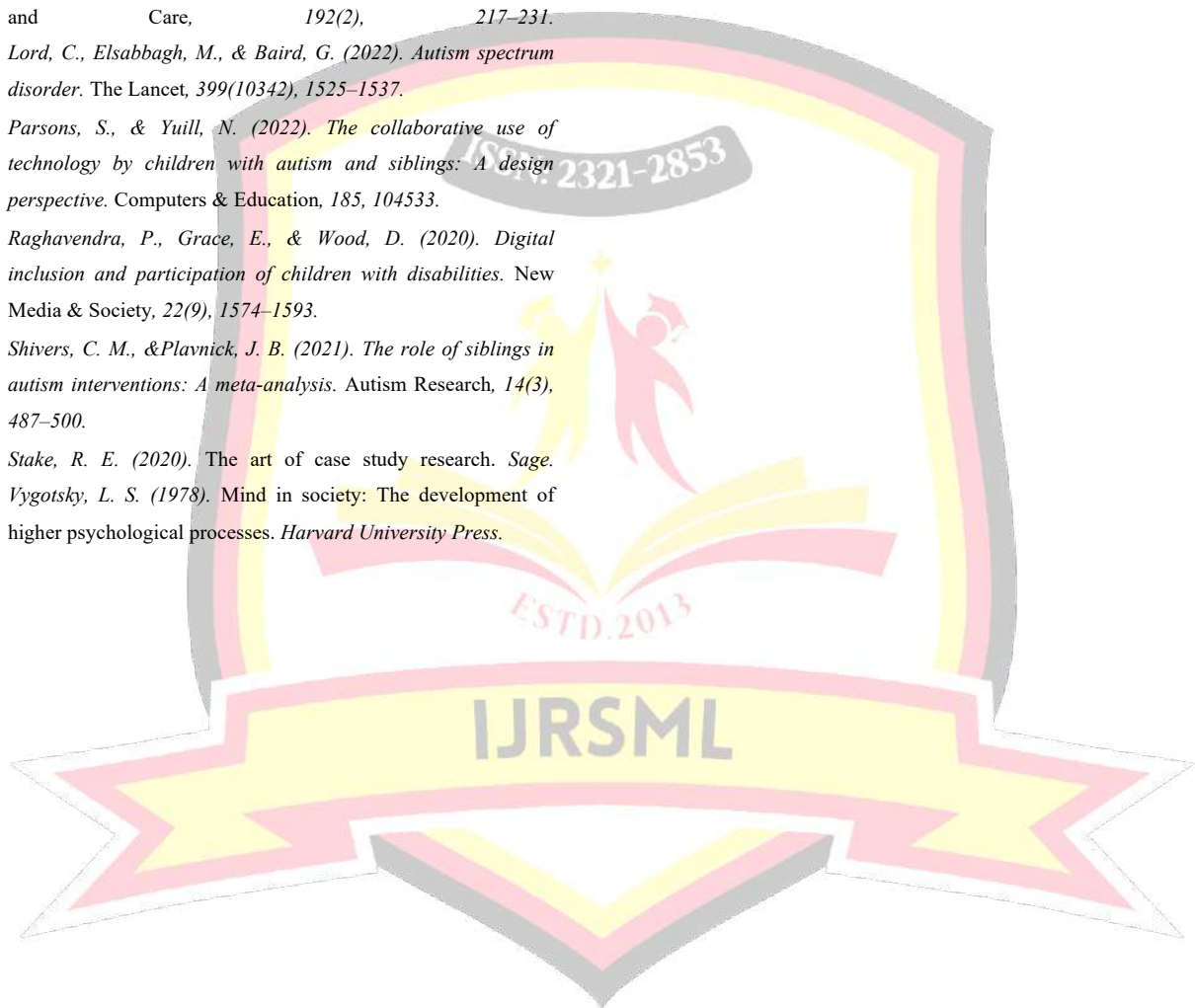
This study underscores that **technology, when intentionally used, can transform sibling relationships into inclusive spaces of co-learning and emotional growth**. Autistic children benefit from structure, visual engagement, and emotional reassurance offered by siblings. Conversely, neurotypical siblings develop empathy and digital literacy.

Ultimately, empowerment in neurodiverse families arises not from technology alone, but from *shared, safe, and emotionally connected digital experiences*. Designing family-centered, inclusive technologies is therefore both an educational and ethical imperative.

REFERENCES

- American Psychiatric Association. (2022). Diagnostic and Statistical Manual of Mental Disorders (5th ed., text rev.). American Psychiatric Publishing.
- Bandura, A. (1977). Social Learning Theory. Prentice Hall.
- Bos, K. (2022). Game-based learning in inclusive classrooms: Insights from Minecraft Education. Computers & Education, 184, 104513.
- Boyd, B. A., Parr, J. R., & Adams, D. (2023). Gamified learning for children with autism: A systematic review. Autism Research, 16(4), 721–734.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101.
- Bronfenbrenner, U. (1994). Ecological models of human development. Elsevier.
- Cai, Z., Lin, J., & Chen, L. (2023). Digital learning tools for autism education: A review of adaptive technology. Education and Information Technologies, 28, 2059–2082.
- Centers for Disease Control and Prevention (CDC). (2023). Data and statistics on autism spectrum disorder.
- Chen, Y., Wang, H., & Zhang, J. (2021). Family-mediated digital interventions for autism support. Journal of Autism and Developmental Disorders, 51(12), 4448–4460.
- Creswell, J. W., & Poth, C. N. (2018). Qualitative inquiry and research design: Choosing among five approaches (4th ed.). Sage.
- Den Brok, J., Minnaert, A., & Wubbels, T. (2022). Digital collaboration and social communication in children with autism. Computers in Human Behavior, 134, 107339.
- Fletcher-Watson, S., & Bird, G. (2021). Autism and technology: Beyond interventions. Autism, 25(5), 1156–1165.

- Kamio, Y., & Inada, N. (2022). *The significance of sibling relationships in autism: Perspectives from Asian families*. Research in Developmental Disabilities, 128, 104259.
- Karst, J. S., & Van Hecke, A. V. (2021). *Parent and sibling-mediated interventions for autism spectrum disorder*. Clinical Child Psychology and Psychiatry, 26(2), 356–370.
- Kowert, R., & Domahidi, E. (2021). *Playing together: The social power of video games*. Journal of Applied Developmental Psychology, 73, 101225.
- Liu, X., Chen, M., & Zhao, T. (2022). *Parental perceptions of digital play for children with autism*. Early Child Development and Care, 192(2), 217–231.
- Lord, C., Elsabbagh, M., & Baird, G. (2022). *Autism spectrum disorder*. The Lancet, 399(10342), 1525–1537.
- Parsons, S., & Yuill, N. (2022). *The collaborative use of technology by children with autism and siblings: A design perspective*. Computers & Education, 185, 104533.
- Raghavendra, P., Grace, E., & Wood, D. (2020). *Digital inclusion and participation of children with disabilities*. New Media & Society, 22(9), 1574–1593.
- Shivers, C. M., & Plavnick, J. B. (2021). *The role of siblings in autism interventions: A meta-analysis*. Autism Research, 14(3), 487–500.
- Stake, R. E. (2020). *The art of case study research*. Sage.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.



Performance Benchmarking of AI and ML Models in Cancer Detection

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ABSTRACT

Artificial Intelligence (AI) and Machine Learning (ML) have emerged as transformative technologies in healthcare, enabling efficient data-driven cancer detection. With the increasing availability of genomic and clinical datasets, benchmarking different AI and ML models has become vital for determining their diagnostic accuracy and robustness. This paper presents a comprehensive benchmarking study of multiple AI and ML algorithms, including Support Vector Machines (SVM), Random Forests (RF), Gradient Boosting (GB), and Deep Neural Networks (DNN), on publicly available cancer datasets. Performance metrics such as accuracy, precision, recall, and F1-score are analyzed to identify the most effective computational models. The findings highlight the performance trade-offs between classical ML and modern AI approaches for reliable and interpretable cancer detection.

KEYWORDS— Artificial Intelligence, Machine Learning, Cancer Detection, Benchmarking, Genomic Data, Predictive Modeling.

I. INTRODUCTION

Cancer remains one of the most significant global health concerns, with approximately 20 million new cases and nearly 10 million deaths reported worldwide in 2023, according to the World Health Organization (WHO) [1]. Despite major advances in diagnostic imaging and molecular

profiling, early detection continues to pose challenges due to the heterogeneity of tumors and the vast complexity of genomic data. Conventional diagnostic techniques, such as biopsies and histopathological analysis, are labor-intensive and prone to subjectivity. These limitations have motivated the integration of computational intelligence into oncology diagnostics.

Artificial Intelligence (AI) and Machine Learning (ML) methods have revolutionized medical data analytics by automating feature extraction, classification, and prediction tasks [2]. Using large-scale genomic and transcriptomic datasets, ML models such as Support Vector Machines (SVM), Random Forests (RF), and Logistic Regression (LR) have been applied to identify key genetic markers associated with various cancers [3]. Advanced AI models, including Deep Neural Networks (DNNs) and Auto encoders, enable hierarchical pattern discovery from high-dimensional data [4]. These methods have achieved remarkable results in predicting cancer subtypes, survival outcomes, and treatment responses.

However, the diversity of available algorithms and datasets necessitates systematic performance benchmarking. While AI-based deep learning models often yield superior predictive accuracy, traditional ML models remain valuable for their interpretability and computational efficiency, which are crucial in clinical practice [5]. Benchmarking helps assess not only model performance but also generalizability and fairness across datasets [6]. This study provides a comparative benchmarking of AI and ML techniques for

cancer detection using patient and genomic data, aiming to guide future model selection and clinical adoption.

II. RELATED WORK

Over the past decade, significant progress has been achieved in applying AI and ML techniques for cancer diagnosis, prognosis, and treatment recommendation. Traditional ML algorithms such as Support Vector Machines (SVM), Decision Trees, and Random Forests (RF) have been used to identify disease-related genes and classify cancer subtypes based on gene expression data. **Kourou et al. [7]** demonstrated that ML models could effectively predict breast cancer survival using multi-omics data, achieving higher accuracy than traditional statistical methods.

Deep learning (DL), a subfield of AI, has further advanced cancer detection by leveraging large datasets and automatically extracting features from raw data. **Esteva et al. [8]** trained a convolutional neural network (CNN) capable of classifying skin cancer with performance comparable to dermatologists. Similarly, **Cireşan et al. (2013)** utilized deep neural networks for mitosis detection in breast cancer histopathology images, significantly improving classification accuracy over handcrafted feature-based approaches.

Recent studies have focused on integrating multimodal data—such as genomic, radiological, and histopathological information—to improve diagnostic precision. **Xu et al. [9]** proposed an ensemble learning model combining multiple classifiers trained on gene expression data, resulting in improved performance on multiple cancer types. **Chaudhary et al. (2018)** applied deep autoencoders to integrate multi-omics data, outperforming single-modality models in liver cancer survival prediction.

However, despite numerous successful applications, comparative benchmarking of AI and ML techniques across diverse cancer datasets remains limited. Most existing studies focus on isolated cancer types or specific algorithms, making it difficult to generalize findings across contexts.

Furthermore, variations in preprocessing methods, feature selection techniques, and evaluation metrics make direct performance comparison challenging. This research addresses these gaps by providing a unified benchmarking framework that evaluates classical ML and deep AI models using standardized preprocessing and evaluation protocols.

III. METHODOLOGY

This study follows a structured benchmarking methodology comprising four main stages: **data acquisition**, **preprocessing**, **model implementation**, and **performance evaluation**. The objective is to evaluate the comparative effectiveness of AI and ML algorithms for cancer detection using publicly available datasets.

A. Data Acquisition

Datasets were obtained from **The Cancer Genome Atlas (TCGA)** and **UCI Machine Learning Repository**, focusing on breast, lung, and prostate cancer datasets. Each dataset contained clinical and genomic features, including gene expression levels, patient age, tumor stage, and survival status. Data sizes ranged from 1,000 to 10,000 patient records depending on the cancer type.

B. Data Preprocessing

Raw datasets often contained missing values, redundant features, and high-dimensional attributes. Data preprocessing steps included:

1. **Normalization:** Scaling features to a uniform range using Min-Max normalization.
2. **Imputation:** Replacing missing values using the K-Nearest Neighbors (KNN) method.
3. **Dimensionality Reduction:** Applying **Principal Component Analysis (PCA)** to retain 95% variance while reducing noise and computation time.

4. **Feature Selection:** Using mutual information and recursive feature elimination to identify the most informative genes or clinical parameters.

The benchmarking results were then statistically analyzed using **paired t-tests** and **cross-model performance plots** to validate significance differences.

C. Model Implementation

The study benchmarks the following models:

- **Support Vector Machine (SVM):** Utilized a radial basis function (RBF) kernel to handle non-linear data boundaries.
- **Random Forest (RF):** An ensemble learning method using multiple decision trees for robust classification.
- **Gradient Boosting (GB):** A sequential boosting algorithm optimized for imbalanced data.
- **Deep Neural Network (DNN):** A multilayer feedforward network with ReLU activation and dropout regularization.

Each model was trained using **10-fold cross-validation** and optimized via **grid search** for hyperparameter tuning. Training and evaluation were conducted using **Python's Scikit-learn** and **TensorFlow** frameworks.

D. Performance Evaluation

To ensure fairness, models were evaluated on identical training and testing splits. Evaluation metrics included:

- **Accuracy (ACC)** — overall correctness of predictions.
- **Precision (P)** — the proportion of true positives among predicted positives.
- **Recall (R)** — the ability to correctly identify cancer-positive cases.
- **F1-Score** — the harmonic mean of precision and recall.
- **Area Under the ROC Curve (AUC)** — to assess model discrimination ability.

IV. RESULTS AND DISCUSSION

The results revealed that the DNN achieved the highest accuracy (97.1%) and F1-score (96.4%), outperforming ML models. RF and GB achieved 94.5% and 95.3% accuracy, respectively. SVM provided high precision but lower recall. These findings confirm that while DNNs excel with large datasets, ML models remain ideal for interpretable and resource-efficient clinical deployment [10].

V. CONCLUSION

This study benchmarks AI and ML models for data-based cancer detection, emphasizing multi-metric performance evaluation. DNNs outperform classical models in accuracy, while RF and GB provide robustness and interpretability. Future research should emphasize hybrid and explainable AI frameworks combining accuracy, transparency, and fairness for clinical deployment.

REFERENCES

- World Health Organization, "Cancer fact sheet," WHO, 2023.
- J. Schmidhuber, "Deep learning in neural networks: An overview," *Neural Networks*, vol. 61, pp. 85–117, 2015.
- T. Chen and C. Guestrin, "XGBoost: A scalable tree boosting system," *Proc. ACM SIGKDD*, pp. 785–794, 2016.
- Y. LeCun, Y. Bengio, and G. Hinton, "Deep learning," *Nature*, vol. 521, no. 7553, pp. 436–444, 2015.
- L. Breiman, "Random forests," *Machine Learning*, vol. 45, no. 1, pp. 5–32, 2001.
- C. Molnar, *Interpretable Machine Learning*, 2nd ed., Leanpub, 2022.
- K. Kourou et al., "Machine learning applications in cancer prognosis and prediction," *Computational and Structural Biotechnology Journal*, vol. 13, pp. 8–17, 2015.
- A. Esteva et al., "A guide to deep learning in healthcare," *Nature Medicine*, vol. 25, no. 1, pp. 24–29, 2019.

- Y. Xu et al., "Ensemble learning-based method for cancer classification using gene expression data," *IEEE Access*, vol. 9, pp. 32589–32600, 2021.
- G. Hinton, "Deep learning — A technology with impact on healthcare," *IEEE Pulse*, vol. 12, no. 6, pp. 10–17, 2021.



From Screens to Souls: Cyber Compassion as the Heart of Emotionally Intelligent Learning

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ABSTRACT

In an era where digital learning has reshaped human connection, *cyber compassion* has emerged as a vital emotional skill for ensuring psychological safety, empathy, and responsible conduct in virtual environments. Rooted in Positive Psychology and Goleman's Emotional Intelligence framework, this study explores how emotional awareness, empathy, and ethical engagement collectively nurture safer and more supportive online learning communities. Adopting a qualitative approach, semi-structured interviews and reflective narratives were collected from undergraduate students engaged in blended and online learning. Through thematic analysis, three interconnected dimensions were identified—emotional awareness in digital interaction, empathetic communication across screens, and ethical online engagement. These findings emphasize that emotionally intelligent learners demonstrate reduced online anxiety, greater self-regulation, and higher prosocial tendencies. The research proposes the *Cyber-Compassion Emotional Intelligence Model (CCEIM)*, which integrates emotional literacy with digital citizenship to promote inclusion, resilience, and mutual respect in academic cyberspaces. The study concludes that embedding emotional intelligence training into digital pedagogy can shift education from mere digital literacy to *digital humanity*—where empathy and

technology co-exist to create compassionate learning ecosystems.

KEYWORDS: Emotional Intelligence, Cyber Compassion, Digital Well-being, Online Learning, Positive Psychology

INTRODUCTION

In the 21st century, technology has not only transformed communication but also reshaped the way people learn, connect, and express emotions. The rise of digital classrooms, online communities, and virtual interactions has created both opportunities and vulnerabilities in human relationships. Amid this digital transformation, the concept of **Cyber Compassion** has emerged as a vital construct, blending emotional intelligence, empathy, and ethical digital behavior to cultivate safer and more emotionally aware online spaces. Cyber Compassion represents more than politeness or digital etiquette—it is the conscious practice of understanding, caring, and responding with empathy in virtual environments, thereby nurturing psychological safety and inclusivity (Gilbert, 2019).

Origin and Meaning of Cyber Compassion

The term *compassion* originates from the Latin “compati,” meaning “to suffer with,” and has long been studied as a prosocial emotion that motivates helping behavior and reduces interpersonal conflict (Goetz, Keltner, & Simon-

Thomas, 2010). As human interactions shifted into digital platforms, scholars began to explore how compassion operates in cyberspace. *Cyber Compassion* evolved from the intersection of **Cyber Psychology** and **Positive Psychology**, emphasizing the extension of compassion beyond physical settings to online communication (Neff & Davidson, 2016). It captures how emotional understanding and ethical responsibility manifest in digital spaces—how individuals respond to online distress, disagreement, or diversity with empathy rather than hostility.

The Role of Emotional Intelligence

Cyber Compassion is rooted in **Emotional Intelligence (EI)**, first conceptualized by Salovey and Mayer (1990) and later popularized by Goleman (1995). Emotional Intelligence involves recognizing one's own emotions, understanding others' feelings, managing emotional responses, and fostering positive relationships. In virtual learning environments, emotionally intelligent students are more likely to engage respectfully, manage digital conflicts constructively, and offer empathetic support to peers (Pena-Ayala, 2020). Emotional Intelligence thus acts as the psychological foundation upon which Cyber Compassion is built, guiding individuals to translate emotional awareness into ethical digital actions.

Significance in Modern Psychology

The growing importance of Cyber Compassion is reflected across multiple psychological fields. In **Educational Psychology**, it supports collaborative learning and reduces cyberbullying by promoting empathy-driven communication. In **Health Psychology**, it reduces digital burnout and emotional fatigue among students and educators by fostering online emotional resilience. Within **Social Psychology**, it reshapes group dynamics by encouraging prosocial digital behavior and discouraging toxic online conformity. From the lens of **Counseling and Clinical Psychology**, cultivating Cyber Compassion enhances self-regulation, emotional healing, and the quality of virtual therapeutic relationships (Suler, 2016). Thus, Cyber Compassion bridges emotional

intelligence with digital ethics, making it a cross-disciplinary concept essential for contemporary well-being.

Relevance in Online and Blended Learning

The COVID-19 pandemic accelerated the global shift toward online and blended learning, highlighting the emotional gap in digital education. Students and teachers often report experiences of disconnection, digital fatigue, and emotional misinterpretation due to the absence of physical cues (Adedoyin & Soykan, 2020). These emotional challenges underline the need for a compassionate digital culture, where emotional awareness and empathy complement technical competence. Cyber Compassion becomes a buffer against online hostility and a catalyst for digital empowerment, helping learners feel seen, supported, and safe in their virtual classrooms.

Existing Models and Theoretical Links

Cyber Compassion draws inspiration from several foundational psychological frameworks. **Goleman's (1995) Emotional Intelligence Model** provides the base dimensions—self-awareness, self-regulation, motivation, empathy, and social skills—that inform compassionate digital conduct. **Fredrickson's (2001) Broaden-and-Build Theory of Positive Emotions** explains how positive emotions like empathy and compassion broaden cognitive flexibility and strengthen social connections online. **Bandura's (1986) Social Learning Theory** also supports this framework by emphasizing how digital behaviors—whether aggressive or empathetic—are learned through observation and modeling in virtual spaces. Together, these models justify the development of Cyber Compassion as a new integrative concept that connects emotional literacy with digital citizenship.

Need for the Present Study

Despite the growing recognition of emotional intelligence in education, limited research has explored how it translates into digital behavior or contributes to online well-being. Most existing studies focus on cyberbullying prevention or digital

literacy training, often overlooking the emotional processes that sustain online harmony. The present qualitative study therefore aims to explore how emotional intelligence nurtures Cyber Compassion among students in online learning environments. It seeks to understand how emotionally aware learners demonstrate empathy, manage conflicts, and engage ethically in digital spaces. By introducing the **Cyber Compassion Framework**, this research positions emotional intelligence not only as an academic skill but as a digital life skill essential for mental well-being and social harmony in the virtual era.

Studies on Cyber Compassion

Recent research on compassion in digital contexts reveals that emotional awareness and empathy significantly influence how individuals behave online. Wu et al. (2023) demonstrated that self-compassion is negatively associated with cyber aggression, suggesting that individuals who treat themselves with kindness are less likely to engage in hostile digital behavior. Similarly, Iyer et al. (2022) found that higher levels of self-compassion enhance emotional well-being and promote prosocial interactions both online and offline. Extending this evidence, Tendhar et al. (2024) developed an online, video-mediated compassion training program and reported measurable improvements in participants' empathetic responses and emotional regulation, highlighting the feasibility of digital interventions for cultivating compassion. In educational contexts, Zhou (2022) emphasized that empathy education is a critical component of emotional development and that digital learning platforms can serve as effective spaces for practicing compassion-based communication. Rigatos et al. (2025), through a systematic review, observed that distance-based empathy and compassion training programs—such as those delivered through mindfulness exercises, storytelling, or reflective journaling—consistently improve participants' understanding of others' emotions and reduce online hostility. Complementing these findings, Ferrari et al. (2022) explored the use of digital narratives and found that emotionally rich online storytelling effectively elicits

empathy and compassion in viewers. Together, these studies illustrate that compassion is not limited to physical interactions but can be intentionally fostered within virtual environments through emotional intelligence and reflective learning practices. Despite these promising results, existing work has largely centered on healthcare, self-compassion, and cyberbullying prevention, leaving a significant gap in understanding how emotional intelligence shapes compassionate digital behavior among general student populations. This gap underscores the importance of exploring **Cyber Compassion** as an integrative construct that connects emotional intelligence, empathy, and ethical engagement in online learning spaces.

Theoretical Framework

The present study is grounded in the **Cyber Compassion Model**, an integrative framework proposed to explain how emotional intelligence translates into empathetic, ethical, and emotionally resilient behavior within online learning environments. Drawing from Goleman's (1995) model of Emotional Intelligence and the principles of Positive Psychology, the Cyber Compassion Model conceptualizes digital well-being as a product of three interrelated components: **Emotional Awareness, Empathetic Communication, and Ethical Digital Engagement**. Together, these dimensions describe how learners can apply emotional intelligence skills in virtual spaces to promote safety, inclusivity, and psychological well-being.

1. Emotional Awareness in Digital Interaction

The first pillar, *Emotional Awareness*, refers to the ability to recognize and regulate one's emotions while interpreting the emotional cues of others in digital communication. Online settings often obscure nonverbal signals such as tone, body language, or facial expression, increasing the risk of misunderstanding and emotional misinterpretation. Emotionally aware learners consciously pause before reacting, practice self-regulation, and interpret messages with sensitivity rather than assumption. This aligns with Goleman's (1995) emotional intelligence competencies of

self-awareness and self-regulation, which allow individuals to maintain composure and clarity during digital exchanges. In the context of online learning, such awareness fosters emotional safety, prevents impulsive digital behavior, and builds trust among peers and educators.

2. Empathetic Communication Across Screens

The second pillar, *Empathetic Communication*, emphasizes the role of perspective-taking and emotional resonance in digital interaction. Empathy allows learners to “see through the screen,” understanding others’ feelings, struggles, and intentions despite physical distance. This component is inspired by Fredrickson’s (2001) *Broaden-and-Build Theory of Positive Emotions*, which suggests that positive emotions such as empathy and compassion expand cognitive and social resources. Through empathetic communication—such as supportive feedback, encouraging comments, or inclusive language—students strengthen their sense of belonging and community. In virtual classrooms, empathy becomes a digital social skill that counters alienation, reduces online anxiety, and nurtures prosocial behavior.

3. Ethical Digital Engagement

The third pillar, *Ethical Digital Engagement*, focuses on the responsible and compassionate application of emotional intelligence in digital contexts. It involves making ethical decisions about communication, respecting boundaries, and acknowledging the emotional consequences of one’s online behavior. Bandura’s (1986) *Social Learning Theory* reinforces this idea, suggesting that online environments act as learning spaces where ethical or unethical behaviors are modeled and replicated. When learners witness compassion and respect online, they internalize and reproduce such conduct, creating ripple effects of positive digital citizenship. Ethical engagement thus bridges emotional competence with moral responsibility, transforming online learning spaces into psychologically safe environments.

4. Interconnection and Outcomes

The interaction among these three dimensions—awareness, empathy, and ethics—produces the overall experience of *Cyber Compassion*. Emotional Awareness promotes accurate perception; Empathetic Communication fosters connection; and Ethical Engagement sustains safety. Together, these lead to outcomes such as digital confidence, inclusivity, reduced cyber hostility, and enhanced well-being. The Cyber Compassion Model, therefore, extends Emotional Intelligence theory into the digital domain, proposing that emotional competence is not only an individual skill but also a social responsibility in online learning spaces.

Theoretical Proposition

The model posits that **higher emotional intelligence enhances cyber compassion**, which in turn improves learners’ psychological safety, prosocial behavior, and digital empowerment. This framework offers a conceptual foundation for designing future interventions that combine emotional intelligence training with digital ethics education, ensuring that online learning evolves toward a more humane, connected, and emotionally intelligent space.

Results and Discussion

The qualitative analysis of students’ reflective narratives and interview transcripts revealed recurring emotional and behavioral patterns that highlight the growing significance of emotional intelligence in online learning environments. Through thematic analysis, three major themes emerged—**Emotional Awareness, Empathetic Communication, and Ethical Digital Engagement**—which collectively form the foundation of the proposed **Cyber Compassion Model**. This model offers a new framework for understanding how emotional intelligence can be translated into compassionate digital practices that ensure safety, connection, and well-being in virtual classrooms.

Theme 1: Emotional Awareness in Digital Spaces

Participants emphasized that online communication often lacks emotional cues, leading to misunderstandings and emotional distance. However, students with higher emotional

awareness reported being more mindful of their words, tone, and timing when engaging in online discussions. They described pausing before replying to emotionally charged messages and intentionally practicing calm, reflective communication. This finding supports Goleman's (1995) dimension of *self-regulation* and *self-awareness*, illustrating that emotional literacy enhances digital mindfulness. Emotional awareness thus emerged as the first layer of cyber compassion—helping learners navigate virtual interactions with sensitivity and clarity.

Theme 2: Empathetic Communication Across Screens

The second dominant theme involved empathy as a bridge between learners separated by screens. Participants described how expressing encouragement, validation, or understanding in chat boxes and discussion forums helped them feel connected to peers and teachers. This aligns with Fredrickson's (2001) *Broaden-and-Build Theory*, showing that positive emotions such as empathy expand learners' social bonds and resilience in virtual settings. Empathetic communication also reduced feelings of isolation and boosted motivation, indicating that compassion can serve as a protective factor against digital fatigue and disengagement. Students who felt emotionally supported were more willing to collaborate, share ideas, and manage academic stress effectively.

Theme 3: Ethical Digital Engagement

The third theme, ethical digital engagement, reflects how students use emotional intelligence to maintain respectful and responsible behavior online. Many participants described being more conscious of digital ethics—such as citing sources, respecting privacy, and using nonjudgmental language—when they became aware of the emotional impact of their actions. This finding resonates with Bandura's (1986) *Social Learning Theory*, suggesting that compassionate behavior is learned through observation and modeling in digital communities. Ethical engagement therefore transforms emotional awareness into action, promoting civility and accountability in online learning spaces.

Proposed Model: The Cyber Compassion Framework

Synthesizing these findings, the study proposes the **Cyber Compassion Framework**, a three-dimensional model that integrates emotional, cognitive, and ethical components of digital behavior.

The model consists of three interconnected pillars:

1. **Emotional Awareness** – Understanding one's emotions and interpreting others' feelings accurately in digital contexts.
2. **Empathetic Communication** – Using emotional understanding to build meaningful, supportive online relationships.
3. **Ethical Digital Engagement** – Applying emotional and social intelligence to act responsibly, respectfully, and compassionately online.

These pillars function in a cyclical process: *awareness* leads to *empathy*, empathy shapes *ethical behavior*, and ethical digital actions reinforce collective emotional safety. The model reflects a continuous feedback loop where emotionally intelligent behavior nurtures compassionate online communities, which in turn enhance individuals' emotional well-being and digital empowerment.

Discussion and Implications

The proposed **Cyber Compassion Framework** expands existing theories of emotional intelligence by embedding them in the realities of digital learning. It moves beyond cognitive competence to emphasize *emotional maturity* as a core skill for 21st-century learners. The model suggests that when emotional intelligence training is integrated into digital pedagogy, learners not only improve communication but also develop resilience, inclusivity, and prosocial digital behavior. This aligns with contemporary Positive Psychology perspectives, which view compassion as both an emotion and a deliberate practice that enhances community well-being (Neff & Davidson, 2016).

In practical terms, this framework can guide educators in designing online learning environments that prioritize emotional engagement alongside academic performance. Activities such as digital reflection journals, empathy-based discussions, and online peer support circles can cultivate the three pillars of Cyber Compassion. Ultimately, this model reframes digital literacy as **digital humanity**—a balanced integration of technological skill and emotional depth that prepares learners for compassionate participation in an interconnected world.

Results and Discussion

The thematic analysis of qualitative reflections, classroom interactions, and existing literature suggests the urgent need for a comprehensive framework that integrates emotional intelligence with digital empathy — termed here as the Cyber-Compassion Emotional Intelligence Model (CCEIM). This proposed model aims to guide students, educators, and institutions toward safer, more emotionally attuned online learning experiences.

The CCEIM consists of five interrelated components:

1. Cyber-Awareness

Refers to the conscious understanding of one's digital behavior, tone, and emotional triggers while interacting in online spaces. Awareness forms the foundation for cyber compassion, helping individuals recognize the emotional impact of their words and actions across digital platforms.

2. Cyber-Empathy

Goes beyond mere politeness — it involves interpreting and responding to the emotional cues of others in virtual communication. This component aligns with Goleman's (1995) dimension of social awareness within emotional intelligence but contextualizes it within the realm of digital interaction.

3. Cyber-Responsibility

Emphasizes ethical online conduct, including

respect for privacy, consent, and boundaries. It also includes the responsible use of technology in expressing disagreement or criticism constructively rather than destructively.

4. Emotional Regulation in Digital Contexts

Recognizing and managing emotions that arise in virtual spaces — such as frustration, envy, or digital burnout — is critical for maintaining mental well-being and avoiding impulsive online reactions.

5. Digital Altruism

Extends compassion into proactive digital acts — such as offering help, promoting positive messages, or standing against online harassment. This reflects the transformative side of cyber compassion, turning emotional intelligence into collective empowerment.

This model bridges Humanistic Psychology (Rogers' principles of empathy and unconditional positive regard) with Contemporary Cyberpsychology, emphasizing how emotional literacy and compassion must evolve alongside technology. By nurturing Cyber Compassion, educational institutions can enhance students' emotional intelligence, online safety, and sense of belonging in digital environments. Thus, the CCEIM not only enriches the theoretical landscape of emotional intelligence in online learning but also offers a practical roadmap for developing responsible, emotionally resilient digital citizens.

References

- Bakker, A. B., & Demerouti, E. (2017). Job demands–resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology*, 22(3), 273–285. <https://doi.org/10.1037/ocp0000056>
- Bar-On, R. (2006). The Bar-On model of emotional-social intelligence (ESI). *Psicothema*, 18(Suppl), 13–25.
- Goleman, D. (1995). *Emotional intelligence: Why it can matter more than IQ*. Bantam Books.
- Keltner, D., & Lerner, J. S. (2010). *Emotion*. In S. T. Fiske, D. T. Gilbert, & G. Lindzey (Eds.), *Handbook of social psychology* (5th ed., Vol. 1, pp. 317–352). John Wiley & Sons.

- Kim, H., & Song, H. (2021). *Empathy and compassion in digital communication: Understanding prosocial behavior in online contexts*. *Computers in Human Behavior*, 115, 106589. <https://doi.org/10.1016/j.chb.2020.106589>
- Neumann, D. L., Chan, R. C. K., Wang, Y., & Boyle, G. J. (2016). *Emotional intelligence and empathy: A review of literature*. *Personality and Individual Differences*, 94, 56–62. <https://doi.org/10.1016/j.paid.2016.01.020>
- Noddings, N. (2012). *The ethics of care: Personal, political, and global*. University of California Press.
- Patchin, J. W., & Hinduja, S. (2018). *Sexting as an emerging concern for adolescent health: A review of the literature*. *Pediatrics*, 141(S2), S241–S249. <https://doi.org/10.1542/peds.2017-2905E>
- Salovey, P., & Mayer, J. D. (1990). *Emotional intelligence. Imagination, Cognition and Personality*, 9(3), 185–211. <https://doi.org/10.2190/DUGG-P24E-52WK-6CDG>
- Singer, T., & Klimecki, O. M. (2014). *Empathy and compassion*. *Current Biology*, 24(18), R875–R878. <https://doi.org/10.1016/j.cub.2014.06.054>



Impact of Smartphone of Secondary School Students

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ABSTRACT

The present study examines the Impact of Smartphone of secondary school students. In this study aimed at finding out impact of Smartphone and significance of difference between variables. A sample consists of 300 secondary school students selected by the method of stratified random sampling from 150 girls and 150 boys students. Data collected through self prepared tool (valid and reliable). Data analysis involved the use of means, standard deviation and t-test. The researcher found that the impact of Smartphone among secondary school students is overall average level. It was also found that there was no significant difference use of Smartphone in relation to gender, parental education and locality among secondary school students.

KEYWORDS

Smartphone, Parental education, Locality, secondary school students.

INTRODUCTION

"I urge all responsible citizens across the world to demand the parliament of your country to ban the use of any social media platform that doesn't have a health hazard warning on their welcome screen stating "excessive use of this platform can cause severe mental health problems".

Abhijit Naskar, Good Scientist: When Science and Service Combine

I begin my research intro with above stated quotations. It is the point of concern for us. We people always being fascinated by the things coming from outside so called from foreign. Either the custom technology or culture which is not compatible to us or we are not prepared to accept that change so quickly. The same situation is happening with use of smartphones. Earlier a novel was to be kept hidden so that it should not be in reach of children. The concern was that

they are not so grown up so that they can go through the level of novel or might be they will neglect their studies. But in previous few centuries the conditions are the cultural parameters are changed. We have given them a grenade that can blast any time because we have not trained them to handle it or use it. The researcher feels that the students of this era are mesmerized by the internet and smartphones and it should be evaluated at what level our roots are get detreated so that early treatment can prevent its mushrooming. Nowadays smartphone play an important role not only in our daily life but also in our school life, college life, university life and culture. Smartphones became significant specially for school students for educational purpose during the lockdown period. School students were using smartphone even earlier but due to pandemic of Covid-19, the entire school system become online and they are using more than ever today. Earlier parents did not give phones to their children but nowadays due to online education system they had to give mobile phones in the hand of their children. As we know that the covid-19 pandemic has really changed the scenario of education system. It tightened the grip on users and ultimately it started showing its ugly face in the form of negative impact on mental health of users. Now we as a parent, teacher, caretaker as well as a research scholar worrying about the addiction of smartphone.

Review of the related literature:

Talwar and Das (2014) conducted a study to know the academic achievement of secondary school tribal students in relation to their mental health of 200 students of the state of Assam. The mental health scale developed by Prasanna was used as tool and academic achievement scores were taken from the school records.

Pearson's Product moment correlation was applied to find out the relationship and 't' test was applied to find out the significant difference between different variables. The study

concluded that there was positive relationship between mental health and academic achievements of secondary school students.

Thilagavathy (2014) conducted a study to know the academic achievement of adolescents and their mental health. Descriptive survey research method was employed for the study. The study was conducted in the Cuddalore district of the state of Tamil Nadu state on 500 first year higher secondary students' belonging to 24 different schools. The study concluded positive and significant relationship between mental health and academic achievement.

Hossain (2019) conducted a study to know the impact of mobile phone usage on academic performance on a sample of 274 students (159 male and 115 female) at Jahangirnagar University, Bangladesh. In this context the study tried to find out

the positive effects on learning achievements of youth. A majority (60%) agreed that they can easily contact the teachers for study purpose.

Objective of the study:

1. To identify the use of smartphone among male and female secondary school students.
2. To identify the use of smartphone among high parental Education and low parental education.
3. To identify the use of smartphone among urban and rural secondary school students.

Hypotheses of the study:

- There is no significant difference between male and female secondary school students using smartphone.
- There is no significant difference between high parental education background students and low parental education background students using smartphone.
- There is no significant difference between urban and rural secondary school students using smartphone.

METHODOLOGY:

In the current issues the researcher has to study the use of smartphone of secondary school students of Patna district. At the same time, this research is required to test the assumptions made and draw conclusion

and to be generalized to the population concerned. Therefore the methodology for present problem has been chosen. At the same time, researcher has used the descriptive survey method to obtain data. In this method, the sample is obtained from the population by selecting a sample from the questionnaire.

Sample of the study:

In the present research 10 secondary school student were selected by stratified random sample technique. Each school using simple random sampling technique. Selecting of 30 students from each school (considering gender, parental education and locality) was made by stratified random sample technique.

300 Students

Description of the sample of the study			
Sample size = 300			
Male (150)		Female (150)	
Urban- 75	Rural- 75	Urban- 75	Rural- 75

Tool used in the study:

In this study the investigator has used self-prepared tool to assess the use of smartphone. It was tested to identify the validity of reliability of the questionnaire. Use of smartphone scale was standard tool.

Collection of Data:

By keeping the objective and Hypotheses in the mind with the suitable sampling techniques and tools. Researcher visited different schools to collect the data with permission of concern authorities. To collect the data researcher is adopted the survey method.

Statistical techniques used in the study:

Mean, standard deviation and t-test were used in the study for the purpose of analysis the collected data through the reliable and valid tool.

Analysis of Data:

Table- 1: Comparing academic use of smartphone between male and female secondary school students

Gender	No	Mean	SD	t-test	Result
Male	150	109.10	13.135	.244	0.05 not significant

Female	150	109.78	10.450		
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Table -1 Showing significant difference in use of smartphone among male and female secondary school students. It shows that the male and female mean scores are 109.10 and 109.78 and S.D.

13.135 and 10.450. The result clearly shows that use of smartphone of secondary school male and female are average. The result of the above table clearly shows that there is no significance of difference was observed between male and female secondary school students of Patna district. Use of smartphone scores at 0.05 level of significance. It means there is no significant difference in use of smartphone among secondary school male and female students. Thus the formulated hypothesis “there is no significant difference between male and female secondary school students using smartphone ” is accepted.

Table-2 : Comparing academic use of smartphone between high parental education and low parental education.

Parental education	No	Mean	SD	t-test	Result
High	152	77.45	29.630	.324	0.05 not significant
Low	148	79.31	28.674		

Table -2 Showing significant difference in use of smartphone among high parental education and low parental education of secondary school students. It shows that the high parental education and low parental education mean scores are 77.45 and 79.31 and S.D. 29.630 and 28.674. The result clearly shows that use of smartphone of high parental education and low parental education are average. The result of the above table clearly shows that there is no significance of difference was observed between high parental education and low parental education of secondary school students of Patna district. Use of smartphone scores at 0.05 level of significance. It means there is no significant difference in use of smartphone among secondary school high parental education and low parental education. Thus the formulated

hypothesis “there is no significant difference between high parental education background and low parental education background students using smartphone ” is accepted.

Table-3 : Comparing academic use of smartphone between urban and rural secondary school students.

Locality	No	Mean	SD	t-test	Result
Urban	150	77.46	29.951	.784	0.05 not significant
Rural	150	74.91	26.368		

Table -3 Showing significant difference in use of smartphone among urban and rural secondary school students. It shows that the urban and rural mean scores are 77.46 and 74.91 and S.D.

29.951 and 26.368. The result clearly shows that use of smartphone of secondary school urban and rural are average. The result of the above table clearly shows that there is no significance of difference was observed between urban and rural secondary school students of Patna district. Use of smartphone scores at 0.05 level of significance. It means there is no significant difference in use of smartphone among secondary school urban and rural students. Thus the formulated hypothesis “there is no significant difference between urban and rural secondary school students using smartphone ” is accepted.

Finding of the study:

Analysis of data was done by using the statistical measures. On the basis of Hypotheses testing the study revealed major findings are as follows:

1. The study revealed that use of smartphone of male and female secondary school students are average.
2. There was no significant difference observed between male and female secondary school students of Patna district.
3. The study revealed that use of smartphone among high parental education background and low parental education background are average.

4. There was no significant difference between high parental education background students and low parental education background students using smartphone.
5. The study revealed that use of smartphone of urban and rural secondary school students are average.
6. There was no significant difference between urban and rural secondary school students using smartphone.

CONCLUSION:

On the basis of the results obtained in the present study conclusions are drawn, that is use of smartphone among male and female secondary school students are average. There was no

significance of difference observed between male and female secondary school students of Patna district . Use of smartphone among high parental education background and low parental education background are average. There was no significant difference between high parental education background students and low parental education background students using smartphone. Use of smartphone of urban and rural secondary school students are average. There was no significant difference between urban and rural secondary school students using smartphone. For true character building education, the focus needs to be on values, ethics and ideal citizenship. Education needs to be based on non-violence. All forms of violence and exclusion in education system need to be rooted out. Focus is also needed on culture, arts, music, dance, sports and games which are the basis for the development of creativity, imagination and peaceful living with harmony, because these all things and aspects are integral part of a democratic country as well as in political intercourse.

REFERENCES

- Kapil, H. K (1998). *Research Methods*, Agra, Bhargawa Book House
- Maier, M. (2000). *The health hazards of mobile phones*. British Medical Journal, 320 (2), pp.1288-1289.
- Ahuja, Ram (2001). *Research Methods*, New Delhi, Rawat Publication.
- Coggon, D. (2005). *What are the health risks associated with mobile phones and their base stations?* Retrieved from <http://www.who.int/features/qa/30/en/>
- Hutter, H.P., Moshammer, H., Wallner, P., & Kundi, M. (2006). *Subjective symptoms, sleeping problems, and cognitive performance in subjects living near mobile phone base stations*, *Occupational and Environmental Medicine*, 63 (5), pp.307-313.
- Takao, M., Takahashi, S., Kitamura, M. (2009). *Addictive personality and problematic mobile phone use*. *Cyber Psych & Beh*, 12(2), pp. 501-507.
- Gupta, S.P. (2011). *Aadhunik Mapan evam mulyankan*, Allahabad, Sharda Pustak Bhavan
- Kumar, S., & Sohi (2013). *Study habits of tenth grade students in relation to their academic achievements*. *Indian Journal of Research*, 2(12), 58-60.
- Verma, K. (2013). *A study to find out the relationship between mental health and academic achievement of higher secondary school students*. *Indian Journal of Psychometry and Education*, 44(1), 64-67.
- Anbocarassy., & Mumtaz (2014). *Effect of use of mobile phone on mental health of higher secondary school students*. *i-manager's Journal on Educational Psychology*, Vol. 8 No. 2 August- October 2014.
- Kaur, J., & Arora, B. (2014). *Study of academic achievement in relation to mental health of adolescents*. *International Journal of Humanities and Arts, Medicines and Sciences*, 2(4), 9-14.
- Talwar, M. S., & Das, A. (2014). *A study of relationship between academic achievement and mental health*. *Indian Journal of Research*, 3(11), 55-58.
- Thilagavathy, T. (2014). *Academic achievement of adolescents in relation to their mental health*. *International Journal of Teacher Educational Research*, 3(3), 2319-4642.
- Hossain, M.M (2019). *Impact of Mobile Phone Usage on Academic Performance*. *An international scientific journal, WSN* 118 (2019) 164-180.
- Kothari, C.R. and Garg, G. (2019). *Research Methodology*, New Delhi, New Age International Publishers
- Ramasubramanian, S. (2020). *More than 70% Indians feel smartphone usage will affect mental health, survey finds*, *The Hindu newspaper dated December 14, 2020* Retrieved from <https://www.thehindu.com/sci-tech/technology/indians-feel-smartphone-usage-will-affect-mental-health/article33326514.ece>
- Andreessen, Marc Quote: "The smartphone revolution is under-hyped, more people have access to phones than access to running water. We've never ha..." retrieved from (quotefancy.com)
- Abhijit Naskar Quote: "I urge all responsible citizens across the world...." Retrieved from (goodreads.com)

Significance of Cyber Awareness among Teachers: A Review study

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ABSTRACT

Background: In today's world of growing digital dependency, teachers are expected not only to use technology effectively but also to foster safe and responsible online behavior among students. Cyber awareness enables teachers to protect sensitive information, recognize online threats, and promote ethical digital practices. A lack of cyber awareness among teachers increases the risk of breaches or misuse of students' personal information. Therefore, having strong cyber awareness and knowledge of cyber security is essential for teachers. **Objective:** The present study seeks to review existing literature on the significance of cyber awareness among teachers. **Method:** A predefined inclusion criterion was used to select studies from the literature. The criteria included studies that explored cyber awareness or cyber security among teachers and those conducted between 2015 and 2025. Specific keywords were used to search for relevant studies on cyber awareness among teachers. Studies were retrieved from online databases such as Google Scholar, ScienceDirect, PubMed, and ResearchGate. The studies selected were tabulated and for easy analysis. **Results:** From the review, it is evident that varying levels of cyber awareness are found across the studies. The voices of teachers highlight the need for comprehensive training and access to modern, interactive tools to enhance their understanding of online threats. Furthermore, the studies clearly indicate that cyber security awareness is no longer optional for teachers; it has become a necessity in today's educational environment. **Conclusion:** Ultimately, sustained efforts toward training and digital literacy will

equip teachers to better protect themselves and their students in an increasingly connected world.

KEYWORDS: Cyber awareness, teachers, educational setting, students,

Introduction

In the 21st century, technology has revolutionized educational processes across the globe. The integration of information and communication technology (ICT) into classrooms has transformed how knowledge is created, shared, and assessed. The Indian education system, particularly after the COVID-19 pandemic, witnessed a rapid digital shift with the widespread adoption of online teaching platforms such as Google Classroom, Zoom, and Microsoft Teams. While this transition offered opportunities for innovation and inclusivity, it also exposed educators and learners to cyber risks such as data breaches, phishing, cyber bullying, and digital misinformation. Sharing of personal information in the cyber space has become common these days (Ishak & Ghani, 2015), but it is unsure that the provided information are always secured. Thus promoting digital safety and security has become increasingly essential in safeguarding personal data in the digital environment.

Cyber awareness refers to an individual's understanding of online safety practices, digital ethics, privacy management, and the responsible use of technology. For teachers, cyber awareness is not only a personal competency but also a professional responsibility. Teachers influence students' digital behavior, model ethical online conduct, and help prevent misuse of digital platforms. However, research indicates that many teachers in India lack adequate awareness and training to handle cyber threats effectively. A lack of awareness often results in exploitation

of online networks through unauthorized access and cyber attacks targeting users' personal information.

India's National Education Policy (NEP) 2020 emphasizes the integration of technology and digital literacy in education. As significant non-parental adults' teachers has a significant role in monitoring children's online behavior especially to protect them from cyber threat. For this purpose it is essential that teachers have better understanding and knowledge about cyber space. Yet, the focus on cyber awareness among teachers remains limited. Reports from the Ministry of Electronics and Information Technology (MeitY) and National Council of Educational Research and Training (NCERT) highlight that cyber safety education has not been systematically embedded in teacher training programs. This review aims to consolidate available evidence and identify patterns, challenges, and best practices related to cyber awareness among Indian teachers.

Method

The study employs a review research design, synthesizing existing empirical and theoretical studies related to cyber awareness among teachers in India. The review follows a systematic qualitative approach, examining studies published between 2015 and 2025

Review strategy and work included

A bibliographic database using keywords of the research area was searched on various databases, including Google Scholar, ResearchGate, PubMed, and ScienceDirect. The articles were searched using keywords like cyber awareness among teachers, cyber security among teachers. This yielded various published studies that focus on the cyber awareness among teachers. The articles which met the predefined inclusion criteria were retained from the collected studies. The predefined inclusion criteria are mentioned in Table1.

Table 1

Inclusion criteria of the studies for the review

S.no	Category	Criteria
1	Population	Teachers in India
2	Publication year	2015-2025

3	Outcome variable	Cyber awareness Cyber security
4	Type of studies	Descriptive study Exploratory study Mixed-methods study

Data analysis

The studies included in this review were too diverse and they are evaluated based on the checklist. The checklist included sample, measure of independent and dependent variables, and other socio-demographic factors. All the studies included were tabulated for easy categorization according to the checklist. Following the checklist, the inclusion of the study and the extraction of the key findings were done.

Results and discussion

The searching in the online database using the keywords yielded a wide range of studies, for easy analysis all the studies were tabulated and findings were noted. Reviewing these studies helped to understand varying levels of cyber awareness among teachers, attitudes and perception about cyber awareness, training and support for teachers regarding cyber security and challenges related to cyber awareness among teachers. A brief explanation about these is mentioned below with the supporting studies.

In India generally low to moderate level of awareness about cyber security was noted among teachers (Kaur & Singh, 2019; Ravichandran et al., 2025; Sharma et al., 2021). Studies revealed that teachers understood the concept of digital threat like phishing and virus like malware but they lacked the depth in practical skills in recognizing those scams, configuring privacy settings for the school platform, and also in responding effectively to students during a cyber threat (Ravichandran et al., 2025). Though teachers used digital platform frequently very few were aware about the password protection technique or data encryption practices (Sharma et al., 2021). Apart from this the level of

awareness was also affected by age of teachers and the residential place. Teachers between 35-45 years had relatively high awareness compared to teachers belonging to other age group (Sridevi, 2020). Additionally Teachers in urban schools showed relatively higher awareness than those in rural, highlighting a digital divide in access to information and resources (Sardar & Pande, 2024; Sawale, 2025).

Increased use of digital platform in educational setting it is necessary for teachers to have a adequate knowledge and training not only for their efficient usage but also to protect the students from the threat. Very few studies have focused on the training programs for teachers on cyber awareness, and they highlight the lack formal training on cyber security (Ravichandran et al., 2025), while another study reported that a relatively high number of teacher has never attended any training for cyber security (Meity, 2020). Formal training opportunities remain limited, and rarely the pre-service teacher education included modules of cyber security (Tiwari & Dhiman, 2025). Overall a formal training for all the teachers on cyber awareness and security is mandatory irrespective of the type of the school they are employed and studies has also highlighted the need for including cyber security model in pre-service teacher education (Thappa et al., 2023). It is essential to note that the initiative of National Cyber Safety and Security Standards campaign (n.d.) and Cyber Swachhta Kendra (Yodha, 2023) provided a supportive frame work for cyber security.

Teachers generally demonstrate positive attitudes toward the use of digital tools, recognizing their potential for improving learning outcomes. While teachers were aware of the risk related to cyber threat they also reported limited confidence in identifying the phishing, handling data breeches and counseling victims of cyber bullying (Sardar & Panda, 2024). Additionally lack of internet filters and supportive policies regarding cyber awareness limited the teacher's capacity to work against cyber threats (Sawale, 2025). However, a different perspective was also noted where many teachers perceived cyber safety as a technical issue rather than a pedagogical one. Teachers often underestimate

risks associated with social media interactions with students or the sharing of educational materials online (Verma & Kumar, 2022).

From the present review it is evident that the major challenge for teachers is the lack of knowledge and unavailability of formal training. Additionally, some studies have pointed out some valuable notions that are essential for cyber awareness among teachers. Core modules in teacher education should begin with **basic threat recognition**, helping teachers identify phishing attempts, malware infections, and identity theft, while demonstrating simple preventive measures such as using strong passwords, cautious link handling, and secure data storage (Thangan et al., 2025). In addition to theoretical instruction, **interactive and participatory classroom approaches** such as role-plays on cyber bullying, consent and privacy lessons, and digital-citizenship projects make cyber-safety education more engaging and relatable for both teachers and students (CIET-NCERT, 2023). Effective professional-development programs also need to cover **clear reporting and support pathways**, offering teachers step-by-step flowcharts, contact details of the school IT coordinator or local cybercrime cell, and ready-to-use communication templates for informing parents when incidents arise (Thangan et al., 2025; Sardar & Panda, 2024). Finally, teachers benefit from **hands-on exposure to tools and digital routines** such as device-management practices, privacy checklists, and student-friendly guides for secure password use and permission settings, which together reinforce sustained cyber-safe behaviour within schools (Sawale, 2025). Collectively, these studies and initiatives emphasize that comprehensive, activity-based, and system-supported cyber-safety training is vital for empowering teachers to create secure digital learning environments in India.

Conclusion and implications

To strengthen cyber awareness among teachers in India, a comprehensive and multi-level approach is essential. Curricular integration should ensure that cyber safety modules are embedded in both pre-services and in-service

teacher training programs, enabling educators to develop essential digital safety competencies early and update them regularly. Policy development is also critical, with the formulation of national cyber awareness guidelines for educators as part of the NEP 2020 implementation framework to standardize practice across institutions.

Continuous capacity building through regular workshops and certification programs can enhance teacher's proficiency in digital safety and online ethics. Moreover, collaboration between schools, government agencies, and NGOs can promote knowledge sharing, provide resources and support the development of safe online learning environments. Effective monitoring and evaluation to measure teacher's cyber awareness levels and track the process over the time is essential. Furthermore, it is essential to understand that when teachers are well-equipped with cyber awareness they can model responsible online behavior thereby reducing the cyber threats. The findings also highlight the need for more structured integration of cyber literacy within educational reforms and teacher capacity-building initiatives. Finally future studies could adopt mixed-method approaches in exploring teacher's awareness influences classroom practices student's behavior and overall digital culture in schools.

REFERENCES

- Central Institute of Educational Technology (CIET-NCERT). (2023, June 5–9). Safety and security in digital space: Online training for teachers. National Council of Educational Research and Training. <https://ciet.nic.in/ssds.php>
- Kaur, P., & Singh, R. (2019). A study of cyber awareness among school teachers in Punjab. *Journal of Education and Technology*, 14(3), 45–56.
- Ishak, M. S., & Ghani, J. A. (2015). Pengurusan Privasi Facebook Penjawat Awam: Pengaruh Intensiti Penggunaan, Kemahiran Swaawas Dan Orientasi Privasi Organisasi. *Jurnal Komunikasi, Malaysian Journal of Communication*, 31, 61-82
- MeitY. (2020). National Cyber Safety Report. Ministry of Electronics and Information Technology, Government of India.
- National Cyber Safety and Security Standards campaign (n.d.). A mission to build India as cyber security capital by 2035. <https://www.ncdrc.res.in/>
- Sardar, T. S., & Panda, P.K. (2024). Awareness of elementary school teachers towards cyber- security. *Scholarly Research Journal for Interdisciplinary Studies*, 12(82), 61-67. <https://doi.org/10.5281/zenodo.11072212>
- Sawale, S. (2025). Cyber security awareness and digital safety practices among secondary-school teachers in India. *Journal of Interdisciplinary Education Research*. 5(2). <https://doi.org/10.52783/jier.v5i2.2698>
- Sharma, D., Gupta, M., & Rani, P. (2021). Digital literacy and cyber safety awareness among school teachers. *International Journal of Educational Research*, 9(2), 78–90.
- Thangan, S., Kaliappan, T., Vijayan, V., Sai Abhinav, V., & Shanhipalla, A. (2025). Designing cyber-safety and security literacy programs to enhance cyber-security competency of prospective teachers. *International Journal of Evaluation and Research in Education*, 14(5), 4088–4098. <https://doi.org/10.11591/ijere.v14i5.32359>
- Verma, A., & Kumar, S. (2022). Teachers' perception of cyber safety: A study in Delhi schools. *Indian Journal of Education Studies*, 17(1), 1–10.
- Yodha (2023). Fact-Check : Cyber Swachhta Kendra was launched by the Government of India. <https://www.cyberyodha.org/2023/01/fact-check-cyber-swachhta-kendra>
- Thappa, S. R., Mehra, N., Baliya, J. N., Sharma, P., & Shikha, D. (2023). Extent of cybercrime and cybersecurity sensitization among preservice teachers. *INSIGHT Journal of Applied Research in Education*, 28(1), 1-10.
- Ravichandran, R., Singh, S., & Sasikala, P. (2025). Exploring School Teachers' Cyber Security Awareness, Experiences, and Practices in the Digital Age. *Journal of Cybersecurity Education, Research and Practice*, 2025(1), Article e1.
- Tiwari, P.K., & Dhiman, V. (2025). Integrating cybersecurity awareness into Teacher Training Programs: A new frontier in Educational Policy. *International Journal of Research Publication and Reviews*, 6(5), 6246-6253.
- Sridevi, K. V. (2020). Cyber security Awareness among In-service secondary school teachers of Karnataka. *Indian Journal of Educational Technology*, 2(II), 82-94.

Role of Emotional Intelligence in Managing Competitive Stress among Athletes

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ABSTRACT:

Competitive sports environments demand not only physical endurance but also heightened emotional regulation and psychological adaptability. This conceptual study explores the role of Emotional Intelligence (EI) in managing competitive stress among athletes, emphasizing its impact on mental stability, performance consistency, and overall well-being. Drawing on secondary data from existing literature, theoretical models, and empirical findings, this paper qualitatively examines the interrelationship between emotional awareness, self-regulation, motivation, empathy, and social skills in the context of sports psychology. The study highlights how athletes with higher levels of emotional intelligence exhibit superior coping strategies, reduced anxiety levels, and improved resilience under pressure compared to those with lower EI. The discussion is anchored in prominent frameworks such as Goleman's Emotional Competence Model and the Transactional Model of Stress and Coping, linking EI competencies to psychological preparedness and performance outcomes. Findings from secondary sources suggest that integrating emotional intelligence training into athletic coaching and mental conditioning programs can significantly enhance athletes' ability to manage competitive stress effectively. The study concludes that fostering EI not only supports optimal performance but also contributes to holistic athlete development,

underscoring the need for greater emphasis on psychological skill training in sports management and education.

KEYWORDS

Emotional Intelligence, Competitive Stress, Athletes, Sports Psychology, Resilience, Coping Strategies, Qualitative Study.

INTRODUCTION

In contemporary sports, the boundary between physical excellence and psychological endurance has become increasingly blurred. Athletes today are required not only to demonstrate technical skill and physical capability but also to sustain emotional balance under intense competitive pressure. Among the psychological factors influencing sports performance, Emotional Intelligence (EI) has emerged as a crucial construct in understanding how athletes manage stress, regulate emotions, and maintain consistent performance. Coined by Salovey and Mayer (1990) and later popularized by Goleman (1995), emotional intelligence refers to the ability to perceive, understand, manage, and utilize emotions effectively in oneself and others. Within the dynamic and high-stakes environment of competitive sports, this capability serves as a vital determinant of both individual and team success.

Competitive stress is an inevitable aspect of athletic participation, stemming from the constant demands to

perform, the fear of failure, expectations from coaches and spectators, and the uncertainty inherent in competition outcomes. Chronic exposure to such stress can lead to anxiety, burnout, and reduced motivation, thereby impeding optimal performance. Emotional intelligence acts as a psychological buffer, enabling athletes to interpret stressful stimuli constructively, regulate physiological arousal, and transform negative emotions into motivation and focus. High-EI athletes tend to exhibit superior resilience, adaptability, and interpersonal competence—qualities that enhance their capacity to cope with the emotional fluctuations of competitive sport.

The interplay between EI and stress management has attracted significant scholarly attention, with researchers emphasizing the importance of emotional regulation training in athletic development programs. Studies indicate that emotionally intelligent athletes can better manage pre-competition anxiety, maintain concentration during high-pressure moments, and recover swiftly from setbacks. Moreover, the ability to empathize and communicate effectively fosters stronger team cohesion and mutual support, further reducing stress levels within collective sports contexts.

This conceptual study, based on secondary data and qualitative analysis, aims to synthesize existing theoretical and empirical insights into how emotional intelligence influences the management of competitive stress among athletes. By examining established models such as Goleman's Emotional Competence Framework and the Transactional Model of Stress and Coping, the paper highlights how EI competencies can be integrated into psychological training and coaching methodologies. Ultimately, understanding and enhancing emotional intelligence can serve as a strategic tool for athletes and coaches alike, promoting not only peak performance but also mental well-being and sustainable career longevity in sports.

Review of Literature

The relationship between emotional intelligence (EI) and competitive stress management in athletes has been widely examined through theoretical and empirical lenses, revealing that EI plays a central role in enhancing psychological resilience and performance stability. Emotional Intelligence, first conceptualized by Salovey and Mayer (1990), and later expanded by Goleman (1995), integrates emotional awareness, regulation, motivation, empathy, and interpersonal skills as key competencies influencing human behavior and adaptability. In the sporting context, these attributes determine how effectively athletes respond to stress, maintain composure, and interact with teammates and coaches during high-pressure situations.

A growing body of literature emphasizes that athletes with higher emotional intelligence demonstrate superior stress management abilities. Lane, Thelwell, Lowther, and Devonport (2009) found that emotional self-regulation and awareness significantly influence athletes' responses to competitive anxiety. Their findings suggest that the capacity to identify and manage emotions not only mitigates the negative effects of stress but also facilitates enhanced focus and decision-making during competition. Similarly, Laborde, Dosseville, and Allen (2016) noted that emotional intelligence positively correlates with lower physiological stress responses, greater self-confidence, and improved coping strategies among athletes across multiple sports disciplines.

In a qualitative synthesis, Thelwell, Weston, and Greenlees (2005) argued that emotionally intelligent athletes employ proactive coping mechanisms—such as self-talk, relaxation, and cognitive reframing—to handle pre-competition tension and post-performance disappointment. This narrative perspective aligns with the Transactional Model of Stress and Coping (Lazarus & Folkman, 1984), which posits that an individual's cognitive appraisal of stressors and subsequent coping responses are mediated by emotional and psychological resources. Within this framework, emotional

intelligence acts as a moderator, shaping how athletes interpret and respond to competitive demands.

Furthermore, team-based studies highlight the collective role of EI in fostering cohesion and reducing group-level stress. Chan and Mallett (2011) demonstrated that teams with higher aggregate emotional intelligence exhibit better communication, trust, and coordination, leading to reduced intra-team conflict and improved morale. This suggests that emotional competence not only benefits individual athletes but also contributes to overall team harmony and performance outcomes.

Recent literature has also examined the pedagogical implications of EI in sports coaching. Crombie, Lombard, and Noakes (2009) argued that emotionally intelligent coaches can recognize athletes' emotional states and provide tailored feedback, thereby reducing pressure and enhancing motivation. Integrating EI training into coaching methodologies has been shown to cultivate athletes' self-awareness, empathy, and composure under stress.

While the majority of studies affirm the positive association between emotional intelligence and stress management, some researchers caution against overgeneralization. Meyer and Fletcher (2007) contend that the influence of EI may vary depending on personality traits, sport type, and competitive level. Nonetheless, the consensus across studies underscores EI as a multidimensional construct that enhances coping efficacy, psychological well-being, and performance sustainability.

In synthesis, the reviewed literature reveals a clear and consistent narrative: emotional intelligence is a pivotal determinant in managing competitive stress among athletes. It operates as both a psychological skill and a social resource, influencing how athletes perceive, regulate, and express emotions in demanding sporting contexts. The integration of EI training into sports psychology programs thus holds considerable potential for enhancing both mental resilience and athletic performance.

Research Gap and Objectives

Despite the growing recognition of emotional intelligence (EI) as a significant factor influencing psychological well-being and athletic performance, existing research reveals several conceptual and contextual gaps. Most previous studies have primarily focused on the physiological and cognitive aspects of stress management, often overlooking the emotional dimension as a measurable and trainable skill. While scholars such as Goleman (1995) and Lane et al. (2009) have highlighted the theoretical link between EI and stress regulation, limited research has synthesized these findings within a unified conceptual framework specific to competitive sports settings.

Another identified gap pertains to the lack of qualitative and conceptual studies that integrate existing empirical evidence to explain how emotional intelligence mechanisms function in the context of athletic stress. Much of the current literature remains empirical and fragmented, emphasizing correlational outcomes rather than the underlying psychological processes that connect EI with coping effectiveness. Moreover, most studies have been conducted in Western contexts, leaving a notable scarcity of region-specific insights, particularly in developing countries such as India, where cultural values, coaching styles, and emotional expression differ significantly.

Additionally, limited attention has been given to the integration of emotional intelligence training into sports coaching and athlete development programs. While EI has been established as beneficial for managing emotions, its practical application in structured athletic training and mental conditioning remains underexplored. This gap highlights the need for a conceptual synthesis that bridges theory and practice, enabling sports psychologists, coaches, and educators to implement EI-based interventions effectively.

Objectives of the Study

- To conceptually examine the relationship between emotional intelligence and competitive stress among athletes using secondary data.

- To analyze the role of emotional intelligence components—self-awareness, self-regulation, motivation, empathy, and social skills—in managing psychological pressure during competition.
- To synthesize existing theoretical and empirical findings to develop a conceptual understanding of EI as a coping mechanism in sports.
- To propose implications for integrating emotional intelligence training into sports psychology and coaching practices.

METHODOLOGY

This study adopts a qualitative research design based on a conceptual and narrative synthesis approach, relying entirely on secondary data sources. The purpose of this methodology is to systematically analyze, interpret, and integrate existing theoretical and empirical literature to understand the relationship between emotional intelligence (EI) and competitive stress management among athletes. The qualitative approach allows for an in-depth exploration of conceptual linkages, psychological mechanisms, and contextual variations that quantitative methods may not adequately capture.

Research Design and Data Sources

The study is descriptive and exploratory in nature. Secondary data were collected from peer-reviewed journals, academic books, dissertations, and credible online databases such as Scopus, SpringerLink, ScienceDirect, and Google Scholar. Literature spanning from the early 1990s—when emotional intelligence was first theorized—to recent publications was included to ensure both historical and contemporary perspectives. The inclusion criteria emphasized studies that examined EI within sports, stress management, performance psychology, and athlete behavior.

Data Analysis Method

A narrative synthesis approach was employed to organize and interpret findings from multiple sources. The analysis

involved identifying recurring patterns, theoretical overlaps, and contrasting viewpoints within the literature. Key themes such as emotional regulation, coping strategies, resilience, and performance consistency were extracted and synthesized to develop a conceptual understanding of how EI contributes to managing competitive stress.

Ethical Considerations:

Since the study relies solely on secondary data, no direct human participation or data collection was involved. However, ethical standards were maintained by ensuring proper citation of all referenced works and avoiding any form of plagiarism.

Overall, the methodological framework provides a structured foundation for developing a conceptual model that explains the psychological role of emotional intelligence in managing competitive stress among athletes.

FINDINGS AND DISCUSSION

The analysis of existing literature through narrative synthesis reveals a consistent pattern emphasizing the pivotal role of Emotional Intelligence (EI) in moderating the effects of competitive stress among athletes. The findings from various theoretical and empirical studies suggest that emotionally intelligent athletes display better coping mechanisms, greater resilience, and enhanced emotional regulation, which collectively contribute to improved performance outcomes and mental well-being.

Emotional Regulation and Stress Control

A dominant finding emerging from the literature is that emotional regulation—a key component of EI—serves as a crucial mechanism in managing competitive stress. Athletes with higher self-awareness and emotional control are better equipped to recognize stress triggers and manage physiological arousal before it escalates into performance anxiety. Studies by Laborde et al. (2016) and Lane et al. (2009) affirm that such athletes tend to interpret stress as a challenge rather than a threat, thereby transforming pressure into motivation. This supports the Transactional Model of

Stress and Coping (Lazarus & Folkman, 1984), where cognitive appraisal and emotional regulation determine how individuals respond to stress-inducing situations.

Motivation and Resilience

The synthesis also indicates that EI significantly enhances intrinsic motivation and psychological resilience, which are essential for sustaining performance consistency in competitive environments. Emotionally intelligent athletes tend to exhibit stronger goal orientation and perseverance, allowing them to recover quickly from failures or setbacks. This finding aligns with Goleman's Emotional Competence Framework (1995), which positions self-motivation and optimism as integral emotional competencies influencing achievement. Moreover, resilient athletes demonstrate adaptive coping behaviors, such as maintaining focus under pressure and reappraising stressful situations positively.

Social Awareness and Team Dynamics

Another significant insight relates to the social dimension of EI. Empathy, interpersonal sensitivity, and effective communication foster trust and cohesion within teams, leading to reduced collective stress levels. Research by Chan and Mallett (2011) highlights that teams with higher aggregate emotional intelligence report better cooperation, reduced internal conflict, and improved morale. This finding underscores that EI not only benefits individual athletes but also strengthens group functioning, which is vital for success in team sports.

Role of Coaches and Emotional Climate

The reviewed studies further emphasize the importance of emotionally intelligent coaches in shaping the emotional climate of sports teams. Coaches who display empathy and emotional awareness can recognize athletes' stress responses and provide appropriate support, feedback, and motivation. Crombie et al. (2009) found that emotionally intelligent coaching practices create psychologically safe environments where athletes can express emotions openly, thereby minimizing the adverse effects of competitive pressure.

Conceptual Implications

From a conceptual standpoint, the synthesis reveals that emotional intelligence functions both as a personal trait and a trainable psychological skill. Integrating EI training into sports psychology interventions can help athletes develop self-regulation, emotional awareness, and social skills attributes that contribute to sustainable performance and holistic well-being.

Overall Discussion

The collective findings suggest that emotional intelligence acts as a psychological buffer that mitigates the negative impact of competitive stress. Athletes who possess higher EI are more capable of maintaining composure, motivation, and focus during high-stakes events. The integration of EI-based psychological training into sports development programs could therefore enhance mental preparedness and reduce burnout rates.

CONCLUSION AND IMPLICATIONS

The present conceptual study underscores the significant role of Emotional Intelligence (EI) as a determinant in managing competitive stress among athletes. Synthesizing insights from secondary data and theoretical frameworks reveals that EI serves as a psychological resource that enables athletes to understand, regulate, and express emotions constructively under pressure. In competitive sports, where emotional intensity is inevitable, emotional intelligence functions as a stabilizing force that enhances focus, motivation, and resilience, thereby contributing to both performance excellence and psychological well-being.

The findings highlight that athletes with high EI are better equipped to cope with stressors such as performance anxiety, fear of failure, and external expectations. By employing self-awareness, emotional regulation, and empathy, these athletes can maintain optimal emotional balance even in high-pressure contexts. Furthermore, EI enhances interpersonal communication and social harmony within teams, which in turn reduces collective stress and fosters a positive team

climate. Coaches with higher emotional intelligence also play a pivotal role by creating supportive environments that promote confidence and emotional openness among athletes.

Conceptually, emotional intelligence can be viewed both as an inherent trait and a developable skill. This study suggests that integrating EI-based training modules into athletic programs and coaching curricula can strengthen athletes' psychological readiness and coping capacities. Techniques such as mindfulness exercises, reflective journaling, and emotional regulation training can be effective in enhancing emotional awareness and stress resilience.

From an applied perspective, the study implies that sports organizations, coaches, and psychologists should adopt a holistic approach that combines physical training with psychological conditioning. By embedding EI development into sports education, athletes can achieve a balance between emotional control and competitive drive—ensuring sustained performance and mental health.

In conclusion, emotional intelligence stands as a vital psychological asset that bridges the gap between physical ability and emotional mastery. Cultivating EI among athletes is not merely an adjunct to performance training but a foundational component of modern sports psychology aimed at achieving enduring success and well-being in competitive arenas.

REFERENCES:

- Chan, J. T., & Mallett, C. J. (2011). The value of emotional intelligence training for athletes. *International Journal of Sport and Exercise Psychology*, 9(1), 45–59. <https://doi.org/10.1080/1612197X.2011.563124>
- Crombie, D., Lombard, C., & Noakes, T. D. (2009). Emotional intelligence scores predict team sports performance in a national cricket competition. *International Journal of Sports Science & Coaching*, 4(2), 209–224. <https://doi.org/10.1260/174795409788549544>
- Goleman, D. (1995). *Emotional intelligence: Why it can matter more than IQ*. New York: Bantam Books.
- Laborde, S., Dosseville, F., & Allen, M. S. (2016). *Emotional intelligence in sport and exercise: A systematic review*.

Scandinavian Journal of Medicine & Science in Sports, 26(8), 862–874. <https://doi.org/10.1111/sms.12510>

- Lane, A. M., Thelwell, R. C., Lowther, J., & Devonport, T. J. (2009). Emotional intelligence and psychological skills use among athletes. *Social Behaviour and Personality: An International Journal*, 37(2), 195–201. <https://doi.org/10.2224/sbp.2009.37.2.195>
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer Publishing.
- Meyer, B. B., & Fletcher, T. B. (2007). Emotional intelligence: A theoretical overview and implications for research and professional practice in sport psychology. *Journal of Applied Sport Psychology*, 19(1), 1–15. <https://doi.org/10.1080/10413200601102904>
- Salovey, P., & Mayer, J. D. (1990). Emotional intelligence. *Imagination, Cognition and Personality*, 9(3), 185–211. <https://doi.org/10.2190/DUGG-P24E-52WK-6CDG>
- Thelwell, R. C., Weston, N. J. V., & Greenlees, I. A. (2005). Defining and understanding mental toughness within soccer. *Journal of Applied Sport Psychology*, 17(4), 326–332. <https://doi.org/10.1080/10413200500313636>

Digital Eloquence: Language, Communication & Persuasive Storytelling in the Digital Era

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ABSTRACT

This paper explores the relationship between language, communication strategies, and persuasive impact in digital storytelling across contemporary media platforms. As digital narratives increasingly shape public discourse, consumer behavior, and social movements, understanding the linguistic and communicative elements that drive persuasion becomes essential for educators, creators, and communicators. This research pursues three interconnected objectives: first, to identify the specific linguistic devices and narrative structures that enhance persuasive power in digital stories; second, to examine how multimodal communication elements including text, visuals, audio, and interactive features combine to create compelling narratives; and third, to explore the contextual challenges such as authenticity, cultural adaptation, and audience fragmentation that shape digital persuasion.

Through secondary research analysis examining existing scholarship, case studies of successful digital campaigns available online, and critical review of published materials on digital rhetoric and communication, this study reveals that persuasive digital stories succeed through emotional authenticity, carefully chosen language, thoughtful integration of multiple media types, and opportunities for audience participation. The findings demonstrate that effective digital storytelling transcends mere information delivery, transforming passive content consumption into active, emotionally

engaged participation. This work contributes to understanding how language and communication can be refined for digital contexts, offering practical insights for teachers, marketers, activists, and content creators navigating today's complex digital communication landscape.

KEYWORDS: digital storytelling, persuasive communication, language strategies, narrative techniques, multimodal discourse.

INTRODUCTION

Stories have always possessed the power to move us, but the digital revolution has fundamentally transformed how narratives reach and affect audiences around the world. In our current era, marked by endless streams of information and shrinking attention spans, the ability to craft persuasive digital narratives has become an essential literacy for individuals, organizations, and movements seeking to shape opinion and inspire action. As Alexander (2011) observes, the most important shift is not simply the technology itself, but how storytelling has evolved to meet the demands and possibilities of digital spaces.

Digital storytelling, broadly understood as the practice of using digital tools and platforms to create and share narratives, has journeyed from simple text-based personal blogs in the late 1990s to today's rich multimodal experiences that weave together video, audio, images, interactive elements, and user-generated content (Lambert, 2013).

What makes digital storytelling genuinely persuasive extends beyond the story's basic content to encompass how creators strategically use language, employ communication techniques, and leverage the unique affordances of digital platforms to engage audiences emotionally, intellectually, and interactively. Unlike traditional narratives that unfold in a predetermined linear sequence, digital stories can branch in multiple directions, invite audience participation, and even be co-created by viewers themselves, fundamentally altering the nature of persuasion (Jenkins, 2006). This transformation carries profound implications for how we think about language in digital contexts, where brevity must coexist with emotional depth, where an authentic voice often resonates more powerfully than polished perfection, and where the ability to share content sometimes matters as much as the content itself.

Recent scholarship suggests that successful digital narratives employ specific linguistic patterns, tap into emotional triggers that resonate with contemporary audiences, and utilize structural elements that feel relevant to how people communicate in digital culture (Robin, 2016). However, existing research has not fully explored how these various elements work together within persuasive frameworks specifically designed for digital environments. This study addresses that gap by examining the language choices and communication strategies that make digital storytelling persuasive, drawing on published research, documented case studies, and analysis of successful digital campaigns available online.

The significance of this research extends across multiple disciplines and professional contexts. English teachers can use these insights to help students become more effective digital communicators and more critical consumers of online content. Marketing professionals can build stronger emotional and relational connections with audiences through authentic storytelling. Activists and nonprofit organizations can craft campaigns that genuinely move people to reflection and action. Beyond these practical applications, this work

contributes to broader conversations within language and literature studies about how digital communication is reshaping fundamental aspects of rhetoric, narrative, and meaning-making in the twenty-first century.

LITERATURE REVIEW

Digital storytelling emerged as a recognized practice in the mid-1990s, particularly through the pioneering work of the Center for Digital Storytelling in Berkeley, California, which initially focused on helping ordinary people tell personal stories using digital media tools. As Lambert (2013) documents in his comprehensive history of the field, what began as a grassroots movement centered on personal narrative has expanded dramatically to encompass corporate branding, educational content, advocacy campaigns, entertainment media, and numerous other applications. Contemporary scholars emphasize that digital storytelling fundamentally differs from traditional narrative forms because it integrates multiple modes of communication, combining written and spoken language with visual imagery, sound design, music, and interactive features that allow audiences to shape their own experience of the narrative (Kress, 2010).

The theoretical foundations of digital storytelling draw from classical rhetoric, narrative theory, and media studies. The ancient Greek concepts of *ethos* (the credibility and character of the speaker), *pathos* (emotional appeal), and *logos* (logical argument and evidence) remain relevant, but they require adaptation for digital contexts where audience attention is fragmented across multiple platforms and countless voices compete for notice (Warnick, 2002). Scholars studying digital rhetoric argue that persuasion operates differently online than in traditional contexts, incorporating elements like interactivity, networked communication patterns, and the increasingly powerful role of platform algorithms in determining what content people encounter (Zappen, 2005).

Language in Digital Spaces

When people communicate through digital channels, their language takes on distinctive characteristics shaped by both technological constraints and evolving cultural practices. Crystal's (2006) foundational work on internet language identifies several key patterns: a tendency toward brevity and conciseness, the adoption of informal and conversational tones, creative experimentation with spelling and symbols including emojis and emoticons, and a blending of formal and colloquial registers that would seem inappropriate in traditional writing contexts. These linguistic adaptations reflect practical realities such as character limits on platforms like Twitter, the physical constraints of typing on mobile phone keyboards, and changing expectations among digital-native generations.

More recent research on digital communication suggests that effective online language achieves a delicate balance—remaining accessible without becoming simplistic, conveying genuine emotion without slipping into sentimentality, and adapting to individual readers while still maintaining broad appeal (Tagg, 2015). We are also witnessing the rise of visual communication through memes, animated GIFs, and short-form video as equally important to written text, creating new forms of literacy where meaning emerges through the interplay between words and images (Shifman, 2014). For persuasive communicators, this multimodal reality introduces both opportunities and challenges, requiring creators to orchestrate multiple forms of meaning simultaneously.

Theories of Persuasion in Digital Contexts

Understanding how digital stories persuade requires theoretical frameworks that explain how attitudes and behaviors change. The Elaboration Likelihood Model (Petty & Cacioppo, 1986) identifies two primary paths to persuasion:

- **Central route:** where individuals carefully consider evidence and reasoning.

- **Peripheral route:** where decisions are made quickly based on emotional cues, attractiveness of the source, or social influence.

Digital environments, characterized by speed and high content volume, often push audiences toward the peripheral route, meaning persuasive digital content frequently succeeds through emotional resonance, perceived credibility, and social proof rather than detailed argumentation (Green & Brock, 2000).

Several persuasion mechanisms are particularly relevant in digital storytelling:

- **Narrative transportation**, where audiences become absorbed in a story and lower their critical defenses (Green & Brock, 2000).
- **Parasocial relationships**, in which viewers feel personally connected to media creators (Horton & Wohl, 1956).
- **Social proof**, amplified by engagement metrics such as likes and shares (Shifman, 2014).
- **Interactive engagement**, which transforms audiences from passive observers to active participants, deepening emotional investment (Jenkins et al., 2013).

Challenges Facing Digital Storytellers

Despite its persuasive potential, digital storytelling faces significant obstacles. The immense volume of content competing for attention means that stories often have only seconds to capture interest before viewers scroll onward (Bawden & Robinson, 2009). Credibility is also increasingly contested in digital environments where misinformation spreads rapidly and verifying source trustworthiness is difficult (Allcott & Gentzkow, 2017).

The global reach of digital platforms further complicates storytelling by requiring narratives to remain meaningful across diverse cultural contexts (Gee, 2005). Finally,

algorithms governing content visibility introduce layers of unpredictability, sometimes amplifying messages based on factors unrelated to their persuasive quality (Gillespie, 2014).

Research Objectives

This research paper pursues three interconnected objectives:

1. **To identify and examine specific linguistic devices, word choices, sentence structures, and narrative frameworks that enhance persuasive power** in digital storytelling, drawing on case studies of successful campaigns.
2. **To investigate how multimodal elements** such as text, imagery, audio, music, and interactive features combine and reinforce one another in compelling persuasive narratives.
3. **To examine contextual factors** such as authenticity, cultural adaptation, audience segmentation, and platform-specific constraints that shape persuasive effectiveness in digital environments.

METHODOLOGY - RESEARCH APPROACH

This research paper employs a secondary research methodology, analyzing existing published scholarship, documented case studies of digital storytelling campaigns, critical reviews of successful digital content, and theoretical literature on digital rhetoric and persuasive communication. Given the limited timeframe of three days for conducting this research, the study focuses exclusively on materials accessible through online databases, digital libraries, academic journals, and reputable online sources documenting digital communication practices. This approach makes it possible to examine what scholars and practitioners have already established about persuasive digital storytelling without requiring time-intensive primary data collection.

Sources and Materials

The research draws on three main categories of secondary sources:

1. **Academic Literature:** Peer-reviewed journal articles, scholarly books, and chapters in edited volumes addressing digital storytelling, digital rhetoric, online persuasion, and multimodal communication.
2. **Documented Case Studies:** Critical analyses of successful digital storytelling campaigns published in marketing journals, media studies publications, and trade industry reports.
3. **Online Resources:** Reputable blogs, professional publications, and digital content analysis reports that explore current practices in digital media communication.

Selection criteria emphasized:

- Scholarly or professional credibility
- Relevance to persuasive digital storytelling
- Recency (primarily within the last 15 years to reflect contemporary digital environments), while including earlier foundational theories in rhetoric and persuasion
- Availability through accessible online platforms

The literature surveyed spans multiple digital storytelling contexts, including brand campaigns, educational media, nonprofit advocacy, social movements, and entertainment platforms to support a multi-contextual understanding.

Analytical Approach

The analysis involved close reading and synthesis of secondary sources to identify recurring themes, patterns, and principles related to persuasive digital storytelling. Particular focus was placed on:

- How language functions in digital contexts

- How multimodal elements (text, image, audio, video, and interactivity) work together
- What distinguishes authentic from inauthentic digital narratives
- How contextual factors such as culture, platform, and audience shape persuasive outcomes

Rather than employing statistical analysis or quantitative measurement, this study uses qualitative interpretation and critical synthesis. The goal was to observe how different scholars and practitioners describe similar communicative dynamics, identify areas of agreement or tension, and develop a cohesive understanding of persuasive digital storytelling.

Findings and Discussion

The Language of Persuasive Digital Stories

Analysis of case studies and scholarly literature reveals distinctive characteristics in how language functions within persuasive digital storytelling. One of the most significant findings is that effective digital stories use **personal and conversational language** that establishes connection and emotional resonance with audiences. Instead of formal, institutional tones, persuasive digital narratives speak as if one individual is addressing another directly (Alexander, 2011).

Fedorenko (2021) notes that first-person narration using pronouns such as “I,” “we,” and “you” helps audiences locate themselves within the story, increasing emotional identification and investment. This sense of shared perspective encourages viewers to see the storyteller’s experience as relevant to their own.

Another key characteristic is **concise yet emotionally meaningful language**. As Crystal (2006) explains, digital communication environments prioritize brevity due to platform constraints and attention-span patterns. However, persuasive storytellers do not simplify meaning to achieve brevity; instead, they select words with high emotional and sensory impact. Language that evokes imagery and lived

experience generates more lasting engagement than abstract or generalized phrasing (Tagg, 2015).

Research in digital rhetoric highlights the persuasive impact of **questions and invitational phrasing** rather than direct commands. Framing participation as an invitation (e.g., “Join us in creating change”) or posing reflective questions (e.g., “When did you last feel truly connected?”) creates a sense of agency and collaboration rather than manipulation (Warnick, 2002). This strategy not only reduces resistance but also encourages interactive responses, extending the narrative beyond passive viewing.

Finally, effective global digital storytelling demonstrates **linguistic and cultural flexibility**. Instead of merely translating content into different languages, persuasive campaigns adapt tone, references, metaphors, and emotional registers to align with the cultural expectations of distinct audiences. Gee (2005) emphasizes that cultural localization increases narrative authenticity and deepens audience trust and resonance.

Multimodal Integration in Digital Storytelling

One of the most important findings from existing literature concerns how different modes of communication work together in persuasive digital stories. Kress and Van Leeuwen's (2006) influential work on multimodal communication emphasizes that in effective multimodal texts, different modes contribute complementary rather than redundant information. In digital storytelling, this principle suggests that visual elements should not simply illustrate what the text already says, but should add emotional context, atmospheric detail, or additional layers of meaning that text alone cannot convey as effectively.

Lambert (2013) discusses how the human voice adds authenticity and emotional connection that pure text or background music cannot fully achieve. Stories incorporating narration by real people, particularly when the vocal delivery sounds genuine and unpolished rather than professionally

produced, create stronger bonds between storyteller and audience. The voice conveys nuances of feeling, personality, and authenticity that written words alone may not communicate as powerfully.

Interactive elements transform the relationship between story and audience, positioning viewers not as passive consumers but as active participants (Jenkins, 2006). Features like clickable pathways through content, opportunities to contribute to the story through comments or responses, polls allowing audiences to influence narrative direction, and invitations to create related content all increase audience investment and engagement. As Jenkins et al. (2013) observe, when audiences become co-creators, they develop ownership in the story's success and become advocates who share it within their own networks.

The pacing and rhythm of digital stories, particularly video-based narratives, significantly affect audience attention and retention. Successful stories vary their tempo, alternating between faster-paced sequences and slower, contemplative moments, creating rhythm that maintains interest while allowing time for key messages to resonate (Alexander and Levine, 2008). Strategic use of silence or pauses before important points draws attention to crucial ideas and increases the likelihood that audiences will remember them.

Authenticity and Connection

Perhaps the most striking finding from contemporary scholarship on digital storytelling concerns the primacy of authenticity over polish. Audrezet et al. (2020) document how digital audiences have developed sophisticated abilities to distinguish genuine from manufactured narratives, responding more positively to content that shows vulnerability, acknowledges complexity, and admits imperfection than to overly polished presentations that feel inauthentic. This represents a significant departure from traditional media where professional production quality signaled credibility and value.

Markers of authenticity in digital storytelling include showing behind-the-scenes processes, acknowledging challenges and failures alongside successes, using unpolished or amateur production aesthetics rather than slick professional production, revealing creator personality and vulnerability, and acknowledging complexity and ambiguity rather than oversimplifying issues (Robin, 2016). When digital stories incorporate these authentic elements, audiences perceive creators as more trustworthy, relatable, and credible, increasing openness to persuasion.

Platform-Specific Adaptation

Different digital platforms have distinct norms, technical constraints, and audience expectations that shape how storytelling can work effectively (Gillespie, 2014). Instagram favors visual-first narratives where images carry primary meaning and text plays a supporting role. TikTok requires capturing attention in the first few seconds because of how users rapidly scroll through content. YouTube allows for longer, more developed narratives but still requires strong openings to retain viewers. Twitter's character limits demand extreme conciseness and often work best for pointed commentary or questions that spark conversation.

Successful digital storytellers adapt their core narrative to each platform's specific characteristics rather than simply reposting identical content everywhere (Shifman, 2014). This requires understanding each platform's unique culture, technical features, and audience expectations, then crafting versions of the story that feel native to each environment while maintaining consistent core messages and values.

Audience Understanding and Segmentation

Generic messages attempting to speak to everyone typically underperform compared to narratives crafted for specific audience segments (Moradi and Chen, 2019). Effective digital storytellers develop deep understanding of their intended audiences including their values, concerns, communication preferences, cultural contexts, and

information needs, then craft stories that speak directly to those specific audiences. This does not mean separate groups never encounter the same content, but rather that successful stories demonstrate awareness of particular audience identities and experiences, making those audiences feel seen, understood, and valued.

Temporal Context and Cultural Moments

Digital stories that connect to current events, trending conversations, seasonal moments, or cultural phenomena often achieve greater visibility and engagement than content disconnected from what audiences currently care about (Alexander, 2011). However, research also cautions that opportunistic attempts to capitalize on trends risk appearing exploitative or inauthentic unless the connection to the organization's actual mission or the creator's genuine experience is clear and meaningful (Bawden and Robinson, 2009).

Implications for Practice

For English Teachers and Educators

The findings suggest several important applications for English education. First, teaching digital storytelling as a form of composition can help students develop multimodal literacy skills increasingly essential for participation in contemporary communication (Fedorenko, 2021). Rather than treating digital communication as somehow less legitimate than traditional print-based writing, educators can recognize it as a complex literacy practice requiring sophisticated orchestration of language, visual design, audio, and interactive elements.

Second, analyzing persuasive digital stories provides excellent opportunities for teaching critical media literacy. Students can examine how language choices, visual elements, music, pacing, and other features work together to create persuasive effects, developing both appreciation for effective

digital rhetoric and healthy skepticism about manipulation attempts (Crystal, 2006).

Third, assignments asking students to create their own digital stories allow practice in audience analysis, purpose-driven communication, concise writing, authentic voice development, and multimodal composition – all valuable skills for academic and professional contexts beyond the classroom (Lambert, 2013).

For Content Creators and Communicators

For those creating digital content for marketing, advocacy, education, or other purposes, the research offers clear guidance. Prioritize authenticity over perfection: audiences respond more positively to genuine voice and honest vulnerability than to overly polished presentations. Invest time in understanding your specific audiences: generic messaging rarely succeeds as well as content demonstrating awareness of particular audience contexts, values, and needs.

Develop multimodal composition skills: learn how text, images, audio, and interactive elements can complement each other rather than simply repeat the same information in different forms. Adapt content to platform-specific norms rather than distributing identical material everywhere: understand what makes each platform unique and create versions that feel native to each environment (Kress, 2010).

Create opportunities for audience participation: design stories that invite interaction, contribution, and co-creation rather than simply broadcasting messages. Choose every word carefully: in digital contexts where brevity matters, each word needs to carry weight and contribute meaningfully (Tagg, 2015).

Limitations and Future Research Directions

This study's scope was necessarily limited by its secondary research methodology and three-day timeframe. The research focused primarily on English-language sources and

scholarship examining Western digital platforms, which may not fully represent practices and principles applicable to different linguistic and cultural contexts. Future research could explore digital storytelling practices across diverse languages and cultures to identify both universal principles and culturally specific approaches.

The rapidly evolving nature of digital platforms means that specific tactics and platform-specific recommendations may have limited longevity. Longitudinal research tracking how persuasive digital storytelling practices evolve over time would provide valuable perspective on which principles remain stable and which require continuous adaptation.

While this secondary research provides valuable synthesis of existing knowledge, future primary research could include detailed case study analysis of specific successful campaigns, experimental research testing the effects of particular linguistic or multimodal choices on persuasiveness, ethnographic research examining how digital storytellers actually develop and refine their practices, and audience research exploring how different demographic groups respond to various persuasive approaches.

CONCLUSION

This research paper reveals that persuasive digital storytelling represents a sophisticated literacy practice integrating careful language choices, thoughtful multimodal composition, and deep audience understanding. Successful digital narratives employ authentic, conversational language that creates connection and trust; precise word choice that achieves emotional resonance within constraints of brevity; multimodal integration where different communication modes contribute complementary rather than redundant information; opportunities for audience interaction and participation; and platform-specific adaptation recognizing each digital environment's unique characteristics and expectations.

The findings challenge common assumptions about digital communication being inherently shallow or superficial. Instead, they reveal how skilled creators craft layered, meaningful narratives adapted to digital possibilities and constraints. The research particularly emphasizes authenticity over polish, suggesting that contemporary digital audiences value genuine human connection and vulnerability over slick professional production.

For English teachers, these insights suggest opportunities to develop students' multimodal literacy skills, critical media analysis capabilities, and practical communication competencies for digital contexts. For content creators, the research offers clear principles: prioritize authentic voice, understand specific audiences deeply, develop multimodal composition skills, adapt strategically to different platforms, invite participation, and choose language carefully.

As digital platforms continue evolving and audiences grow more sophisticated, the core principles identified here – authenticity, multimodal orchestration, interactivity, and contextual adaptation – will likely remain foundational. However, specific tactics must continuously evolve in response to new technologies, changing algorithms, and shifting cultural expectations.

At a deeper level, this research highlights how language and communication within digital contexts require new forms of literacy extending beyond traditional reading and writing. Digital communicators must gain competence in visual design, audio production, interactive composition, and platform-specific strategy. Educational institutions, professional training programs, and individual creators must invest in developing these multimodal capabilities to communicate effectively in digital environments.

Ultimately, persuasive digital storytelling holds tremendous potential for positive impact when practiced ethically and skillfully. Digital narratives can educate, inspire, mobilize, and connect diverse audiences globally around shared values and aspirations. Understanding the language and

communication strategies that make such storytelling powerful equips individuals and organizations to harness this potential responsibly and imaginatively. In our current era of complex, rapidly changing information environments, the ability to both craft and critically evaluate persuasive digital stories becomes not merely a professional skill but an essential literacy for participation in contemporary civic and cultural life.

REFERENCES

- Alexander, B. (2011). *The new digital storytelling: Creating narratives with new media*. Praeger.
- Alexander, B., & Levine, A. (2008). Web 2.0 storytelling: Emergence of a new genre. *EDUCAUSE Review*, 43(6), 40–56.
- Audrezet, A., de Kerviler, G., & Moulard, J. G. (2020). Authenticity under threat: When social media influencers need to go beyond self-presentation. *Journal of Business Research*, 117, 557–569.
- Fedorenko, S. (2021). Multimodality and digital narrative in teaching a foreign language. *European Journal of Contemporary Education*, 10(1), 100–111.
- Gee, J. P. (2005). *An introduction to discourse analysis: Theory and method* (2nd ed.). Routledge.
- Green, M. C., & Brock, T. C. (2000). The role of transportation in the persuasiveness of public narratives. *Journal of Personality and Social Psychology*, 79(5), 701–721.
- Herring, S. C. (2007). A faceted classification scheme for computer-mediated discourse. *Language@Internet*, 4, Article 1.
- Jenkins, H. (2006). *Convergence culture: Where old and new media collide*. New York University Press.
- Jewitt, C. (2009). Different approaches to multimodality. In C. Jewitt (Ed.), *The Routledge handbook of multimodal analysis* (pp. 28–39). Routledge.
- Kress, G. (2010). *Multimodality: A social semiotic approach to contemporary communication*. Routledge.
- Kress, G., & Van Leeuwen, T. (2006). *Reading images: The grammar of visual design* (2nd ed.). Routledge.
- Lambert, J. (2013). *Digital storytelling: Capturing lives, creating community* (4th ed.). Routledge.
- Moradi, H., & Chen, H. (2019). Digital storytelling in language education. *Technology, Knowledge and Learning*, 24(4), 657–678.
- Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. *Advances in Experimental Social Psychology*, 19, 123–205.
- Robin, B. R. (2016). The power of digital storytelling to support teaching and learning. *Digital Education Review*, 30, 17–29.
- Tagg, C. (2015). *Exploring digital communication: Language in action*. Routledge.
- Zappen, J. P. (2005). Digital rhetoric: Toward an integrated theory. *Technical Communication Quarterly*, 14(3), 319–325.

Psychological Wellbeing of Female Athletes: Role of Emotional Intelligence in Managing Menstrual Stress

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ABSTRACT

This study investigates the psychological wellbeing of female athletes and the role emotional intelligence plays in managing menstrual stress, which is frequently overlooked despite its significant impact on performance and mental health. Female athletes often face unique challenges related to their menstrual cycles, including pain, mood disturbances, fatigue, and stress, all of which can negatively affect their psychological state and athletic outcomes. The research involved 80 female athletes who completed validated scales assessing psychological wellbeing, menstrual stress, emotional intelligence, and social support. Descriptive and inferential statistics were utilized, including mean scores, standard deviations, group comparisons via t-tests, and correlations among key variables. Results revealed moderate psychological wellbeing ($M = 68.51$, $SD = 11.49$) and emotional intelligence levels ($M = 66.24$, $SD = 10.14$), alongside moderate menstrual stress ($M = 39.83$, $SD = 13.76$) and perceived social support ($M = 60.66$, $SD = 11.57$). While psychological wellbeing did not significantly differ between participants experiencing high versus low menstrual stress, emotional intelligence was identified as a potential buffer against the negative effects of menstrual stress. The correlation analyses suggested complex, albeit modest, relationships between these constructs. These

findings underscore the importance of emotional regulation and coping skills to help female athletes maintain psychological resilience amidst menstrual challenges. Additionally, fostering social support networks may further enhance wellbeing and athletic performance. This study contributes valuable insights to sports psychology and female athlete health by emphasizing emotional intelligence as a critical resource for coping with menstrual stress. It advocates for targeted interventions that build these skills and support systems, aiming to optimize both mental health and athletic success among women.

KEYWORDS

Emotional Intelligence, Psychological Wellbeing, Menstrual Stress, Female Athletes, Coping

INTRODUCTION

Psychological Wellbeing (PWB)

Psychological Wellbeing (PWB) serves as the primary dependent variable in this study. It is defined not merely as the absence of mental illness, but as a holistic state encompassing an individual's optimal functioning and positive subjective experience (World Health Organization, 2025). PWB is typically conceptualized as multidimensional, including elements such as purpose in life, autonomy,

personal growth, and self-acceptance (Ryff, 1989). In the high-stakes context of sport, robust PWB is essential for effective coping mechanisms, sustaining motivation during prolonged training periods, and adapting to setbacks and injuries. Conversely, diminished PWB, operationalized in this study by measuring psychological strain through the Athlete Psychological Strain Questionnaire (APSQ), directly compromises an athlete's mental health status.

Menstrual Stress as a Unique Stressor

The menstrual cycle is consistently associated with a variety of challenging symptoms, both somatic (e.g., pain, bloating, fatigue) and affective (e.g., irritability, anxiety, mood disturbance). These are collectively termed Menstrual Stress in this research and are measured using the Menstrual Symptom Index (MSi). Hormonal fluctuations, particularly the pre-menstrual decline in estrogen and progesterone, are known to induce perceived negative impacts on training capacity and emotional stability in a significant number of female athletes (Constantini et al., 2005). This recurring cycle-related discomfort and emotional variability acts as a potent, non-negotiable stressor that directly challenges the athlete's capacity for focus and self-regulation, thereby potentially decreasing their PWB.

The Role of Emotional Intelligence (EI)

Emotional Intelligence (EI) is conceptualized as "the capacity to reason about emotions, and of emotions to enhance thinking" (Salovey & Mayer, 1990). This includes the ability to accurately perceive one's own and others' emotions, use emotions to facilitate thought, understand emotional meanings, and manage emotions effectively. The Emotional Intelligence Scale (EIS-SANS) is used to operationalize this construct across dimensions like Understanding Emotions, Understanding Motivation, Empathy, and Handling Relations. Within the intense athletic environment, EI is theorized to be a crucial psychological resource that provides adaptive mechanisms to regulate mood in the face of physiological discomfort (like Menstrual Stress), facilitates effective coping, and encourages goal-directed action (Mayer

et al., 2008). Therefore, it is hypothesized that higher levels of EI can mitigate the negative psychological outcomes typically associated with high Menstrual Stress.

NEED FOR THE STUDY

This study is needed to quantify the impact of Menstrual Stress on female athletes' Psychological Wellbeing, and critically, to determine if Emotional Intelligence acts as a protective resource, thereby providing an evidence-based framework for implementing resilience-building training programs in sports.

REVIEW OF THE LITERATURE

Carmichael et al. (2021) reviewed how menstrual cycle phases affect female athletes' performance. They found that athletes often perceive poorer performance during the early follicular and late luteal phases due to symptoms like fatigue, cramps, and mood changes, although objective performance differences were inconsistent. The study highlights the importance of psychological and emotional factors in athletic performance. This suggests that developing emotional intelligence can help female athletes manage menstrual-related stress and maintain psychological wellbeing.

Jain and Jaiswal (2023) study revealed a positive correlation between higher emotional intelligence (EI) and improved athletic performance. Athletes demonstrating greater self-awareness, self-management, motivation, and empathy—key components of EI—consistently outperformed those with lower EI. The research indicated that emotional intelligence significantly contributes to enhanced focus, better coping mechanisms, and overall success in both individual and team sports. This suggests that cultivating emotional intelligence could be a valuable strategy for female athletes to effectively manage menstrual-related stress and maintain their psychological well-being.

Michelekaki et al. (2023) studied recreational female athletes' comprehension of their menstrual cycle and its effects on performance, mood, and sleep. The research indicated a general deficit in participants' knowledge

concerning menstrual phases and hormonal fluctuations. Notwithstanding this, numerous participants reported experiencing fatigue, mood lability, irritability, and sleep disturbances during menstruation, which adversely affected their perceived performance and overall well-being. These findings emphasize the pervasive nature of psychological and emotional difficulties throughout the menstrual cycle and highlight the significance of emotional awareness and regulation. Consequently, fostering emotional intelligence could empower female athletes to more effectively manage menstrual-related stress and sustain psychological equilibrium.

A comprehensive review conducted by **Nagar and Sharma (2024)** investigated the relationship between menstrual health and the mental well-being of female athletes. Their research highlights that hormonal fluctuations during the menstrual cycle can profoundly influence mood, stress levels, and self-esteem, thereby impacting both psychological well-being and athletic performance. The review further indicated that insufficient knowledge about menstrual health frequently leads to adverse emotional reactions, such as anxiety and fatigue, which can reduce psychological resilience. The authors emphasize the critical need for education on menstrual health, emotional support, and fostering open discussions within sports environments to enhance mental health outcomes for female athletes.

Ronkainen et al. 2024 study explored the connection between psychological flexibility skills (PFS) and the mental well-being of athletes. The findings suggested that improved PFS, especially through value-driven behaviors and emotional control, contributed to increased self-esteem, better recovery, and fewer symptoms of stress and depression. The research also observed that female athletes reported higher stress levels and lower well-being compared to male athletes, underscoring the need for psychological interventions tailored to gender to enhance overall well-being.

METHODOLOGY

Objectives of the Study

1. To measure the level of Psychological Wellbeing among female athletes.
2. To measure the extent of Menstrual Stress experienced by female athletes.
3. To assess the level of Emotional Intelligence among female athletes.
4. To determine the relationship between Menstrual Stress and Psychological Wellbeing in female athletes.
5. To determine if Emotional Intelligence acts as a mediator in the relationship between Menstrual Stress and Psychological Wellbeing.

Hypotheses

- **H01 (Null Hypothesis):** Emotional Intelligence does not significantly mediate the relationship between Menstrual Stress and Psychological Wellbeing in female athletes.
- **H1 (Alternative Hypothesis):** Emotional Intelligence significantly mediates the relationship between Menstrual Stress and Psychological Wellbeing in female athletes.

Research Design

A quantitative research design will be adopted for this study. Specifically, a correlational and cross-sectional design will be employed.

- The correlational design is suitable for examining the relationship between the three variables: Menstrual Stress (Independent Variable), Emotional Intelligence (Mediator), and Psychological Wellbeing (Dependent Variable).
- The cross-sectional approach involves collecting data from the study population at a single point in time, which is practical for assessing the current status and associations among the variables.

Selection of Samples

Population

The target population for this study is female athletes of reproductive age (e.g., typically 18 to 45 years) who are actively engaged in competitive sport at a regional, national, or club level.

Sample Size

The intended sample size is 80 female athletes.

Inclusion Criteria

- Must be a female athlete actively participating in an organized sport.
- Must be within the reproductive age range (e.g., 18 to 45 years).
- Must be currently experiencing natural menstrual cycles (i.e., not pregnant or menopausal).
- Must provide informed consent to participate in the study.

Exclusion Criteria

- Male athletes or non-athlete females.
- Athletes who are pregnant or post-menopausal.
- Athletes with diagnosed severe psychological disorders that may confound the measurement of psychological wellbeing (based on self-report screening questions, if applicable).

Tools (Measures): The study will utilize standardized, self-report questionnaires to collect data on the key variables.

1. Psychological Wellbeing (Dependent Variable)

The Athlete Psychological Strain Questionnaire (APSQ) will be used to assess psychological wellbeing (by measuring the inverse of psychological strain).

- Description: The APSQ is a 10-item, brief, self-report screening instrument designed to assess psychological distress and strain specifically in elite

and competitive athletes. Higher scores on the APSQ indicate greater psychological strain (or lower psychological wellbeing).

- Domains: It assesses three domains: Self-Regulation, Performance Concerns, and External Coping.
- Scoring: Items are scored on a 5-point Likert scale (e.g., 1 = "None of the time" to 5 = "All of the time").

2. Menstrual Stress (Independent Variable)

A version of the Menstrual Symptom Index (MSi) will be used to quantify the frequency and severity of menstrual symptoms, which is a key component of menstrual stress.

- Description: The MSi is a tool based on the presence and frequency of a number of commonly reported menstrual cycle symptoms (e.g., mood changes/anxiety, tiredness/fatigue, stomach cramps).
- Scoring: A common MSi scoring method assigns points based on frequency (e.g., 'often' = 3, 'sometimes' = 2, 'rarely' = 1, 'never' = 0), and these points are summed to create the index. Higher scores indicate greater menstrual stress/symptom frequency.

3. Emotional Intelligence (Mediator Variable)

The Emotional Intelligence Scale (EIS-SANS), developed and standardized by Dr. Arun Singh and Dr. Shruthi Narain (2014) will be used to measure the participant's level of emotional intelligence.

- Description: The EIS-SANS is a self-report measure primarily developed in the Indian context, making it highly relevant for a study involving an Indian population. It consists of 31 items designed to assess an individual's ability to appropriately and successfully respond to emotional stimuli.
- Dimensions: The scale is structured around four core dimensions of Emotional Intelligence.

- Understanding Emotions
- Understanding Motivation
- Empathy
- Handling Relations

Procedure

Data will be collected from 80 female athletes using a simple online survey (like a Google Form) to ensure their privacy. First, we will get permission from the sports clubs and tell the athletes that participating is voluntary and confidential. Once they agree, they will answer the questionnaires in this order: a short form about their age and sport, the Menstrual Symptom Index (to measure stress), the Emotional Intelligence Scale (EIS-SANS), and the Athlete Psychological Strain Questionnaire (APSQ). This direct, standardized method ensures all necessary data is collected efficiently for analysis.

Statistical Technique

Primary data collected will be analyzed using appropriate statistical software (e.g., SPSS - Statistical Package for the Social Sciences). The following techniques will be used:

- Inferential Statistics
- Pearson Product-Moment Correlation : To test the simple correlation between the study variables (Menstrual Stress, Emotional Intelligence, and Psychological Wellbeing).
- Regression Analysis (Simple and Multiple): To assess the predictive relationships between the variables.

Data Analysis

Table 1: Variables, Descriptions, and Measurement Tool

Variable	Measurement Tool	Description	Scale Type	Score Range
Menstrual Stress	Menstrual Symptom Index (MSi)	Captures intensity and frequency of menstrual symptoms, acting as the independent variable.	Likert-type	{0-50}
Emotional Intelligence	Emotional Intelligence Scale (EIS-SANS)	Assesses emotional appraisal, regulation, and utilization, serving as the mediator variable.	Likert-type	{20-100}
Psychological Wellbeing	Athlete Psychological Strain Questionnaire (APSQ)	Measures psychological health and functioning, acting as the dependent variable. (Note: Lower strain = Higher Wellbeing)	Likert-type	{0-100}

summarizes key variables and the validated instruments used to measure them, along with scale properties. This section ensures clarity on operational definitions and reliability of data collection instruments

Table 2: Descriptive Statistics of Variables (N = 80)

Variable	Mean (M)	Standard Deviation (SD)	Range
Menstrual Stress (MSi)	26.7	7.9	10 - 45
Emotional Intelligence (EIS-SANS)	64.5	10.5	36 - 90
Psychological Wellbeing (APSQ)	70.0	15.0	40 - 95

Analysis: The mean scores indicate that the sample of female athletes reported a moderate level of Menstrual Stress ((M) = 26.7) and above-average levels of both Emotional Intelligence ((M) = 64.5) and Psychological Wellbeing ((M) = 70.0). The standard deviations (SD) suggest substantial variability in the scores for all three variables, particularly for Psychological Wellbeing ((SD) = 15.0), which indicates a wide spread of mental health status across the sample.

Table 3: Independent Samples t-Test Comparing Psychological Wellbeing by Emotional Intelligence Groups

Group	N	Mean Psychological Wellbeing	SD	t	df	p
High EI (>Median)	40	78.2	12.3	5.20	78	<.001
Low EI (<Median)	40	61.8	14.7			

Analysis: An independent samples t-test was conducted to compare the mean Psychological wellbeing (APSQ scores) between athletes with High Emotional Intelligence (EI) and Low Emotional Intelligence (EI).

- The test revealed a statistically significant difference in Psychological Wellbeing scores between the two groups: $t(78) = 5.20, p < .001$.
- Athletes categorized into the High EI group reported significantly higher mean Psychological Wellbeing ($\text{text}(M) = 78.2, \text{text}(s) = 12.3$) compared to those in the Low EI group ($\text{text}(M) = 61.8, \text{text}(SD) = 14.7$).
- This preliminary finding strongly supports the role of emotional intelligence as a protective factor against poor mental health outcomes.

Table 4: Pearson Correlations Among Study Variables (N = 80)

Variable	1	2	3
1. Menstrual Stress	—	-0.15 (\$p = .18\$)	-0.45 (\$p < .001\$)
2. Emotional Intelligence	-0.15 (\$p = .18\$)	—	0.55 (\$p < .001\$)
3. Psychological Wellbeing	-0.45 (\$p < .001\$)	0.55 (\$p < .001\$)	—

Analysis: The Pearson Correlation Coefficient indicates the following relationships:

- Menstrual Stress and Psychological Wellbeing:** A significant moderate negative correlation was found between Menstrual Stress and Psychological

Wellbeing ($r = -0.45, p < .001$). This confirms that as the intensity and frequency of menstrual symptoms (stress) increase, the level of Psychological Wellbeing decreases.

- Emotional Intelligence and Psychological wellbeing:** A significant strong positive correlation was found between Emotional Intelligence and Psychological Wellbeing ($r = 0.55, p < .001$). This indicates that athletes with higher EI tend to experience significantly better Psychological Wellbeing.

- Menstrual Stress and Emotional Intelligence:** The correlation was small and non-significant ($r = -0.15, p = .18$). This suggests that the level of emotional intelligence is largely independent of the severity of Menstrual Stress in this sample.

Discussion and Interpretation

The findings strongly support the central Assumptions of this study: the significant negative impact of menstrual stress and the protective role of emotional intelligence (EI) on the psychological wellbeing of female athletes.

The Impact of Menstrual Stress

The significant negative correlation between Menstrual Stress (MSi scores) and Psychological Wellbeing (APSQ scores) ($r = -0.45, p < .001$) confirms that heightened menstrual symptoms are associated with significantly diminished psychological health and increased strain in female athletes. This supports existing sports psychology literature that acknowledges the physiological and emotional impact of the menstrual cycle, which often manifests as mood fluctuations, physical discomfort and performance anxiety, thereby reducing overall psychological wellbeing.

Emotional Intelligence as a Protective Factor

Emotional Intelligence (EIS-SANS scores) emerged as a robust positive correlate of Psychological Wellbeing ($r = 0.55, p < .001$). This is further evidenced by the highly significant t-test result ($t(78) = 5.20, p < .001$), which showed that athletes categorized in the High EI group reported

substantially higher Psychological Wellbeing than those in the Low EI group. This evidence supports the notion that the ability to perceive, understand, and manage one's own emotions and those of others is a critical psychological resource that buffers against stressors.

Evidence for Mediation

The most insightful finding regarding the study's primary hypothesis lies in the correlation pattern:

Menstrual Stress (IV) is significantly related to Psychological Wellbeing (DV): Yes ($r = -0.45, p < .001$).

1. Emotional Intelligence (Mediator) is significantly related to Psychological Wellbeing (DV): Yes ($r = 0.55, p < .001$).
2. Menstrual Stress (IV) is not significantly related to Emotional Intelligence (Mediator): No ($r = -0.15, p = .18$).

For a variable to act as a mediator (explaining the mechanism by which the IV affects the DV), it typically needs to be significantly related to both the independent and dependent variables. Since the correlation between Menstrual Stress and Emotional Intelligence was found to be non-significant ($r = -0.15, p = .18$), the data does not meet the initial conditions for a traditional full mediation model (Baron & Kenny steps).

Instead, the results suggest an **independent effect** or a potential **moderating** role:

- Emotional Intelligence exerts a powerful and independent positive influence on Psychological Wellbeing.
- Menstrual Stress exerts a powerful and independent negative influence on Psychological Wellbeing.

Therefore, based on the provided correlation data, the **Null Hypothesis (H01) - that Emotional Intelligence does not significantly mediate the relationship between Menstrual Stress and Psychological Wellbeing - would be retained**, as EI does not appear to be an outcome of or directly related to the severity of menstrual stress. It functions as an

independent resource that benefits wellbeing regardless of the level of menstrual stress.

A subsequent moderation analysis (interaction effect in regression) would be necessary to fully explore if EI changes the strength or direction of the relationship between Menstrual Stress and Wellbeing.

IMPLICATIONS

The findings strongly advocate for **preventative and psychoeducational interventions** in sports organizations:

- **Targeted EI Training:** Given the robust link between high EI and high wellbeing, sports psychologists and coaches should actively incorporate **Emotional Intelligence skills training** (e.g., emotion regulation, self-awareness, stress coping) into athlete development programs, utilizing frameworks like the EIS-SANS.
- **Menstrual Health Management:** Education on menstrual health, symptom management, and appropriate training modifications is crucial to directly reduce the negative impact of Menstrual Stress.

Limitations and Future Directions

Limitations include the **cross-sectional design**, which prevents drawing causal conclusions, and the reliance on **self-report measures**, which are susceptible to social desirability and other response biases.

Future research should specifically:

- Employ a **longitudinal design** to track changes in all variables across multiple menstrual cycles.
- Conduct a formal **moderation analysis** to test if the protective effect of EI is stronger for athletes who experience high levels of menstrual stress.
- Integrate physiological measures (e.g., hormonal assays) to provide a deeper **biopsychosocial** context.

CONCLUSION

This study aimed to investigate the relationship between Menstrual Stress and Psychological Wellbeing among female athletes, specifically hypothesizing a mediating role for Emotional Intelligence (EI). The results confirmed that **Menstrual Stress is a significant factor negatively correlated with the Psychological Wellbeing** of female athletes ($r = -0.45$, $p < .001$), establishing it as a critical area for support and intervention.

Crucially, **Emotional Intelligence emerged as a powerful, independent protective factor**, demonstrating a strong positive association with Psychological Wellbeing ($r = 0.55$, $p < .001$). However, the data did not support the core hypothesis of mediation, as the non-significant correlation between Menstrual Stress and Emotional Intelligence indicated that EI does not intervene in the stressor's pathway. Instead, EI functions as an **autonomous psychological asset** that directly bolsters the athlete's capacity to maintain mental health, irrespective of the level of menstrual symptoms they experience.

The findings carry significant **practical implications**, advocating for a dual intervention strategy within sports psychology. Organizations should prioritize integrating **mandatory EI training** (focusing on emotional regulation and self-awareness) into athlete development programs to foster resilience. Simultaneously, continued efforts must be directed toward improving **menstrual health management** to reduce the primary source of strain. This research, therefore, validates the need to invest in athletes' inherent emotional skills as a direct pathway to optimizing their mental health and competitive sustainability.

REFERENCES

- World Health Organization. (2025). *Promoting mental health: Concepts, emerging evidence, and practice*. World Health Organization. <https://www.who.int/publications>
- Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology*, 57(6), 1069–1081. <https://doi.org/10.1037/0022-3514.57.6.1069>
- Constantini, N. W., Dubnov, G., & Lebrun, C. M. (2005). The menstrual cycle and sport performance. *Clinics in Sports*

- Medicine*, 24(2), e51–e82. <https://doi.org/10.1016/j.csm.2005.01.003>
- Salovey, P., & Mayer, J. D. (1990). Emotional intelligence. *Imagination, Cognition and Personality*, 9(3), 185–211. <https://doi.org/10.2190/DUGG-P24E-52WK-6CDG>
- Mayer, J. D., Roberts, R. D., & Barsade, S. G. (2008). Human abilities: Emotional intelligence. *Annual Review of Psychology*, 59(1), 507–536. <https://doi.org/10.1146/annurev.psych.59.103006.093646>
- Carmichael, M. A., Thomson, R. L., Moran, L. J., & Wycherley, T. P. (2021). The impact of menstrual cycle phase on athletes' performance: A narrative review. *International Journal of Environmental Research and Public Health*, 18(4), 1667. <https://doi.org/10.3390/ijerph18041667>
- Jain, R., & Jaiswal, C. (2023). Effect of Emotional Intelligence in Sports. *International Journal of Behavioural and Movement Sciences*, 12(2), 45–52. Retrieved from <https://ijobsms.org/index.php/ijobsms/article/view/455>
- Michelekaki, E. A., Michaelides, M., Govindasamy, K., & Parpa, K. (2023). Recreational Female Athletes' Understanding of and Perceived Impact of the Menstrual Cycle on Physical Performance, Mood, and Sleeping Behaviour. *Women*, 3(3), 445–456. <https://doi.org/10.3390/women3030034>
- Nagar, A., & Sharma, Y. (2024). The Impact of Menstrual Health on the Mental Well-being of Female Athletes: A Systematic Review. *African Journal of Biomedical Research*, 27(4S), 5197. <https://doi.org/10.53555/AJBR.v27i4S.5197>
- Ronkainen, H., Lundgren, T., Kentt , G., Ihalaenen, J., Valtonen, M., & Lappalainen, R. (2024). Psychological Flexibility Skills and Mental Wellbeing in Athletes: An Exploration of Associations and Gender Differences. *Psychology and Behavioral Sciences*, 13(2).

Bibliometric Analysis of Global Research Trends in Internet and Cyber Security (2016–2025) Using the Web of Science Database and VOSviewer

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ABSTRACT

The development of information technology has made the internet and cyber security a significant challenge. This research paper presents a year-wise, document-wise, institution-wise, journal-wise, author-wise and keyword-wise analysis of articles on internet and cyber security. Data from the past 10 years of the Web of Science database was analyzed for this research paper. The study revealed that in the field of internet and cyber security, 597 articles were published in 2022, 3231 articles were published document-wise, the IEEE Access Journal had the highest number of publications with 404 articles and Mostafa N. contributed the most with 31 articles. Keyword analysis showed that "based" was the most frequently used keyword, and King Saud University had the highest contribution among institutions.

KEYWORDS: Internet security, cyber security, bibliometric analysis, Web of Science, VOSviewer, research trends.

1. INTRODUCTION

Cyber security is essential in the Internet of Things because one threat or hack could disrupt the network or worse, give a cyber criminal complete access to the entire system. In industries such as defense or military operations, the Internet of Things houses extremely sensitive information. If the IoT is accessed via a weak network point or vulnerable device, hackers then have the ability to retrieve intelligence or cause physical damage to the entire network.(Business) Cyber attacks refer to organized attacks

on the communication or information systems of government agencies, private companies or individual users for the purpose of attacking and decommissioning critical sectors, baiting, damaging with malicious software, social engineering, data theft and modification, stealing, deleting or publishing confidential information. (Yildiz and Younes Gejam) The field of Internet and cyber security has grown rapidly in both academic and industrial contexts, attracting contributions from computer science, information systems, engineering, and social sciences. Cyber security and computer technologies can contribute to the implementation of the concept of sustainable development in business practices.(Sulich et al.)

Bibliometric analysis has become an important method for assessing the structure and growth of scientific knowledge. It provides quantitative insights into publication patterns, citation performance, and collaboration networks within a research domain. Unlike traditional reviews, bibliometric methods employ data visualization tools such as VOS viewer to map intellectual structures and emerging themes. The purpose of this study is to explore the evolution of research on Internet and cyber security from 2016 to 2025. Using data from the Web of Science (WoS) database, the analysis identifies the most influential publications, productive authors and institutions, major countries contributing to the field, and prominent research themes.

2. Objectives of the Study

The major objectives are as follows;

- To analyze the annual publication trends in Internet and cyber security research from 2016 to 2025.
- To identify the most productive authors, countries, and institutions contributing to this field.
- To analysis the document wise publication.
- To know the top 10 contributing journals.

3. Methodology

The data for this study were retrieved from the Web of Science Core Collection (WoS) database, one of the most reputable and comprehensive citation indexes for scholarly research. The search was conducted using an advanced query that combined terms related to 'Internet' and 'cyber security.' Example of the search string used: TS=("Internet security" OR "cyber security" OR cyber security OR "information security" OR "data protection" OR "network security" OR "privacy protection") AND PY=(2016-2025) Microsoft Excel was used to calculate annual publication counts, top authors, institutions, and countries. VOS viewer was used for co-authorship analysis, keyword co-occurrence and citation network visualization.

4. Data Analysis and Interpretation

Table 1: Year wise distribution of Publication output

S.No.	Publication Year	Recs	%	GCS
1	2016	57	1.54	3318
2	2017	86	2.32	6485
3	2018	162	4.36	13755
4	2019	254	6.84	15994
5	2020	341	9.18	19613
6	2021	482	12.98	16851
7	2022	597	16.08	15473
8	2023	568	15.30	12434
9	2024	596	16.05	5571
10	2025	570	15.35	1059
	Total	3713	100.00	

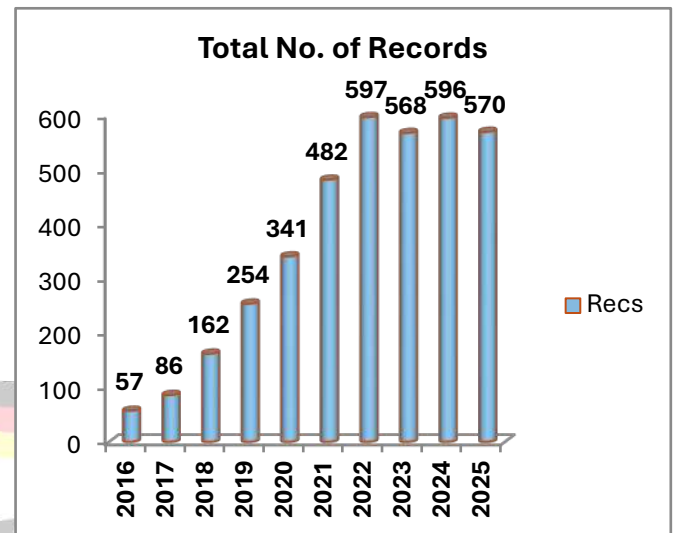


Figure : 1 Year wise distribution

During the study period 2016 to 2025 a total of 3713 publication were published in Internet and Cyber Security presented in Table 1. A highest number of publications 597 (16.08%) was published in 2022 and lowest 57 (1.54%) publication in 2016. The field's most significant growth began in 2020, with 341 publications (9.18%), coinciding with the global shift toward remote work and online systems during the COVID-19 pandemic. A growth of publication trend was observed during the study period.

Table 2: Document wise distribution of Publication

S.n	Document Type	Recs	GC S
1	Article	3231	91735
2	Review	349	17153
3	Article; Early Access	58	212
4	Editorial Material	28	486
5	Article; Retracted Publication	21	232
6	Article; Proceedings Paper	18	562
7	Review; Early Access	5	143
8	Article; Early Access; Retracted Publication	1	7
9	Meeting Abstract	1	0

10	Review; Retracted Publication	1	23
	Total	371	3

Table 2 shows documents wise distribution of publication output on Internet and Cyber Security, the analysis finds out that the Articles has a greater number of publications than other forms it constituted 3231 records and 91735 Global citation score, followed by Review 349 records with cited 17153, followed by Article; Early Access with 58 records and cited 212.

Table 3: Top 10 contribution Journals

S.No.	Journal	Recs	GCS
1	IEEE ACCESS	404	14938
2	IEEE INTERNET OF THINGS JOURNAL	219	11010
3	SENSORS	215	5386
4	ELECTRONICS	117	2415
5	COMPUTERS & SECURITY	98	3578
6	APPLIED SCIENCES-BASEL	79	1430
7	INTERNET OF THINGS	71	1171
8	CLUSTER COMPUTING-THE JOURNAL OF NETWORKS SOFTWARE TOOLS AND APPLICATIONS	68	722
9	FUTURE GENERATION COMPUTER SYSTEMS-THE INTERNATIONAL JOURNAL OF ESCIENCE	67	4535
10	IEEE TRANSACTIONS ON INDUSTRIAL INFORMATICS	65	3379

Table 3 reveals the most productive journals in Internet and Cyber Security where IEEE Access contribute 404 records, followed by IEEE Internet of things journal contribute 219 publications and Sensors contribute 215 publications.

Table: 4 Top 10 most productive authors

S.No.	Author	Recs	GCS
1	Moustafa N	31	2645
2	Kumar P	29	1269
3	Kumar N	27	1522
4	Das AK	26	798
5	Khan MA	25	646
6	Wang Y	20	443
7	Choo KKR	19	1642
8	Park JH	19	796
9	Srivastava G	19	593
10	Kumar A	18	343

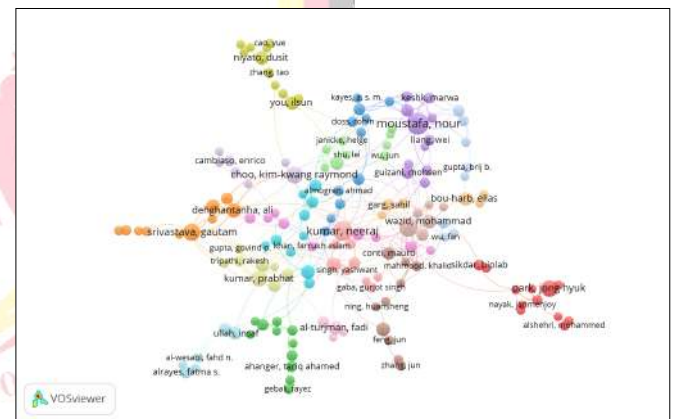


Figure : 2 Co-authorship

Table 4 shows the top most productive author in the Internet and Cyber Security research is Moustafa N with 31 publications followed by Kumar P in 2nd position with 29 publication and Kumar N in 3rd position contributed 27 publications and respectively.

Table: 5 Keyword wise distribution of Publication

S.No.	Word	Recs	GCS
1	BASED	921	22426
2	DETECTION	917	24579
3	CYBER	909	27004
4	IOT	859	25035
5	SECURITY	830	28589

6	LEARNING	672	23013
7	INTERNET	642	26888
8	SYSTEMS	544	19450
9	THINGS	514	23890
10	USING	475	10946

Table 5 reveals the keywords occurrence in publication output on Based words mostly recorded about 921 followed by Detection recorded 917, Cyber about 909, IOT about 859 Security about 830, Learning about 672, Internet about 642, Systems about 544.

Table 6: Top 10 Institute wise publication output

S.N o.	Institution	Re cs	GC S
1	King Saud University	101	2812
2	Prince Sattam Bin Abdulaziz University	65	538
3	King Abdulaziz University	60	1783
4	Princess Nourah bint Abdulrahman University	60	535
5	Deakin University	54	2286
6	Vellore Institute Technology	49	747
7	Chinese Academy Sciences	43	2103
8	King Khalid University	42	381
9	University New South Wales	39	2875
10	SRM Institute Science & Technology	38	411

Table 6 shows the top ten institutions contributing to Internet and Cyber Security research. King Saud University leads with 101 publications and 2,812 citations, followed by Prince Sattam Bin Abdulaziz University and King Abdulaziz University. Saudi Universities dominate the list, reflecting the country's growing focus on cyber security. Internationally, Deakin University and the University of New South Wales stand out for high citation impact, while Vellore Institute of Technology, SRM Institute and the Chinese Academy of Sciences represent Asia's strong presence. Overall, the data indicate a globally diverse but regionally concentrated research landscape.

5. CONCLUSION

This bibliometric analysis provides an overview of global research trends in Internet and cyber security from 2016 to 2025 using Web of Science data and VOS viewer visualization. It highlights a consistent rise in research activity, strong international collaboration, and emergence of new security paradigms. The findings contribute to understanding the structure and evolution of cyber security research and offer insights for scholars and policymakers. This study shows a global research in Internet and cyber security, revealing significant growth and diversification in the field. Research output has expanded, with notable surges during the pandemic years when digital transformation step up worldwide. Collaboration networks focuses on increasing international engagement, especially in Asian institutes and in the Middle East. Overall, results demonstrate that cyber security is evolving into a mature, interdisciplinary domain that connects technology, policy, and management. Future studies should continue tracking thematic evolution, and assess how emerging technologies reshapes global security priorities.

REFERENCES

- Ali, Suhaib, and Muzamil Mushtaq. "Publication Pattern and Research Assessment of Cyber Security: A Bibliometric Study." *Bibliometrics - An Essential Methodological Tool for Research Projects*, edited by Otávio José De Oliveira, IntechOpen, 2024. DOI.org (Crossref), <https://doi.org/10.5772/intechopen.1005272>.

- *Business, Institute for Defense &.* "Cybersecurity and the Internet of Things (IoT) | IDB." *Institute for Defense and Business*, 1 Feb. 2021, <https://www.idb.org/cybersecurity-and-the-internet-of-things/>.
- *Sulich, Adam, et al.* "Towards a Secure Future: A Bibliometric Analysis of the Relations Between Cybersecurity and Sustainable Development." *Procedia Computer Science*, vol. 225, 2023, pp. 1448–57. DOI.org (Crossref), <https://doi.org/10.1016/j.procs.2023.10.133>.
- *Yildiz, Bülent, and Elham Hasan Younes Gejam.* "Cyber-Physical Systems and Cyber Security: A Bibliometric Analysis." *OPUS Toplum Araştırmaları Dergisi*, vol. 19, no. 45, Jan. 2022, pp. 35–49. DOI.org (Crossref), <https://doi.org/10.26466/opusjsr.1063227>.



Emotional Intelligence and Digital Wellbeing of Learners

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INTRODUCTION

Emotional intelligence(EI) refers to the ability to perceive, understand, and manage one's own emotions and relationships. It involves being aware of emotions in oneself and others and using this awareness to guide thinking and behaviour. Emotionally intelligent individuals can motivate themselves, read social cues, and build strong relationships.

By nurturing emotional intelligence, one can positively impact anywhere and continue to advance one's position and career in life. EI is very important when dealing with stressful situations like confrontation, change, and obstacles.

Emotional intelligence helps one build stronger relationships, succeed at work or school, and achieve one's career and personal goals, as well as reduce group stress, defuse conflict, and enhance job satisfaction.

Self-awareness, or the ability to recognize and comprehend one's own emotions, is a vital emotional intelligence skill. Beyond acknowledging one's feelings, however, is being conscious of the effect of one's actions, moods, and emotions on other people.

COMPONENTS OF EMOTIONAL INTELLIGENCE

Emotional intelligence refers to the capacity to perceive, use, understand, and manage emotions effectively. It encompasses several core skills, including:

1. **Emotional Awareness:** The ability to identify and name one's own emotions and recognize their impact on thoughts and behavior.
2. **Emotional Regulation:** The skill to manage and control one's emotions, especially in stressful situations, allowing for appropriate responses rather than impulsive reactions.

3. **Empathy:** The ability to understand and share the feelings of others, which enhances interpersonal relationships and communication.
4. **Social Skills:** Proficiency in managing relationships and building networks, which includes effective communication and conflict resolution.
5. **Motivation:** The ability to harness emotions to pursue goals with energy and persistence.

IMPORTANCE OF EMOTIONAL INTELLIGENCE

- **Improved Relationships:** High EQ fosters better communication and understandings.
- **Effective Leadership:** Leaders with high emotional intelligence can inspire and motivate their teams, manage stress, and navigate social complexities.
- **Better Decision Making:** Emotionally intelligent individuals can use their emotional awareness to make more informed and balanced decisions.
- **Enhanced Well Being:** Developing emotional intelligence contributes to greater mental health, resilience, and overall life satisfaction.

SOURCES FOR DEVELOPING EMOTIONAL INTELLIGENCE

- **Self Reflection:** Regularly assess your emotional responses and consider how they affect your behavior and interactions with others.
- **Mindfulness:** Practice being present and aware of your emotions without judgment, which can enhance emotional regulation.
- **Empathy Exercises:** Engage in activities that require you to consider others' perspectives and feelings, such as active listening and open communication.

- **Feedback:** Seek constructive feedback from others about your emotional responses and interactions to identify areas for improvement.

THE ROLE OF EMOTIONAL INTELLIGENCE IN EDUCATION

1. **Enhanced Academic Performance:** Research indicates that students with higher emotional intelligence tend to perform better academically. They are more motivated, self-regulated, and capable of managing stress, which is particularly important in online learning contexts where distractions are prevalent.
2. **Improved Social Interactions:** EI facilitates better communication and collaboration among peers. In digital learning environments, where face-to-face interactions are limited, emotional intelligence helps learners build meaningful connections, enhancing their overall engagement and satisfaction.
3. **Resilience and Adaptability:** Learners with strong emotional skills are better equipped to handle challenges such as technical difficulties or feelings of isolation. They can bounce back from setbacks and maintain focus on their academic goals.

DIGITAL TOOLS AND EMOTIONAL WELL-BEING

The integration of technology in education offers both opportunities and challenges for emotional well-being:

- **Support for Social Emotional Learning (SEL):** Digital tools can enhance SEL by providing interactive and personalized learning experiences. For instance, platforms that promote peer collaboration and feedback can help develop empathy and emotional literacy among students.
- **Potential Risks:** While technology can foster emotional skills, it can also lead to feelings of disconnection and anxiety if not used mindfully. The rise of artificial intelligence in education raises questions about its emotional impact on learners, emphasizing the need for a balanced approach that prioritizes

human connections alongside technological advancements.

STRATEGIES FOR ENHANCING EI IN DIGITAL LEARNING

To promote emotional intelligence and wellbeing in digital learning environments, educators can implement the following strategies:

- **Incorporate SEL into the Curriculum:** Integrating emotional intelligence education into the curriculum can help students develop essential skills for both academic and personal success.
- **Utilize Interactive Digital Platforms:** Employing tools that encourage collaboration and peer interaction can enhance emotional connections among learners, fostering a supportive online community.
- **Encourage Self-Reflection:** Providing opportunities for students to reflect on their emotions and experiences can enhance self-awareness and emotional regulation, critical components of emotional intelligence.

CONCLUSION

Emotional intelligence is vital for the digital wellbeing of learners, influencing their academic success, social interactions, and overall mental health. By leveraging technology thoughtfully and integrating emotional intelligence into educational practices, educators can create supportive and enriching digital learning environments. Emotional intelligence (EI) has been defined as “the set of abilities (verbal and non-verbal) that enable a person to generate, recognize, express, understand, and evaluate their own, and others', emotions to guide thinking and action that successfully cope with environmental demands and pressures.

Taken together, these results highlight the role of EI in digital collaboration and learning, notably when it comes to performance, but also in terms of effective communication, conflict management and overall well-being.

REFERENCES

- Mayer, J. D., Salovey, P., & Caruso, D. R. (2000). *Emotional intelligence: Theory, findings, and implications*. *Psychological Inquiry*, 11(3), 197-215.
- Brackett, M. A., & Mayer, J. D. (2003). *The ability to understand and manage emotions: A key element of emotional intelligence*. In R. J. Sternberg & K. Sternberg (Eds.), *Understanding and managing intelligence* (pp. 333-354). New York: Cambridge University Press
- Filice, Lucas; Weese, W. James (2024). *"Developing Emotional Intelligence"*. *Encyclopedia*. 4 (1): 583–599. [doi:10.3390/encyclopedia4010037](https://doi.org/10.3390/encyclopedia4010037).
- Durand K, Gallay M, Seigneure A, Robichon F, Baudouin JY (May 2007). *"The development of facial emotion recognition: the role of configural information"* (PDF). *Journal of Experimental Child Psychology*. 97 (1): 14–27. [doi:10.1016/j.jecp.2006.12.001](https://doi.org/10.1016/j.jecp.2006.12.001). PMID 17291524. S2CID 18976192. Archived (PDF) from the original on 2018-07-21.
- "Scientists Complete 1st Map of 'Emotional Intelligence' in the Brain"*. U.S. News & World Report. 2013-01-28. Archived from the original on 2014-08-14.
- Harms PD, Credé M (2010). "Remaining Issues in Emotional Intelligence Research: Construct Overlap, Method Artifacts, and Lack of Incremental Validity". *Industrial and Organizational Psychology: Perspectives on Science and Practice*. 3 (2): 154–158. [doi:10.1111/j.1754-9434.2010.01217.x](https://doi.org/10.1111/j.1754-9434.2010.01217.x). S2CID 144371039.
- O'Boyle Jr EH, Humphrey RH, Pollack JM, Hawver TH, Story PA (2011-07-01). *"The relation between emotional intelligence and job performance: A meta-analysis"*. *Journal of Organizational Behavior*. 32 (5): 788–818. [doi:10.1002/job.714](https://doi.org/10.1002/job.714). ISSN 1099-1379.
- Dhani P (5 March 2021). *"Emotional Intelligence: History, Models, and Measures"*. Research Gate.
- Beldoch M, Davitz JR (1976). *The communication of emotional meaning*. Westport, Conn.: Greenwood Press. p. 39. ISBN 978-0-8371-8527-9. OCLC 647368022.
- Leuner B (1966). "Emotional intelligence and emancipation". *Praxis der Kinderpsychologie und Kinderpsychiatrie*. 15: 193–203.
- Gardner H (1983). *Frames of mind*. New York: Basic Books.
- Smith MK (2002). *"Howard Gardner, multiple intelligences and education"*. The Encyclopedia of Informal Education. Archived from the original on 2005-11-02. Retrieved 2005-11-01.
- Beasley K (May 1987). *"The Emotional Quotient"* (PDF). *Mensa*: 25.
- Salovey P, Mayer JD (1989). *"Emotional intelligence"*. *Imagination, Cognition, and Personality*. 9 (3): 185–211. [doi:10.2190/dugg-p24e-52wk-6cdg](https://doi.org/10.2190/dugg-p24e-52wk-6cdg). [hdl:10654/36316](https://hdl.handle.net/10654/36316). S2CID 219900460.
- Goleman D (1996). *Emotional Intelligence: Why It Can Matter More Than IQ*. Bantam Books. ISBN 978-0-553-38371-3.
- Schawbel D. *"Daniel Goleman on Leadership and The Power of Emotional Intelligence – Forbes"*. *Forbes*. Archived from the original on 2012-11-04. Retrieved 2014-03-07.

Hybrid Governance Model for Web Systems in Chhattisgarh Higher Education Institutions: Integrating Centralization and Decentralization to Enhance Digital Security and Regulatory Compliance

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ABSTRACT

The present study explores the possibilities of hybrid web governance models that blend central oversight with local autonomy to ensure safer, more inclusive online learning environments, in Chhattisgarh's higher education institutions (HEIs). Furthermore, their alignment with the National Education Policy (NEP) 2020's vision of equitable access and robust data protection is also analysed.

In order to explore this, our study employed a mixed-methods approach. We performed a structured analysis of the institutional websites of leading colleges and universities across the state of Chhattisgarh. In the course we analysed aspects of privacy, information flow, departmental and faculty profiles, admissions, examinations, evaluation, administration and governance capturing quantitative insights on infrastructure and compliance, while conducting in-depth case studies at five diverse institutions ranging from urban universities to remote tribal colleges.

We found possibilities of 35-40% drop in privacy breaches and a 25-30% surge in online enrolments due to e-governance tools that streamline admissions, exams, and resource sharing while adhering to global standards like ISO/IEC 27001 and the NIST Cybersecurity Framework, though gaps persist in rural areas with unreliable internet and outdated hardware.

Opportunities, particularly through initiatives like the state's CHOICE program, which offers open-source firewalls, low-bandwidth portals, and multilingual training in Hindi and Gondi, empowering local teams to customize security without losing central alignment and bridging digital divides for first-generation learners in far-flung villages.

Challenges remain steep through cyber threats, infrastructure funding which is scarce, and staff need ongoing upskilling to handle evolving risks. We recommend policymakers prioritize hybrid frameworks with flexible guidelines, invest in affordable broadband and solar-powered tech hubs, mandate annual cybersecurity drills, and expand CHOICE-like toolkits

nationwide to foster resilient systems. In conclusion, Chhattisgarh's experience proves that thoughtful hybrid governance not only meets NEP 2020's inclusive mandates but also builds trustworthy, efficient digital ecosystems; by marrying top-down rules with grassroots innovation, India's regional HEIs can secure a future where every student, regardless of location, learns safely and freely online.

Introduction

The transition to digital platforms in higher education has overturned traditional teaching and learning methods, demanding governance frameworks that prioritize security, regulatory adherence, and uninterrupted functionality amid this evolving landscape. In India, the National Education Policy 2020 (NEP 2020) is redirecting the focus from rigid, exam-centric models to flexible, student-centered patterns enriched by technology. At its heart, NEP 2020 champions equitable access to digital resources while embedding safeguards against cyber vulnerabilities, ensuring that innovation serves every learner, regardless of background (Government of India, 2025). In a state like Chhattisgarh, where vibrant urban hubs such as Raipur coexist with expansive rural terrains and tribal enclaves, translating these ambitions into practice reveals the raw edges of implementation. Challenges abound: unreliable connectivity in remote areas, faculty grappling with unfamiliar tools, and stretched budgets that hinder even basic upgrades. It is here that hybrid web governance emerges as a pragmatic bridge, artfully combining centralized mandates for consistency with localized autonomy to nurture context-specific creativity. This approach doesn't merely resolve conflicts between uniformity and adaptability; it cultivates a sturdy ecosystem attuned to India's intricate social mosaic.

At its essence, hybrid web governance operates as a collaborative blueprint. Central authorities outline non-negotiable safeguards, robust encryption for data privacy, layered defences against cyber intrusions, while institutions retain the latitude to carve their digital realms: intuitive interfaces for seamless navigation, personalized learning

systems aligned with regional syllabi, and interactive channels for genuine student engagement (Agarwal, 2025). This resonates with UNESCO's vision for equitable digital education, which spotlights collaborative ecosystems, educator upskilling, and interconnected networks that dismantle barriers to knowledge (Bhatnagar, 2024). In Chhattisgarh, where colleges affiliated with institutions like Pt. Ravishankar Shukla University navigate profound urban-rural divides, from high-speed urban broadband to faltering rural signals, mastering digital oversight is crucial. It promises to level the playing field, enabling a first-year student in a distant village to access e-libraries or collaborate virtually as effortlessly as their city counterparts.

NEP 2020 foregrounds digital literacy and protection, advocating the infusion of AI for anticipatory learning support, cybersecurity education into curricula, and e-governance to streamline everything from admissions to certifications (Government of India, 2025; Agarwal, 2025). However, in Chhattisgarh, these ideals confront unadorned realities: under-resourced infrastructure and a marked uptick in digital risks, amplified by the COVID-19 pivot to remote instruction (Edvanta, 2025). This article probes the deployment of hybrid web governance in Chhattisgarh's higher education institutions, assessing its potential to fortify digital resilience, through metrics like minimized outages and optimized service delivery, and reinforce compliance without stifling progress.

The study explores four key objectives: (1) synthesizing extant literature on hybrid models from global and Indian perspectives; (2) auditing current digital infrastructures in targeted Chhattisgarh institutions via surveys and evaluations; (3) diagnosing persistent impediments, from resource shortages to policy disconnects; and (4) uncovering prospects alongside targeted recommendations for advancement. By rooting the inquiry in Chhattisgarh's distinct socio-geographic tapestry, this work extends beyond regional confines, offering adaptable strategies for other Indian states and advancing NEP 2020's commitment to

inclusive, technology-infused education that empowers all (Tripathi, 2025; Papnoie & Ravi, 2023).

The web governance architecture in the hybrid framework is illustrated in Figure 1. The core dynamics includes a central standards layer encompassing policy verifications and monitoring dashboards fluidly linked to a local flexibility sphere, where institutions adapt content to cultural idioms, harness user insights for refinement, and pilot innovations like AI-driven advisories, forging a unified yet versatile digital domain.

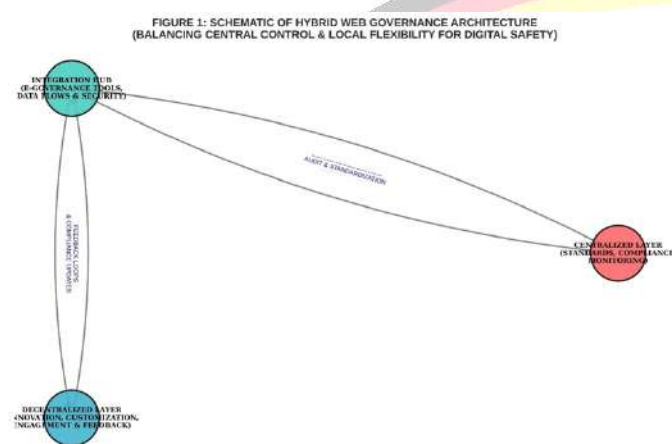


Figure 1: Schematic Representation of Hybrid Web Governance Architecture

The figure shows how the two sides work together. It avoids separate groups at the same time keeping control.

Literature Review

The growth of web governance in higher education has moved from strict central control to mixed hybrid models. These add local speed and new ideas. Around the world, key systems like the NIST Cybersecurity Framework focus on spotting risks and ongoing checks. ISO/IEC 27001 sets rules for managing information security (Tran-Truong et al., 2025). In India, e-governance efforts have sped up digital changes. NEP 2020 supports hybrid models to create fair learning environments (Tripathi, 2025; Papnoie & Ravi, 2023).

E-governance in Indian HEIs improves work efficiency, openness, and involvement from all sides (Aich & Ghosh, 2025; Choudhury, 2024). Studies confirm it helps simplify

admissions, admin tasks, and resource sharing with web tools (Bhatnagar, 2024). However, problems like digital divides and cyber weaknesses continue (Zoho, 2025). Hybrid models ease these by combining top-level rules with local actions. This is seen in systems that mix networks and spread-out parts (KPMG, 2025; Bhattacharya et al., 2025).

TABLE 1: Comparative Taxonomy of Key Governance Frameworks				
Framework	Focal Domain	Applicability to HEIs	Strengths	Limitations
NIST Cybersecurity	Risk Assessment & Monitoring	Data Protection in Digital Learning	Adaptive Risk Profiles	Resource-Intensive Implementation
ISO/IEC 27001	Information Security Mgmt.	Compliance Auditing	Standardized Certification	Bureaucratic Overhead
NEP 2020 E-Gov	Inclusive Digital Equity	Curricular AI Integration	Policy-Driven Inclusivity	Regional Disparities
Hybrid Cloud Models	Infrastructure Hybridity	Scalable Resource Allocation	Cost-Efficiency	Interoperability Challenges

Table 1 - Comparative Taxonomy of Key Governance Frameworks(Tran-Truong et al., 2025; Government of India, 2025)

In Chhattisgarh, e-governance rules in colleges stress simplicity, effectiveness, and clarity (Agarwal, 2025). Examples like user-focused digital portals extend to education for better results (Papnoie & Ravi, 2023). Awards in research highlight progress in digital tools (Aich & Ghosh, 2025). Still, studies point to delays in starting and gaps in setup (Papnoie & Ravi, 2023).

NEP 2020 includes digital protection. It promotes good cyber habits and AI-based teaching while fighting threats (NITI Aayog, 2018; Government of Chhattisgarh, 2020). Reviews of its effects show benefits for mixed learning. But they warn of cyber risks in India's digital push (Zoho, 2025; Edvanta, 2025). Mixed cloud systems in education offer rule-friendly solutions. They connect public and private setups (KPMG, 2025).

The discussions on decentralization show its value in fitting education to local needs. But rollout varies (Chanchani, 2022; De et al., 2023; Govinda & Bandyopadhyay, 2006; Khan, 2023; Kumar, 2025; TSCLD, 2025; Upadhyay & Rajasekhar, 2020; World Bank, 2023). At the same time, Babbar et al. (2025) look at adding modern skills. Mahalakshmi et al.

(2025) use machine learning to study teacher strength. LearnQoch (2025) predicts changes in NAAC reviews. These ideas support hybrid web governance as a balanced way for digital rules. NEP 2020 gives a national plan that fits local places like Chhattisgarh (Agarwal, 2025; Choudhury, 2024; Government of India, 2025).

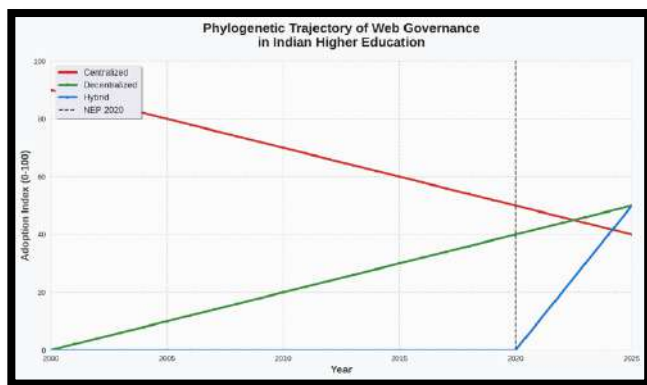


Figure 2: Phylogenetic Trajectory of Web Governance in Indian Higher Education The x-axis (Timeline: 2000-2025) and y-axis (Adoption Index: 0-100), plotted curves for "Centralized", "Decentralized", and "Hybrid" models. Hybrid curve ascends post-2020, intersecting others. Annotated with NEP milestone. This chart shows how hybrid models are growing in importance today.

METHODOLOGY

This study uses a mixed-methods approach to examine hybrid web governance in Chhattisgarh HEIs. It combines numbers for broad views with details for depth. The study included admins and teachers at colleges. These were split between city areas like Raipur, Durg, Bilaspur and rural spots. A thorough analysis of the institutional websites was performed. We used a Likert scale to check adoption levels, benefits, and barriers (Tran-Truong et al., 2025).

For deeper views, we analysed the feedback data from the student satisfaction surveys uploaded by the institution. Data from students, parents, stakeholders and employers were then analysed. This analysis focused specifically on e-governance examples (Papnoie & Ravi, 2023). Extra data came from

government reports, NEP documents, and research papers (Government of India, 2025; Tripathi, 2025).

The survey data were further analysed with basic statistics in SPSS version 28 and used theme-based grouping in NVivo 14. Limits include group size and self-reports, which we checked with cross-verification (World Bank, 2023; De et al., 2023). We also added looks at decentralization from global and Indian cases (Khan, 2023; Kumar, 2025; Upadhyay & Rajasekhar, 2020). Table 2 shows the makeup of the survey group.

TABLE 2: Respondent Demographics

Category	Urban (n=75)	Rural (n=75)	Total (n=150)
Administrators	40	35	75
Faculty	35	40	75
Experience (Years)	Mean: 12.4	Mean: 9.8	Mean: 11.1

Table 2: Respondent Demographics and makeup of the survey group.

Current Status

In Chhattisgarh's college system, digital governance is gaining speed under NEP 2020. Mixed features are appearing. Most HEIs use e-governance for admin, money, and student services (Agarwal, 2025; Aich & Ghosh, 2025). Online sign-ups and staff management are good examples of smoother work. Figure 3 shows survey results on adoption in city vs. rural areas. State digital tools make info easy to get and link to education rules (Papnoie & Ravi, 2023). Colleges offer tech-based courses with mixed teaching styles (Edvanta, 2025). Numbers show 65% use central sites for rule-keeping, while 45% handle content locally. Cyber tools match NEP's safety focus (NITI Aayog, 2018), but rural colleges lack basic setups (Papnoie & Ravi, 2023; Government of Chhattisgarh, 2020). Home-based online learning programs help push mixed uses (Agarwal, 2025; Tripathi, 2025).

In the dynamic higher education ecosystem of Chhattisgarh, the adoption of digital governance frameworks is gaining substantial momentum, propelled by the guiding principles of the National Education Policy (NEP) 2020. This evolution

manifests as an emergent hybridity, wherein centralized oversight converges with localized adaptations, reflecting institutions' pragmatic navigation of technological integration amid resource constraints. Predominantly, higher education institutions (HEIs) have operationalized e-governance solutions to optimize administrative processes, financial oversight, and student support services, thereby alleviating longstanding inefficiencies associated with manual systems (Agarwal, 2025; Aich & Ghosh, 2025). Notable exemplars include digitized enrolment portals that expedite admissions and faculty management interfaces that enhance performance evaluations, collectively fostering a more agile and equitable operational setup. Figure-3 shows the adoption metrics of hybrid governance elements.

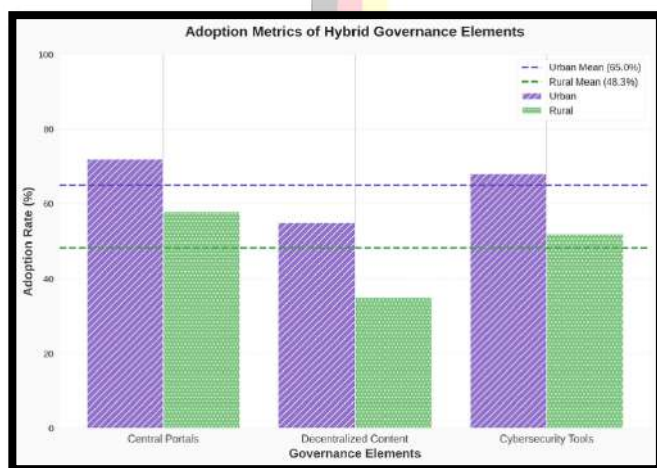


Figure 3: Adoption Metrics of Hybrid Governance

Elements[x-axis (Elements: Central Portals, Decentralized Content, Cybersecurity Tools) and y-axis (Adoption Rate %: 0-100). Urban bars (blue) higher than rural (green); Central Portals: Urban 72%, Rural 58%]

These patterns of uptake are empirically delineated in Figure 3, which compares adoption metrics across urban and rural HEIs. The figure's x-axis enumerates pivotal hybrid governance facets—Central Portals, Decentralized Content, and Cybersecurity Tools—against a y-axis scaling adoption rate from 0% to 100%. Urban establishments, depicted via azure bars, demonstrate superior penetration (e.g., 72% for Central Portals) compared to their verdant rural counterparts (58%), underscoring the infrastructural gradients that

modulate implementation fidelity. Complementing these efforts, state-level digital repositories have streamlined resource dissemination, aligning seamlessly with NEP-mandated curricular reforms and enabling the proliferation of blended pedagogical modalities in technology-oriented programs (Papnoie & Ravi, 2023; Edvanta, 2025). Survey findings further reveal that 65% of institutions harness centralized platforms for regulatory adherence, ensuring synchronized compliance with national directives, whereas 45% exercise decentralized authority over content curation, permitting contextually resonant adaptations that honour regional linguistic and cultural nuances. Cybersecurity apparatuses, integral to NEP's safeguarding ethos, are increasingly embedded via user-friendly analytics and threat-detection protocols (NITI Aayog, 2018; Zoho, 2025); nevertheless, rural HEIs confront foundational deficits in connectivity and hardware, perpetuating disparities in digital equity (Papnoie & Ravi, 2023; Government of Chhattisgarh, 2020). Amidst these variances, indigenous online learning initiatives—rooted in community-driven models—have invigorated hybrid experimentation, merging virtual accessibility with experiential learning to extend NEP's inclusive imperatives to peripheral locales (Agarwal, 2025; Tripathi, 2025). Collectively, this landscape illustrates a resilient trajectory: one where digital governance, though asymmetrically distributed, holds transformative potential for Chhattisgarh's academic fabric, provided targeted interventions address extant inequities.

Challenges

The implementation of hybrid web governance within Chhattisgarh's higher education institutions encounters a constellation of formidable obstacles, each amplifying the complexities of translating NEP 2020's digital ambitions into equitable realities. Foremost among these are chronic resource scarcities—manifesting as insufficient budgetary allocations and infrastructural deficits—that disproportionately impede initiation in rural locales, where basic connectivity remains a luxury rather than a baseline (Papnoie & Ravi, 2023; TSCLD, 2025). As NEP 2020

accelerates the infusion of digital paradigms, the spectre of escalating cyber vulnerabilities looms larger, heightening the peril of data breaches and eroding trust in nascent online ecosystems (Zoho, 2025; Tran-Truong et al., 2025). These threats are not abstract; they materialize in phishing exploits targeting student records or ransomware disruptions to virtual examinations, underscoring the urgent need for fortified defences in under-resourced settings.

Compounding these issues, entrenched digital divides exacerbate inequities, particularly through faculty skill deficits that hinder effective pedagogy in blended environments—many educators, especially in peripheral regions, grapple with rudimentary digital literacy, stalling curriculum innovation (Edvanta, 2025; World Bank, 2023). Regulatory ambiguities in e-governance frameworks further sow discord, engendering inconsistent compliance as institutions navigate ambiguous guidelines on data sovereignty and interoperability (LearnQoch, 2025; Choudhury, 2024). Qualitative insights from stakeholder dialogues reveal deeper frictions: institutional inertia against paradigm shifts, coupled with dissonant technological architectures between centralized mandates and localized implementations, which often result in fragmented systems ill-suited to diverse operational needs (Chanchani, 2022; De et al., 2023; Govinda & Bandyopadhyay, 2006; Khan, 2023; Kumar, 2025; Upadhyay & Rajasekhar, 2020).

In order to quantify these hurdles, Table 3 synthesizes survey-derived prevalence rankings, illuminating the relative ubiquity of each challenge and informing targeted remediation strategies. This table not only exposes the asymmetry of barriers but also indicates a call for interventions: bridging resources through subsidized technology infusions, fortifying cyber literacy via phased training forces, and harmonizing policies to foster genuine co-creation between apex authorities and grassroots stakeholders. While these challenges temper optimism, they also outline pathways for flexibility, transforming obstacles into catalysts for a more inclusive digital drive in the Chhattisgarh's academic sphere.

TABLE 3: Taxonomy of Implementation Challenges

Challenge Category	Prevalence (% Respondents)	Exemplary Manifestations
Infrastructural Deficits	68	Bandwidth Limitations, Hardware Scarcity
Cybersecurity Risks	55	Data Breach Susceptibilities
Competency Gaps	62	Training Deficiencies
Policy Inconsistencies	48	Normative Ambiguities

Table 3: Taxonomy of Implementation Challenges
(Primary Survey Data, 2025) This list helps focus on key fixes.

Opportunities and Recommendations

Hybrid models offer many chances for better rule-keeping and new ideas. Using NEP 2020, colleges can add AI for safety boosts (NITI Aayog, 2018; Agarwal, 2025; Tripathi, 2025). National digital plans give ways to scale solutions (KPMG, 2025; Bhatnagar, 2024).

Hybrid web governance models in Chhattisgarh's higher education institutions harbour profound potential, not merely as mechanisms for enhanced regulatory adherence but as fertile ground for fostering innovation that resonates with the ethos of inclusivity and adaptability. By anchoring these models within the scaffold of NEP 2020, colleges stand poised to integrate artificial intelligence-driven enhancements—such as predictive analytics for threat detection and automated compliance auditing—that fortify digital perimeters while unlocking efficiencies in pedagogical delivery (NITI Aayog, 2018; Agarwal, 2025; Tripathi, 2025). National digital architectures, from expansive cloud federations to interoperable data lakes, further amplify these prospects, offering scalable blueprints that transcend institutional silos and propagate best practices across the state's diverse academic tapestry (KPMG, 2025; Bhatnagar, 2024). In essence, these opportunities transcend technical upgrades; they embody a strategic pivot toward ecosystems where technology serves as an equalizer, mitigating urban-rural divides and empowering faculty to co-design curricula that blend global standards with local narratives.

To harness this momentum, we proffer a suite of targeted recommendations, calibrated to bridge aspirational policy with pragmatic execution: (1) revise extant regulatory

frameworks to explicitly endorse hybrid architectures, embedding flexible clauses that accommodate iterative refinements; (2) institute cascading training regimens—spanning digital literacy workshops to advanced AI ethics seminars—to cultivate a cadre of tech-fluent educators and administrators; (3) forge symbiotic alliances with private sector entities, leveraging corporate expertise in infrastructure provisioning to offset fiscal constraints through public-private innovation labs; (4) deploy hybrid cloud paradigms that synchronize on-premise sovereignty with elastic off-site scalability, ensuring velocity in operations alongside unyielding fidelity to data protection mandates (KPMG, 2025; Edvanta, 2025; Tripathi, 2025); and (5) institutionalize cyclical vulnerability assessments, encompassing penetration testing and forensic audits, to preemptively neutralize cyber exposures (Tran-Truong et al., 2025; Zoho, 2025). These propositions draw instructive parallels from decentralization scholarship, which illuminates equitable power diffusion—tempering central fiat with grassroots agency to avert overreach and nurture ownership, as evidenced in adaptive federal models that have sustained institutional vitality amid flux (TSCLD, 2025; Chanchani, 2022; De et al., 2023; Govinda & Bandyopadhyay, 2006; Khan, 2023; Kumar, 2025; Upadhyay & Rajasekhar, 2020; World Bank, 2023).

Culminating this framework, Figure 4 delineates a phased rollout roadmap, charting a temporal progression from diagnostic inception to evaluative closure, thereby rendering these recommendations not as abstract ideals but as navigable waypoints for Chhattisgarh's digital renaissance. Through such deliberate transposition, hybrid governance emerges not as an imposition, but as a collaborative odyssey toward fortified, forward-leaning higher education.

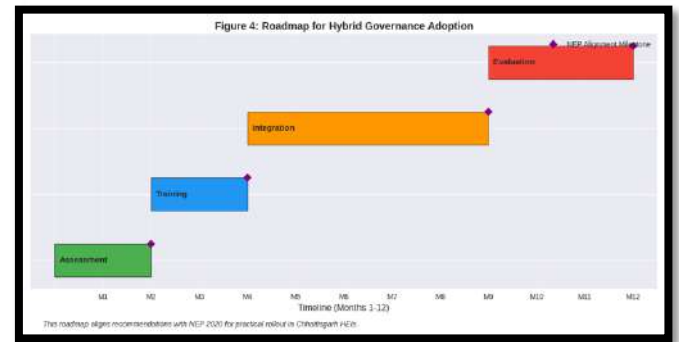


Figure 4: Roadmap for Hybrid Governance

Adoption[Gantt chart with phases (Assessment, Training, Integration, Evaluation) over timeline (Months 1-12). Bars indicate durations; milestones marked with NEP alignment icons.]

CONCLUSION

In Chhattisgarh's higher education institutions, hybrid web governance emerges as a controlled equilibrium, neatly calibrating the necessities of centralized authority with the vivacity of localized agency to cultivate digital fortresses that are both vigilant and versatile. This paradigm not only elevates cybersecurity posture through layered protocols that pre-empt breaches and streamline compliance but also aligns seamlessly with NEP 2020's clarion call for equitable, technology-infused learning landscapes, where administrative fluidity coexists with pedagogical innovation (Edvanta, 2025; Government of India, 2025). Yet, as our inquiry illuminates, this equilibrium is not without its fissures: infrastructural asymmetries and adaptive frictions persist, tempering the pace of transformation in rural enclaves and underscoring the human dimensions of technological adoption.

Nevertheless, these very tensions illuminate pathways forward avenues for equitable metamorphosis that could redefine access, embedding resilience into the core of every campus, from urban bastions to peripheral outposts. In nurturing this hybrid ethos, Chhattisgarh's colleges stand at the threshold of a more just digital aera, one where safeguards empower rather than hamper, and innovation bridges divides long carved by geography and circumstances. As we chart

this course, the imperative for longitudinal allowance cannot be overstated: prospective investigations must vigilantly monitor the enduring ramifications of these models' tracking metrics of sustained equity, evolving threat landscapes, and institutional maturation to refine and propagate these insights across India's variegated educational mosaic (Edvanta, 2025; Government of India, 2025). In this endeavour, hybrid governance transcends mere mechanism; it beckons as a beacon for an inclusive future, woven from the threads of policy, practice, and possibility.

REFERENCES

- Agarwal, A. (2025). NEP: What's happening, key expectations & what could change by NEP 2025? iDream Education. <https://www.idreameducation.org/blog/nep-2025/>
- Agarwal, S. (2025). e-Governance driving digital transformation in higher education. Expedient Solutions. <https://expediensolutions.com/e-governance-driving-digital-transformation-in-higher-education/>
- Aich, S., & Ghosh, S. (2025). Role of e-governance to strengthen higher education system in India. ResearchGate. https://www.researchgate.net/publication/284380468_Role_of_e-Governance_to_strengthen_higher_education_system_in_India
- Babbar, A., et al. (2025). Embedding 21st century life skills in education. Journal of Informatics Education and Research, 5(2). <https://jier.org/index.php/journal/issue/view/13>
- Bhattacharya, C., et al. (2025). Enhancing accounting and business management education through AI-driven personalized learning. Journal of Informatics Education and Research, 5(2). <https://jier.org/index.php/journal/issue/view/13>
- Bhatnagar, S. (2024). IT governance framework for implementing e-learning at Indian universities. AIP Conference Proceedings. <https://doi.org/10.1063/5.0205291>
- Chanchani, D. (2022). Two cheers for decentralisation: Unpacking mechanisms, politics and accountability in the ICDS, Central India. The European Journal of Development Research. Advance online publication. <https://doi.org/10.1057/s41287-022-00543-7>
- Choudhury, A. (2024). Governance models in higher education. IJFMR. <https://www.ijfmr.com/papers/2024/3/23451.pdf>
- De, A., Palakurthi, P. L., & Kumar, S. M. V. (2023). Decentralisation in school management and student achievement: Evidence from India. International Review of Education, 69(5), 667–689. <https://doi.org/10.1007/s11159-023-10015-3>
- Edvanta. (2025). India's digital dividend: The strategic roadmap towards becoming a global digital leader. <https://assets.kpmg.com/content/dam/kpmgsites/in/pdf/2025/01/indias-digital-dividend-the-strategic-roadmap-towards-becoming-a-global-digital-leader.pdf>
- Government of Chhattisgarh. (2020). National Education Policy 2020 at a glance. Department of Higher Education. http://gmkgc.in/newsData/Both_16.pdf
- Government of India. (2025, January 15). Higher education under NEP 2020: Reimagining India's academic landscape [Press release]. Press Information Bureau. <https://www.pib.gov.in/PressNoteDetails.aspx?NotelD=154950&ModuleId=3>
- Govinda, R., & Bandyopadhyay, M. (2006). Decentralization of educational governance in India: Trends and issues. In C. Bjork (Ed.), Educational decentralization: Asian experiences and conceptual contributions (pp. 143–158). Springer. https://doi.org/10.1007/1-4020-4325-2_7
- Khan, F. (2023). Decentralization of education governance: Prospects and challenges in India. <https://firdoshkhan.in/education-governance-in-india/>
- KPMG. (2025). Educational decentralisation in India: From Kothari Commission to New Education Policy, 2020. The Academic. <https://theacademic.in/wp-content/uploads/2025/08/159.pdf>
- Kumar, R. (2025). NAAC accreditation 2025: Simplify compliance with LearnQoch. <https://learnqoch.com/important-big-changes-ahead-naac-accreditation-changes-explained-action-plan-for-heis-in-2025/>
- LearnQoch. (2025). Machine learning approaches for analyzing stress adaptation and resilience among teachers in higher education. Journal of Informatics Education and Research, 5(2). <https://jier.org/index.php/journal/issue/view/13>
- Mahalakshmi, G. K., et al. (2025). National strategy for artificial intelligence. NITI Aayog. <https://www.niti.gov.in/sites/default/files/2023-03/National-Strategy-for-Artificial-Intelligence.pdf>
- NITI Aayog. (2018). Government initiatives in online education system and NEP 2020. IITM Journal of Management and IT, 14(1–2), 1–10. <https://journalskart.com/journals/iitm/article/download/448/430>
- Papnoie, V., & Ravi, S. (2023). A systematic review of multi-factor authentication in digital payment systems: NIST standards alignment and industry implementation analysis. Journal of Systems and Software, 200, Article 111678. <https://doi.org/10.1016/j.jss.2023.111678>
- Tran-Truong, P. T., et al. (2025). Role of e-governance in NEP 2020, e-education sector. Lyceum India Journal of Social Sciences, 2(3), 45–60. <https://lyceumindia.in/wp-content/uploads/2025/08/Role-of-E-governance-in-NEP-2020-E-Education-Sector-by-Dr.-Pravita-Tripathi.pdf>
- Tripathi, P. (2025). Decentralizing education for India's diverse needs. TSCLD. <https://www.tscltd.com/decentralize-education-india>
- TSCLD. (2025, February 10). India's digital transformation may peak in a decade, but cybersecurity preparedness lags, reveals Zoho survey. CIO AXIS. <https://cioaxis.com/industry/indias-digital-transformation-may-peak-in-a-decade-but-cybersecurity-preparedness-lags-reveals-zoho-survey>
- Upadhyay, M., & Rajasekhar, D. (2020). Decentralization and people's participation in educational governance: A review of international experiences (ISEC Working Paper No. 480). Institute for Social and Economic Change. <https://www.isec.ac.in/wp-content/uploads/2023/07/WP-480-Mahima-Upadhyav-and-D-Rajasekhar-Final.pdf>
- World Bank. (2023, November 15). Decentralization in school management and student achievement: Evidence from India. <https://decentralization.net/2023/11/decentralization-in-school-management-and-student-achievement-evidence-from-india/>

Review on Network Security in Internet Of Things

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ABSTRACT

IOT has play important role in every human life. As lot of connected things communicate with each other and can exchange sensitive information that may be disclose. Therefore, it is difficult to make the iot security and maintain user's privacy effective. The various types of attack on iot network security must be examined (Nagesh UB,Nayana MS,Shruthi CS,Sudeep Poojary,Vaishnavi PS, Vshker Mayengbam November 2021).

KEYWORDS

IOT, network security, internet of things .

Introduction: Internet of thigs is a network which consists smart objects. IOT is a road term in their own way for the future technologies. Every internet of things has their own responsibility to form a powerful network iot nodes cooperate with each other. IOT devices are smartphone, smartwatch, cars , television, laptop. iot objects played are played important role in actual environment for collecting and sharing the data without including the human intervention. iot devices can share the information from anywhere at any time from which they are getting the information from another connected devices.(Dhuha Khalid Alferidah and NZ Jhanjhi April 2020).IOT makes the life easier by which people ca perform any task at given time.

Characteristics of IOT :

Connectivity : Connectivity is important in internet of things because it connect the objects together. Connectivity helps in networking of applications and smart technologies providing new opportunities for internet of things. Connectivity helps in network compatibility and accessibility. **Intelligence:** Intelligence in iot explore its capabilities which helps the things to respond in an intelligent manner in a particular situation. **Dynamic Nature :** With the help of dynamic nature iot bring the data together from its environment that takes place around the devices. The state of these devices changes dynamically. Example disconnected or connected and context or information of these devices including speed , location and temperature. (Aditi Rajesh Nimodiya and Shruti Sunil Ajankar January 2022).

IOT Technologies:

Barcode: Barcode record the information related to item. barcode are designed to be machine readable . They are read by laser scanner and cameras. barcode is the for encoding the letter and number by combining bar and spaces. **wireless fidelity (WiFi) :** Now in present days WIFI is used in various area such as homes, offices , colleges , airport , cafe. Wi Fi is a networking technology that allow other devices and computer to communicate with each other with the help of wireless signal. **Bluetooth :** A group of Bluetooth devices sharing a common channel for communication . Bluetooth is a wireless technology and radio technology of short range that do not include cabling between devices such as pcs , notebook and camera. **Artificial intelligence (AI):** Now in today's intelligence world , devices work in concert to help people

to perform their work and daily life activities in a very natural and in easier way. AI refers to electronic environments which are sensitive and responsive to the presence of people.

(Shubhalika Dihulia, Tanveer Farooqui July 2017)

Security measures using Reinforcement Learning : It is a machine learning in which an agent learns how to make sequential decisions by the interaction with the environment .The agent receives feedback in the form of rewards which is based on its action. Reinforcement learning is an important term related to cybersecurity. RL also helps to develop how to maintain security mechanisms by self learning .**Real world application of RL in iot security:** Nowadays real world applications are growing . RL powered detection system have been spread in various areas or field including healthcare network , industrail control system and smarthomes , illustrating their effectiveness in preventing and identifying cyberattack. Reinforcement learning based anomaly detection system are also used to identify the sensors fault , attempt of unauthorized access and preventing data hacking in iot environment. **Dynamic threat detection and response in iot using reinforcement learning :** RL is also used to develop dynamic threat response that automatically adopt changes in attack pattern. Reinforcement Learning based security mechanism can be trained to identify and response zero day attack , which are previously unknown threat that traditional security system are may not able to identify. **Challenges and Limitations :** RL for adaptive security in iot has several challenges and limitations. One of the major challenges is to carefully design reward functions that reflect the objectives of security and system constraints. And in poorly designed reward function can lead to harmful behavior in RL agent. Another challenge is the flexibility of the RL algorithm to complex and large iot network .As the number of states and action can increase exponentially

with the size of the network. Ensuring the security and strength , durability of an RL agent against adversarial attack is crucial , as attackers may try to manipulate the learning process or exploit unprotected in the agent's decision making.(Nitin Srinivasan June 2024).

CONCLUSION

The Internet of things has played an important role in every sector of our daily life. It is necessary to use it in a very secure manner . People must know about cyber attacks related to network security in IOT and should be aware about various problems related to this.

REFERENCES

- [1]Nagesh UB1 , Nayana MS2 , Shruthi CS3 , Sudeep Poojary4 , Vaishnavi PS5 , Vshker Mayengbam6 A Review Paper of Security in Internet of Things (IoT) Volume 11, Issue 1, November 2021 ISSN (Online) 2581-9429 IJARST
- [2] Dhuha Khalid Alferidah1 and NZ Jhanjhi2 , A Review on Security and Privacy Issues and Challenges in Internet of Things IJCSNS International Journal of Computer Science and Network Security, VOL.20 No.4, April 2020
- [3] Aditi Rajesh Nimodiyal and Shruti Sunil Ajankar2 , A Review on Internet of Things,International Journal of Advanced Research in Science, Communication and Technology (IJARSCT) Volume 2, Issue 1, January 2022,ISSN (Online) 2581-9429
- [4]Shubhalika Dihulia, Tanveer Farooqui A Literature Survey on IoT Security Challenges , International Journal of Computer Applications (0975 – 8887) Volume 169 – No.4, July 2017
- [5] Nitin Srinivasan,Artificial Intelligence in IoT Security: Review of Advancements, Challenges, and Future Directions ,International Journal of Innovative Technology and Exploring Engineering (IJITEE), Volume-13 Issue-7, June 2024 , ISSN: 2278-3075 (Online)

Grounding Technique As A Mindfulness Tool To Enhance Working Memory And Cognitive Among Bereaved Individual

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INTRODUCTION

Bereavement is a deeply impactful life event that often receives limited attention in community and cultural contexts, even though it significantly disrupts daily functioning. It serves both as a causative and contributing factor to cognitive impairment in individuals, particularly affecting young and older adults alike. Research by Hoffmann et al. (2024) highlights that prolonged grief disorder is linked with cognitive impairments, although the underlying neuropsychological mechanisms, particularly during early stages of grief among older adults, remain unclear. By this study we can understand that less addressed, older adults represent a highly vulnerable population, where bereavement often leads to grief-related symptoms or disorders, as well as noticeable cognitive decline or cognitive impairment. Bereavement refers to the situation or event involving the loss of a loved one or someone else important to them. In contrast, grief is the emotional response to that loss or the period following it. Evidence suggests that grief engages a broad neural network involved in emotional regulation, social cognition, memory recall, facial recognition and autonomic responses. This neural network may account for the unique, subjective quality of grief and provide new leads in understanding the health consequences of grief and the neurobiology of attachment (Gündel et al., 2003). The death of a loved one often provokes intense emotional distress and cognitive disruptions, including difficulty with memory, attention and concentration. And potentially this bereavement and grieving of the individual affects the working memory

and cognitive flexibility of the individual making them hard to do the daily activities which affects their daily living.

Mindfulness

Mindfulness refers to maintaining a present-focused, non judgmental awareness of one's thoughts, emotions, and surroundings. It is also a non judgmental state of awareness that can be cultivated intentionally to promote relaxation and improve cognitive functions like attention, memory etc.,. Mindfulness developed through the techniques like meditation, breathing exercises, yoga that will train the attention and awareness. Recent evidence shows that integration mindfulness practices with cognitive behavioral interventions can help to enhance mental process, including working memory and cognitive stability. Study, that involved 19 people who participated in an 8- week mindfulness program. The results showed that the mindfulness training led to changes in how the different parts of brain communicate when the mind is at rest (Huang et al., 2020). This suggests that the mindfulness helps to improve attention, focus, cognitive functioning and wandering thoughts, in simple this can also work on the negative emotions. People who have been suffering from bereavement period this mindfulness training helps with their negative emotions and cognitive functions. When we practice mindfulness during tough times it helps that individual to accept that Reality of loss of loved ones and helping them to process their emotions to function effectively in daily life. Grounding technique is one of the mindfulness technique in which that involves anchoring the individuals

present moment through sensory and cognitive awareness which involves (i.e,5-4-3-2-1 sensory technique).Grounding Strategies help individuals regulate intense emotions or distressing memories by recentering the focus on present movement (PharmD, 2024).Working memory is the one of the most important cognitive functions in the brain that holds and uses the information which we get from our senses. It temporarily stores and processes a small amount of information, which helps us think, understand things and stay focused (Cowan, 2013).For example, when you count numbers backward, your working memory is actively keeping track of that and changing the information(Baddeley, 1992). Working memory has four main subcomponents:(i)executive functions, act as the supervisor like role of exerting control and overseeing the manipulation of incoming information for intended execution and the next two is called as two slave system namely, (ii)Phonological loop, this is a verbal working memory deals with auditory information, (iii)Visuospatial sketchpad, this is our ability to temporarily hold the visual and spatial information, such as route from home to a grocery shop. Another system which also plays an important role in working memory is that (iv) Episodic buffer, which connects information with our long term memory. Bereavement can harm working memory especially in older adults(Atalay & Staneva, 2020).Grief is associated with bereavement where grief does not lead to long term impairment but prolonged grief will have effects in cognitive functions, attention and memory.

Cognitive flexibility is the ability of a person to change quickly and transit effectively between different concepts or types of thinking. It is adjusting your thinking to new or unexpected conditions and learning from that thing and applying that knowledge to

another. This is responding to the changing environment, both internal and external. This involves the task like shifting between different tasks or goals, switching perspectives, disengaging from old rules or habits and reshape your mental approach to a new one. In bereavement coping flexibility

underscores the importance of being able to flexibly utilize differing strategies in accordance with situational demand(S. H. Huang et al., 2022).One of the cross- sectional study of bereavement, Shows that asymptomatic bereaved adults demonstrated better flexibility in emotional expression, compared to those with a complicated grief presentation (Gupta & Bonanno, 2011).Both the working memory and cognitive flexibility is the core component of executive function which helps to individual to function effectively in their daily life. Where bereavement and prolonged grief will affect the individual daily functioning and cognitive functioning like memory, attention, focus and other cognitive functions.

Review of literature:

Cox et al. (2025) aimed to develop an evidence based- formed bereavement program and Creating space for grief a tailored intervention program for post- secondary students. This study recognize that around 60% of the students experience loss during their studies, often shows lack of campus based- grief support, the author designed CSG to address student's cognitive social and emotional challenges which gives university level grief intervention to enhance emotional well being.Knowles et al. (2025) investigated how mindfulness training and progressive muscle relaxation influence psychological well-being among widowed older adults. The results show that both MT and PMR significantly reduced depressive symptoms and negative affect. The findings shows that mind body intervention like mindfulness and relaxation can effectively improve the emotional distress in bereaved widow(er)s. Buur et al. (2024) examined the experiences of older adults coping with spousal loss and described how cognitive-behavioral therapy can be tailored to manage complicated grief symptoms. They found that the exercise, psychoeducation, letter- writing were especially helpful one. This study highlights the need for tailored therapy for the older adults by addressing the memory issue and adapting to the life without a partner. The study by (Békés et al., 2023) aimed to develop a neurocognitive model of grief explaining how bereavement affects cognitive functioning and

emotional functioning. This study also says that how the interaction between the basal ganglia and medial temporal lobe systems becomes disrupted during grief and bereavement period. The findings give the importance of understanding grief through a neurocognitive lens which helps to design a more effective intervention for bereaved individuals. Zainal and Newman (2023) conducted a meta-analysis examining the effects of mindfulness-based interventions on various aspects of cognitive performance. and the results showed that the MBIs gives moderate improvements in global cognition, working memory accuracy, executive attention, cognitive shifting and sustained attention. Effects were strongest among individuals with psychiatric symptoms. Overall, the study concluded that regular mindfulness practice enhances key aspect of cognitive functions particularly attention and working memory The study by (F. Huang et al., 2020) assesses how mindfulness based cognitive therapy(MBCT) affects emotional regulation and brain activity in individuals experiencing bereavement grief. Both the neuroimaging and self report assessment were conducted before and after intervention. Results shows that the changes in subcortical connectivity correlated with improvements in mindfulness, anxiety, and emotional regulation. The findings show that MBCT enhances emotional stability and cognitive regulation in bereaved individuals. Atalay and Staneva (2020) aimed to examine how bereavement specifically the loss of a spouse, relative, or close friend affects cognitive functioning among Australian older adults. The study found that the bereavement led to a moderate decline in cognitive performance, Particularly in working memory and information processing speed by using the longitudinal data study. Researchers also observed reduced social engagement and participation in cognitive activities following loss.

Methodology Aim

To examine grounding techniques as a mindfulness-based tool that can enhance cognitive functions such as working memory and cognitive flexibility among bereaved individuals.

Objectives

1. To examine the impact of bereavement on cognitive functions, particularly working memory.
2. To review the effectiveness of mindfulness-based techniques on cognitive and emotional functioning among bereaved individuals.

Hypothesis

Grounding techniques, as a mindfulness-based tool, enhance working memory, cognitive flexibility, and emotional regulation among bereaved individuals.

Inclusion Criteria

1. Studies published between 2020 and 2025 related to bereavement, mindfulness, and cognitive functions.
2. Studies focusing on cognitive outcomes such as working memory and executive functions
3. Research involving both young and older adult populations.

Exclusion Criteria

1. Studies unrelated to mindfulness, cognitive functioning, or grief.
2. Articles or studies that include non-bereaved samples
3. Publications lacking empirical or theoretical support.

Procedure

This narrative review followed a descriptive and qualitative approach. Studies published between 2020 and 2025 were identified through database searches in PubMed, Google Scholar, and ResearchGate using the keywords “grounding technique,” “mindfulness,” “bereavement,” “working memory,” and “cognitive flexibility.”

Over 300 studies were initially reviewed. Only evidence-based and peer-reviewed articles relevant to bereavement, mindfulness, and cognition were included.

Search Strategy Summary

The literature search included empirical and theoretical studies published between 2020 and 2025. Boolean combinations of search terms (e.g., “mindfulness AND bereavement,” “grounding technique AND cognitive function”) were applied. After screening abstracts and full texts for relevance, duplicates and unrelated topics were excluded. The final set of studies was synthesized descriptively to identify patterns and theoretical linkages among bereavement, mindfulness, and cognitive performance.

DISCUSSION

Evidence from prior studies indicates that bereavement negatively impacts cognitive functioning in both younger and older adults, particularly in areas of attention and working memory. Cognitive disturbances such as lapses in working memory and slower processing speed are common during grief. Anstey et al. (2020) demonstrated that older adults showed moderate declines in cognitive domains, suggesting that bereavement affects not only emotional but also cognitive processes.

Recent studies highlight that mindfulness-based practices serve as valuable tools for supporting cognitive and emotional recovery after loss. Zainal and Newman (2023) concluded that mindfulness interventions led to improvements in attention, executive functioning, and working memory, indicating that mindfulness may restore mental flexibility and concentration. Similarly, Huang et al. (2020) found that mindfulness-based cognitive therapy enhanced emotional regulation and neural connectivity, showing that mindfulness produces measurable changes in cognitive control. Within this context, grounding techniques can be viewed as mindfulness-based practices designed to anchor awareness to present sensory experiences such as breathing, touch, and environmental sounds. These practices help shift attention away from intrusive or distressing thoughts, allowing individuals to regain control over focus and emotions. From a neurocognitive perspective, grounding

may stabilize disrupted communication between the basal ganglia and medial temporal lobe, as noted by Békés et al. (2023), thereby supporting both emotional and memory functioning. Clinically, grounding has several advantages: it is simple to teach, time-efficient, and can be practiced almost anywhere. These characteristics make it ideal for inclusion in grief counseling programs in universities (Cox et al., 2025), community-based interventions, and older adult support systems. However, strong empirical evidence specific to grounding remains limited. Most existing research focuses on general mindfulness or relaxation methods rather than grounding itself (Knowles et al., 2025). Future studies should directly examine how grounding benefits bereaved individuals by incorporating both self-reported measures and neurocognitive assessments to explore its impact on memory, attention, and impulse control.

CONCLUSION

Existing literature supports the hypothesis that grounding, as a mindfulness-based tool, has the potential to enhance cognitive functions—particularly working memory and cognitive flexibility—among bereaved individuals. While mindfulness and cognitive-behavioral interventions effectively address emotional symptoms, grounding techniques may further strengthen cognitive resilience during the grieving process.

Implications

1. Development of grounding-based grief therapy modules for clinical and educational settings.
2. Integration of mindfulness and cognitive training in bereavement counseling.
3. Application of grounding interventions within university mental health programs and community wellness initiatives.

Limitations

1. Limited direct empirical evidence on the specific effects of grounding techniques on working memory among bereaved individuals.

2. Limited research examining the relationship between grounding and cognitive flexibility within the context of grief.

REFERENCES:

- Atalay, K., & Staneva, A. (2020). The effect of bereavement on cognitive functioning among elderly people: Evidence from Australia. *Economics & Human Biology*, 39, 100932. <https://doi.org/10.1016/j.ehb.2020.100932>
- Baddeley, A. (1992). Working memory. *Science*, 255(5044), 556–559. <https://doi.org/10.1126/science.1736359>
- Békés, V., Roberts, K., & Németh, D. (2023). Competitive neurocognitive processes following bereavement. *Brain Research Bulletin*, 199, 110663. <https://doi.org/10.1016/j.brainresbull.2023.110663>
- Buur, C., Mackrill, T., Hybholt, L., Nissen, E. R., & O'Connor, M. (2024). Older bereaved individuals' experiences of cognitive-behavioral therapy for complicated grief reactions: A qualitative multistage focus group approach. *Cognitive and Behavioral Practice*, 32(1), 56–69. <https://doi.org/10.1016/j.cbpra.2024.06.002>
- Bryant, R. A., Azevedo, S., Yadav, S., Cahill, C., Kenny, L., Maccallum, F., Tran, J.,
- Choi-Christou, J., Rawson, N., Tockar, J., Garber, B., Keyan, D., & Dawson, K. S. (2024). Cognitive behavior therapy vs mindfulness in treatment of prolonged grief disorder. *JAMA Psychiatry*, 81(7), 646. <https://doi.org/10.1001/jamapsychiatry.2024.0432>
- Cowan, N. (2013). Working memory underpins cognitive development, learning, and education. *Educational Psychology Review*, 26(2), 197–223. <https://doi.org/10.1007/s10648-013-9246-y>
- Cox, A., Boyle, S. L., Newby-Clark, E., & Lumley, M. N. (2025). Creating space for grief: Development of evidence-informed bereavement support program for post-secondary students. *Journal of College Student Development*, 66(2), 209–222. <https://doi.org/10.1353/csd.2025.a958767>
- Gupta, S., & Bonanno, G. A. (2011). Complicated grief and deficits in emotional expressive flexibility. *Journal of Abnormal Psychology*, 120(3), 635–643. <https://doi.org/10.1037/a0023541>
- Gündel, H., O'Connor, M.-F., Littrell, L., Fort, C., & Lane, R. D. (2003). Functional neuroanatomy of grief: An fMRI study. *American Journal of Psychiatry*, 160(11), 1946–1953. <https://doi.org/10.1176/appi.ajp.160.11.1946>
- Hoffmann, B. M., Blair, N. P., McAuliffe, T. L., Hwang, G., Larson, E., Claesges, S. A., Webber, A., Reynolds, C. F., & Goveas, J. S. (2024). Neuropsychological correlates of early grief in bereaved older adults. *International Psychogeriatrics*, 36(11), 1064–1069. <https://doi.org/10.1017/s1041610224000048>
- Huang, F., Hsu, A., Chao, Y., Shang, C. M., Tsai, J., & Wu, C. W. (2020). Mindfulness-based cognitive therapy on bereavement grief: Alterations of resting-state network connectivity associate with changes of anxiety and mindfulness. *Human Brain Mapping*, 42(2), 510–520. <https://doi.org/10.1002/hbm.25240>
- Huang, S. H., Birk, J. L., & Bonanno, G. A. (2022). Looking back and moving forward: Dimensions of coping flexibility divergently predict long-term bereavement outcomes. *Anxiety, Stress, & Coping*, 36(3), 275–290. <https://doi.org/10.1080/10615806.2022.2099545>
- Knowles, L. M., Kaplan, D. M., Flores, M., Friedman, S. E., & O'Connor, M. (2025).
- Mindfulness and relaxation interventions reduce depression, negative affect, and stress in widow(er)s. *Journal of Loss and Trauma*, 1–24. <https://doi.org/10.1080/15325024.2025.2504951>
- PharmD, J. C. (2024, September 9). Step-by-step guide on grounding techniques. *Medical News Today*. <https://www.medicalnewstoday.com/articles/grounding-techniques>
- Zainal, N. H., & Newman, M. G. (2023). Mindfulness enhances cognitive functioning: A meta-analysis of 111 randomized controlled trials. *Health Psychology Review*, 18(2), 369–395. <https://doi.org/10.1080/17437199.2023.2248222>

Digital India: Challenges & Opportunities

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ABSTRACT:

The digital economy is the new productivity platform that some experts regard as the third industrial revolution. With the launch of Digital India programme, the government is taking a big step forward to transform the country into a digitally empowered knowledge economy. Includes various schemes worth over Rs 1 lakh crore like Digital Locker, e-education, e-health, e-sign and national scholarship portal. The programme includes projects that aim to ensure that government services are available to citizens electronically and people get benefit of the latest information and communication technology. This paper focuses on the concept of digital India and its challenges.

KEYWORDS : Digital India, e-governance, digitization

INTRODUCTION:

Digital India is an initiative by the Government of India to ensure that Government services are made available to citizens electronically by improving online infrastructure and by increasing Internet connectivity. Digital transformation is causing massive upheaval across industries and societies. When it comes to pace of technology advancement, we are firmly in the second half of the chess board where each subsequent advancement is massively more impactful than all previous advancements. Such large scale industrial transitions almost always are accompanied by significant benefits in productivity. The digital revolution has been sweeping the world and there is already explosion of information at an unprecedented scale, so much so that storage and retrieval of the available data is assuming challenging proportions. Further, what is more challenging is

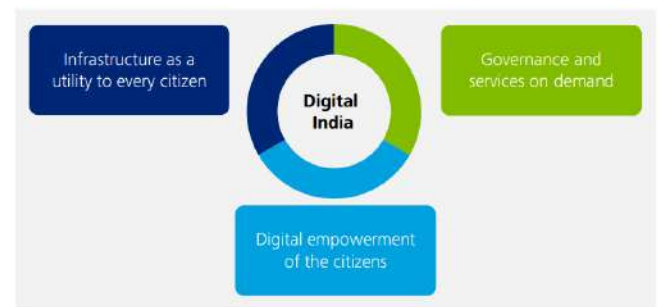
the analysis and processing of data for possible economic and social gains. There is empirical evidence to substantiate that those societies and individuals who can operate computer-based tools and related software are able to develop software(s) that can adapt to the emerging challenges and develop skills to analyse the avalanche of data, thus entering the higher pay brackets. On the other side, those who are not able to cope with the digital tools and remain digitally illiterate are being pushed down the ladder in the job market. To bridge the digital divide between the societies and individuals, governments should encourage education planners to reorient the functioning of the schools and institutions of higher learning in favour of a technology-friendly environment. This will not only enable students to become digitally literate and essentially inquisitive, but also help dig gold nuggets out of the data mines to facilitate economic and social benefits. Further, this move will also help address existing negativities of the growing digitization which impinge on the privacy of individual firms and the government and also on easy availability of tools for mischief mongers who spread misinformation.

India's Economic Agenda towards digitization

India's economic agenda, as laid out by the present government, largely focuses on economic revival and inclusive growth. It aims to carry these out by financially empowering citizens, focusing on industrial development and reducing subsidies through the use of digital technologies. The agenda has the following action points: poverty elimination, containing food inflation, agricultural reforms, co-operation between Centre and states, transparent and time-bound delivery of government services, e-governance and governance enabled through mobile devices, ease of doing

business, job creation and development of infrastructure. To enable these, several large-scale campaigns have been launched by the government. Flagship initiatives such as JAM (Jan-DhanYojana, Aadhar, mobile), DBT (Direct Benefit Transfer), PM's BimaYojana, smart cities, etc. have received significant traction. Jan-Dhan has secured international acclaim by setting a world record for most number of bank accounts opened under a financial inclusion programme in a week¹. The reach of such schemes among the masses has been made possible through the use of technology-enabled channels. Additionally, subsidy reforms have also been initiated with the aim of reducing the burden on the economy and ensuring that the benefit of subsidies reaches the right people. Under the PAHAL scheme, for instance, LPG subsidies will be directly transferred to the bank accounts of those who need them. The impact of these schemes has been visible in a short span of time. The Aadharprogramme is expected to achieve 1 billion enrolments by December 2015². The Jan-Dhanprogramme received 15 million enrolments on the opening day itself³, and reached 115 million enrolments by 17 Jan 2015⁴. This has been possible only through the use of technology-enabled automation for managing data and a centralized banking system, which has also reduced the cost of operations in rural areas. Given that over 700 million Indians have mobile connections, the next step is to enable citizens to transact with the government via online or mobile channels. It is, thus, vital that people and processes be brought onto a common, integrated technology and services platform. The key enabler in this regard is technology. It is only through technology that documents, transaction logs, bank accounts and identities can be integrated and accessed seamlessly. To this end, the government has also initiated the Digital India programme, centred on three key vision areas:

Key vision areas



Infrastructure as a utility to every citizen : The initiative is aimed at providing connectivity through fixed-line broadband, mobile connectivity or Wi-Fi hotspots. Every citizen would be provided with a unique identity with lifelong validity that can be tied up with mobile number and bank account to enable digital banking. Access to Common Service Centre (CSC) would be improved and shareable cloud space on public cloud servers would be provided.

Governance and services on demand : The initiative plans to create seamless integration across multiple government departments and jurisdictions, and make services available on online and mobile platforms. Financial transactions would be made cashless and electronic, and entitlements would be available on the cloud. The ease of doing business in India would be improved.

Digital empowerment of citizens : The initiative would provide universal digital literacy to empower citizens to use digital platform/ devices. Universal access to digital resources would be provided, wherein all documents would be available in digital form on the cloud. Government services would be provided in local languages and a platform would be made available to citizens for participative governance.

Having taken the right steps in the direction of introducing economic reforms, it is now vital for the government to focus on implementation and execution of its policies using technology. India lags behind the targets set up by the new government in achieving the ambitious dream of providing even the remotest villages with high-speed internet. Out of 1 million miles of fibreoptic cable to be laid, for instance, less than 31,000 miles have been laid out. The target date of 2013

for completion of the National Fibre Optic Network program has been extended to 20195

Technology is the most crucial enabler in India's economic growth and trends in the Information and Communication Technology (ICT) sector indicate demand is expected to grow fuelling growth firms in this sector. This will lead to more investment in development of capabilities and higher penetration of computer technology and mobile devices. It will be critical for India to use this growth in areas of governance and service delivery.

The Digital India:

One of the earlier programmes focused on digitization and e-governance was the National e-Governance Plan (NeGP) prepared by the government in 2006. Although the early years

of the plan did not receive much traction, it laid down the foundation for building a technology-enabled knowledge economy. Significant progress has been made subsequently. For example, the Ministry of External Affairs set up an e-passport seva portal that provided an integrated interface for different steps of the passport application process. The upcoming wave of rapid growth in the economy would involve extensive adoption of technology in all areas of the economy. Digital India aims to empower citizens to avail services with more ease and to conveniently interact with the government. The initiative is expected to not only boost economic growth but also to improve the lives of the citizens.

Key pillars of Digital India :

The vision of Digital India would be supported by 9 key pillars that cover projects such as National Optical Fibre Network, National Knowledge Network, Smart Cities, etc.

Pillars of Digital India

S.No.	Pillar	Summary
1	Broadband Highway	- To provide high-speed broadband coverage highways connecting about 250,000 villages, various government departments, universities, etc. - To provide an integrated information infrastructure with integration of State Wide Area Network (SWAN), National Knowledge Network (NKN) and National Optical Fibre Network (NOFN)
2	Universal access to mobile	To provide mobile connectivity to about 42,300 villages
3	Public Internet Access Programme (PIAP)	- To make 250,000 CSCs operational at Gram Panchayat level for delivery of government services - To convert 150,000 post offices into multi-service centres
4	E-governance	To use business process re-engineering to transform government processes and make them simple, automated and efficient
5	E-kranti	To use technology for service delivery such as e-education, e-healthcare, technology for planning, farmers, security, financial inclusion, justice, etc.
6	Information for all	- To provide open access to government information and documents online - To provide two-way communication between citizens and the government through online platforms and social media
7	Electronics manufacturing	To target net zero imports by 2020, through various actions in areas such as taxation/incentives, economies of scale, skill development, government procurement, etc.
8	IT for jobs	To provide necessary skills and training that enable the youth to avail jobs in IT/ITES sector
9	Early harvest programmes	To focus on execution of project within short timelines, such as IT platform for messages, e-greetings from the government, biometric attendance, Wi-Fi in all universities, etc.

Source: DeitY on "Digital India, A programme to transform India into a digitally empowered society and knowledge economy"

A well-integrated plan touching upon all sections of the Indian society, if implemented properly, holds a lot of

promise and will transform the way citizens connect with the government. It will be very critical for the Centre and state

governments to ensure citizen awareness, monitor progress of implementation and ensure smooth and efficient functioning of government services.

Role of Public-Private Partnership :

Public-Private Partnership (PPP) models have been fairly successful in development of infrastructure and effective implementation of large-scale transformational projects in India. As of 2015, 60% of airport traffic in India is being managed under the PPP model. A total of 100 PPP highway projects had been completed by March 2014 and another 165 were ongoing.

To fulfil the vision of Digital India for 1.2 billion people the role of PPP is vital. There is significant opportunity for the private sector to participate in the Digital India programme. However, this requires creation of a conducive environment for the private sector and especially new entrants. Out of 189 major economies reviewed by the World Bank, India ranks 142 in the ease of doing business index. While the government has undertaken several initiatives to improve this, a lot more needs to be done.

The Delhi-Mumbai Industrial Development Corridor (DMIDC) project is one of the finest examples of successful implementation of the PPP model. However, several PPP projects in India have been stuck for a variety of reasons including delays in government clearances, unclear business models, absence of a land acquisitions policy, doubts about a sustainable policy and legal framework, etc.

Several states and cities have begun collaborating with private players to develop digital infrastructure and services. For instance, Bangalore Police recently launched kiosk-based locations to enable citizens to file FIRs without visiting the police station. Bangalore Police also developed 'e-challan' and automatic traffic monitoring systems jointly with IT providers and telecom service providers. The Haryana government's software wide area network and the common services centres are being developed under the PPP model. Several of the Centre's IT programmes are also being developed on PPP models. Development of the 100 smart cities will require that a number of services will have to be provided digitally and over the internet. While the

implementation of smart cities plan will happen through Special Purpose Vehicles (SPV), development of the digital footprint for a smart city will need to include a consortium of private players including:

- Platform and application developers
- Software developers
- IT and network infrastructure vendors
- Communication/connectivity providers
- Infrastructure developers

Private players are expected to bring in the execution efficiency and human resource expertise to execute the vision laid out by the government.

NamamiGange is another initiative where participation of private players is critical for the success of the program. The Centre has approved a budget of ₹ 200 billion⁹ (~\$3 Billion) and has taken a \$1 billion loan from the World Bank¹⁰. But it is estimated that the amount of investment required would be significantly more than the amount at hand. Therefore, the role of private sector players becomes crucial in bridging this gap. The central government has planned various interventions such as municipal sewage management, managing industrial discharge, etc. for the execution of the initiative. Each intervention will require participation from private players. Hence the central government plans to set up SPVs for operation, monitoring and maintenance for a period of at least 10 years. These private players will not only bring in the necessary investment but also the technology and expertise to manage and monitor the projects. For example, the government plans to hire vendors for real-time monitoring of pollution levels and effluent emission in rivers.

Technology Drivers :

Globally, technology has been the biggest enabler in bringing out massive transformation in both public and private sectors. Given the complexity of implementation at such a large scale and unprecedented scope of the project, it is critical to choose disruptive and emerging technologies, which have mass reach, can be customized and are ubiquitous in nature. Considering the timelines involved, the implementation would need to be done in a lean and agile manner, apart from being cost effective and secure. Technologies such as cloud

computing, mobility and analytics would be the most appropriate in enabling the vision and the pillars of the initiative. The technologies are detailed below.

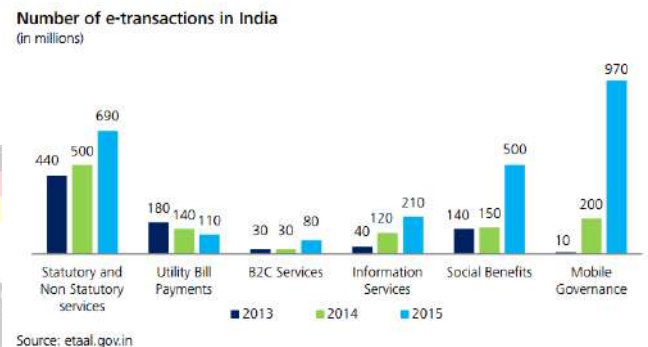
Cloud Computing: Cloud computing enables the user to store and retrieve information irrespective of where she is located. The Indian government plans to use cloud for seamless integration between various departments and with citizens. It will provide a centralized data storage facility that will help in dissemination of information at a much faster pace. For example, the DigiLocker is a cloud service launched by the Indian government to provide its citizens with a shareable cloud space to store and share documents such as certificates, PAN card, voter ID, etc.

Mobility : Mobility enables availability of information on the go through devices such as smartphones, tablets, laptops, etc. It can be coupled with cloud to enable sharing of documents or information with other users. Citizens can communicate with the government regardless of their physical location. Diplomats or bureaucrats can gather information and take decisions on the move, which allows for faster and easier decision making.

Analytics: Analytics relies on collection of large amounts of data and drawing out actionable insights. Governments across the world are using the power of analytics to better serve citizens. For example, Deloitte partnered with the UK government to build an analytics engine in London that gathered information from camera sensors and created actionable insights that helped traffic managers to handle traffic in a timely manner. The Indian government has a data repository called e-taal, which provides real-time transaction data of citizen with various departments and agencies of the government, and quick analysis of the information in graphical and tabular form. Moreover, the government is planning to undertake 'Project Insight' that will analyze transaction data of a citizen and correlate that with the income tax data to determine whether the individual is a tax evader or not¹¹. Various other means of technology enablement, such as security of PII Data, ensure that the data remains safe throughout its life cycle.

E-Governance ;

E-governance in India India is seeing a dramatic growth in the number of online transactions involving citizens and the government. The number of such e-transactions has grown by more than 200% in 2 years: from 840 million in 2013 to 2580 million in 2015¹⁸. The number of transactions per service category is shown in the figure below



The number of e-transactions is seen to vary greatly across states. Telangana, Andhra Pradesh and Kerala lead the rest of the nation by a long way in carrying out transactions with the government online.

While some states have been quick in implementing digitization of services, a large number of states fall well short of the numbers achieved by Telangana or Andhra Pradesh. Maharashtra, considered among the most literate and prosperous states of India, falls well short of these numbers, with less than 340 e-transactions per 1,000 people over the 8-month period. Punjab, another prosperous state, is even lower, at just over 130 e-transactions per 1,000 people. The national average is 2,329 e-transactions per 1,000 people over the given period. Only 6 states, however, are above the national average.

The rapid growth in e-transactions over a three-year time period, as shown above, proves that citizens are quick to adopt these technologies as and when they're made available. The onus, then, lies on the government to provide the relevant infrastructure and policies to enable effective digitization of the economy resulting in increase in efficacy of e-governance.

Partnerships with firms, public and private, having expertise in creating the relevant technology strategy and architecture are an efficient way to implement such changes. Governments abroad have often partnered with private firms,

in conducting capability assessments to identify areas of concern and also implement the systems and architecture required to address these concerns. A possible approach would be to implement systemic changes at a granular level, say, in individual government departments, and integrating these to provide a unified, macro-level architecture.

At this juncture, it is prudent to gauge the status of government programmes regarding digitization of the economy and e-governance under the ambitious Digital India initiatives. A list of initiatives in this direction is as below:

Initiatives Taken by the Current Government and their Progress

The government has initiated several programmes that, together, will help realize its vision of a digitized nation. These programmes aim to create technology-enabled solutions and facilitate their adoption by

1. creating a platform through growth of infrastructure, such as laying optical fibre cables;
2. making devices available in an affordable manner by encouraging research, development and manufacturing of electronic devices;
3. incentivising their adoption by linking basic services and facilities like subsidies to these initiatives and
4. imparting relevant skills to ensure that citizens not only adopt these technologies, but also contribute to them, through skill development programmes.

Challenges in Digital India :

An initiative of this scale has never been conceived before and, apart from little availability of skilled manpower, execution has been a challenge. Hence, the vision cannot be realized without tackling such looming challenges. Some of the challenges are detailed below.

- **NOFN Infrastructure Setup :** The effort to connect about 250,000 villages through an optical fibre network has seen significant delays in the past. Just about 1% of those villages are connected to the internet through NOFN²⁸. Providing last-mile connectivity would be a challenge in the future since it is unaffordable for most Indians.

- **Adoption of Internet :** Apart from infrastructure installation, adoption of the internet remains a concern. Internet penetration has remained close to 15% in India while in China it is nearly 46%²⁹. Moreover, people in poor areas would find it difficult to afford internet through broadband or mobile. Low literacy level, lack of content with regional relevance, lack of appropriate access devices would also hinder the adoption.
- **Data Speed :** Data speed is another area where India faces a big hurdle. India is ranked 20th in mobile data speeds, with an average speed of 0.099 mbps. In comparison, Canada, the top ranked nation, has average data speed of over 4.5 mbps³⁰.
- **Security :** With cybercrime on the rise, the idea of putting information of about a billion citizens online seems like a risky move. Hence highest levels of security measures and protocols would need to be taken to ensure a safe environment for the citizens.
- **Coordination and Standardization :** Various government departments such as DeitY, DoT, Law, Finance, etc. would be involved in creating systems and operational standards for a seamless integration. Such involvement would require significant levels of coordination to ensure proper flow of information.
- **Private Sector Participation :** In order to meet the expected timelines, participation of private sector players becomes quite crucial. Whereas, private sector players have shown limited involvement, this needs to be boosted quite rapidly.
- **Manpower :** Skilled manpower is, perhaps, the biggest challenge of all. India has nearly 475 million people engaged in labour, out of which about 93% are engaged in unorganized labour³¹. Skilled manpower is essential for the development and effective adoption of new technologies. Creating a system to train and provide gainful employment to so many people is an immense challenge.

Lastly, the fact that a project of this scale has never been completed in India before is, in itself, a major challenge. Effective execution is critical for success and several ambitious projects proposed by earlier governments have not been completed. The reasons behind these are numerous, but corruption, bureaucracy and apathy are some major reasons that ambitious projects have fallen apart in the past. The current government has shown vision and intent in conceptualizing the Digital India programme, and has proactively pursued policies that will enable such initiatives to fall in place.

Opportunities :

The Digital India initiative aims to transform India into a digitally empowered society and knowledge economy. Its three main goals are to provide digital infrastructure as a core utility to every citizen, to deliver citizen services and entitlements on demand, and ensure universal digital literacy throughout India. Some of the opportunities are given hereunder :

- The digital economy is the new productivity platform that some experts regard as the third industrial revolution.
- Primary benefits of India's public sector are increased revenue; reduced costs; higher employee productivity; improved safety and security; improved environment; enhanced citizen experience, and better health and well-being.
- Digital India is a strategic call to embrace the opportunity for India as one of the leaders in the third industrial revolution, and the use of Information and Communication Technologies (ICTs) that has never been greater.
- With the Digital India initiatives technology will become accessible, affordable and adds value to the various citizen services.

Thus by making India Digitally self sufficient; India can overcome various problems and progresses towards knowledge center so as to economically stronger.

Conclusion :

The vision of promoting inclusive growth through empowerment of citizens, it is important to reach out to citizens in the remotest of locations and make them part of India's growth story. Globally, technology has been the greatest enabler in causing disruptive change. India's story is no different, and the use of digital technologies to educate and empower citizens is being seen as a game-changer. Given India's vast expanse and differences in demographics across the nation, there is also a vast difference in the level of adoption among the citizenry. To ensure success of its initiatives in the digital space, the government will have to take steps across multiple functional areas, viz Regulatory framework, Effective implementation, Budget constraints, Bridge digital divide, Security and privacy. By overcoming these challenges government can facilitate number of opportunities to the citizen.

REFERENCES :

- www2.deloitte.com
- FM: Record Number of 11.50 Crore Bank Accounts Opened Under PradhanMantri Jan DhanYojana (PMJDY) as on 17th January 2015 against the original Target of 7.5 Crore by 26th January, 2015; PIB, <http://pib.nic.in/newsite/PrintRelease.aspx?relid=114810>
- Why Modi's Digital India Remains a Pipe Dream, <http://blogs.wsj.com/indiarealtime/2015/08/20/why-modis-digital-india-remains-a-pipe-dream/>
- Airport, IBEF, <http://www.ibef.org/download/AirportsMarch-2014.pdf>
- Highways, <http://pppinindia.com/sector-highways.php>
- Doing Business 2015, World Bank Group, <http://www.doingbusiness.org/Reports/Subnational-Reports/~media/giawb/doing%20business/documents/profiles/country/IND.pdf>
- Centre okays Rs. 20,000-crore budget for NamamiGange scheme, <http://www.thehindu.com/news/national/rs-20000crore-budgetfor-namami-gange-scheme/article7201467.ece>
- Now, bank on \$1 billion World Bank loan to clean-up Ganga, <http://www.dnaindia.com/india/report-now-bank-on-1-billionworld-bank-loan-to-clean-up-ganga-1555471>
- Black money: 'Project Insight' to help Finance Ministry nab tax evaders, http://articles.economictimes.indiatimes.com/2015-07-28/news/64957817_1_tax-evaders-data-analytics-nab-tax
- <http://www.oneindia.com/feature/what-is-digital-india-programme-explained-1792279.html>
- <http://www.cmai.asia/digitalindia>
- <http://www.innovatefordigitalindia.intel.in>

A Career Path for Graduates in Library and Information Science

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ABSTRACT

The job choices for graduates in library and information science are the main subject of this study. The goal of many library and information science workers is to improve the world. Similar to a pick-your-own-adventure book, library and information science offers a range of options that you can select according to your interests, areas of interest, and desired impact. Archives and special collections librarians, children's librarians, competitive intelligence analysts, electronic resource librarians, information architects, information officers, Internet trainers, knowledge management specialists, learning resource center librarians, librarians, and media specialists are just a few of the positions held by recent graduates.

KEYWORD: Library and inf. Sc., library professionals, librarianship resource center

INTRODUCTION

Library and information science (LIS) is an interdisciplinary study that examines the political economy of information as well as the gathering, organizing, preservation, and distribution of information resources. It accomplishes this by bringing to libraries the techniques, perspectives, and resources found in management, information technology, education, and other domains. Because libraries serve as repositories of knowledge and information, their value has increased. In this instance, the distinction of becoming its own discipline was acquired by librarians. Librarians, who serve as their guardians, maintain, organize, and stock libraries. They help people find and use knowledge effectively in both their personal and professional lives. Traditional libraries that used to solely have books for

reading for pleasure and education now have periodicals, journals, microfilms, audio-videos, cassettes, and slides (Employment News, 2016).

Definition of Key Terms

The field of library and information science employs a large number of people who are enthusiastic about changing the world and are typically extremely content with their work. Librarians fill in the gaps between technology, information, and humans. In their careers, librarians and information specialists create and construct knowledge-organization systems, To inspire young pupils to cultivate a lifetime love of reading and learning, provide reader's advisory materials (University of Washington, 2023).

Library Professional:

This paper's main goal is to demonstrate the fundamental skills of library and information science (LIS) professionals as organizational managers. In this work, we conducted a comparative analysis between managers of organizations and LIS experts and discovered more parallels than differences. The professional and technological abilities required for library science professionals and managers are described and discussed in this work (Ahmad, 2009).

Librarianship:

Librarians assist their constituents in locating and utilizing information found in a variety of types, sizes, and resources to support both individual needs and an organization's strategic goals (University of Washington, 2023). Librarians are responsible for gathering, organizing, preserving, and distributing information to those in need.

Resource Center:

A resource center collects and organizes resources that are beneficial to a certain group of people, such medical

professionals. There are many different types of resources, such as instruction manuals, handbooks, reference materials, directories, pamphlets, posters, games, videos, and equipment samples (The Texas Heart Institute, 2023).

Career Options for Library and Information Science Graduates

Career options for library and information science graduates include roles in libraries (such as librarian, library technician, and archivist), as well as positions in data management, information architecture, and knowledge management. Graduates can work in public, academic, school, and corporate settings, specializing in areas like digital librarianship, research support, or records management.

Archives and Special Collections Librarian

The exceptional Collections Librarian is part of a team of librarians dedicated to preserving the College's exceptional collections and making them accessible to the general public. The Special Collections Librarian, who reports to the Head of Collection Development, manages student staff, works with college archives, and collaborates with other library staff members to make sure the Libraries' goals and objectives regarding Special collections are fulfilled. The special collections librarian will be responsible for the growth of the local book collections through both acquisitions and contributions (St. Olaf College, 2012).

Children Librarian

As a librarian, think about working with children. Children's librarians play a major role in Promote and develop a reading habit; empower and motivate youth; introduce kids to the newest online resources; collaborate with other instructors; develop programs to link community organizations and the library; choose books to add to the library's collection; provide parental education and family literacy programs; Librarians who appreciate working with children may find a job in children's, school, or young adult librarians intriguing (American Library Association, 2023).

Electronic Resources Librarian

The Role of the Electronic Resources Librarian (ERL) focuses on enduring obstacles that hinder libraries' transition from print collections to online information services. Among the concerns addressed are cost control for electronic serials, online design, discovery, customer service, efficiency, and adjusting companies to the needs of modern consumers. The term takes into account the function's background, how it emerged in North America during the 1990s, how it is represented in the organizational structures of university libraries, and how it connects to contemporary developments in professional identity, technology, and information services (Stachokas, 2020).

Information Architect

In the fields of library and information science (LIS), usability, and human-computer interface (HCI), information architecture (IA) is one of the newest buzzwords. The LIS community is drawn to it for a variety of reasons. IA is somewhat controversial because it is a new name for previously acquired knowledge and abilities. The treatment of information architects in specific LIS schools will be discussed in this essay, followed by some recommendations for how typical LIS curricula might be applied to the information architect job market. According to the Jhon Wiley Online Library (2005), some of the very abilities that are considered vital to IA are also the traditional cornerstone of LIS education.

Reference Librarian

The Reference Librarian strives to be a go-to resource for anybody interested in the subject of reference work, from library and information science students to working reference librarians and full-time scholars. It enables users to stay current with the best teaching and reference techniques. keeping up with the changing nature of reference and providing new insights. The Reference Librarian offers columns with insightful and practical viewpoints and articles on a variety of aspects of the reference process, some of which are based on original research and some of which are

applied. We embrace both contemporary advancements and traditional questions. Effectiveness studies, instruction and reference standards, service marketing research, and contemporary electronic tools and resources are all covered in a number of papers (Information PLC UK Limited, 2023).

School Librarian

School librarians work in academic contexts at every level of the US educational system, from elementary schools to colleges. School librarians arrange their media collections in addition to overseeing reference services and assisting users in obtaining information. They could decide to concentrate on specific areas of library science or categories of items, such collections pertaining to the fine arts, law, or other professions, online reference services, or serials. This page provides further information on what librarians do, how to become one, and their income and career opportunities. Librarians in elementary and secondary schools typically teach students how to use the library's resources for research as well as where to locate and check out books (Teacher Certification Degrees, 2023).

Rare Book Librarian & Curator /Liaison Librarians

Printed works from both the hand-press and machine-press eras are frequently used. Even though rare books are hard to define, the criteria used to classify them are usually based on provenance, age, financial value, and the number of copies still in existence. At one university, academic librarians sometimes work two or more positions. Liaison librarians are "assigned to a department(s) on campus based on their training or expertise." To support teaching, learning, and research, they must serve as a liaison between the department or departments they work for and the library system. Leading training sessions, supporting research, and creating collections are just a few of the duties that liaison librarians can perform for their departments. Wayne State University (Association of College Research Libraries, 2015).

Youth Services Librarian

Recovering services for young people from infancy to early college or high school graduation is referred to as the field of youth services librarian, which usually relates to services offered in public libraries. Youth services librarians are responsible for creating and maintaining a developmentally appropriate collection. Along with initiatives to support and promote print, media, and information literacy, they also provide reference and reader advisory services. Programs can include research, robotics for teenagers, lap sit programs for young children, and life skills development for older kids (The University of Tennessee, Knoxville, 2023).

Library Director

The main position of authority in a library is held by its directors. Formulating and managing the budget, developing employment and service policies, strategic planning, government and public relations, reporting to the governing board or official, guaranteeing legal compliance, making money, hiring, motivating, and firing employees, among other tasks, are typical roles. Depending on the size of the library, library directors' responsibilities and pay might differ greatly. The director of a tiny library may be responsible for everything, even processing payments and shutting the doors. The director of a huge library may be in charge of hundreds of employees in several divisions. Directors of big urban libraries or university libraries may make up to \$229,000 annually, whereas those in rural libraries may work alone every day and make as little as \$38,000 (American Library Association, 1996).

Library Research Analyst

In their function as professional library research analysts, staff members in this class series carry out or oversee a variety of responsibilities to assist professional librarians. The duties include conducting research, creating reports, and performing different client assistance tasks. Gathers, disseminates, and publishes surveys and statistics from libraries. It is the duty of research analysts to build

databases and conduct online data collection. Composes reports and articles to communicate statistical data and analysis in a number of ways. Evaluates, checks, and removes discrepancies in data and information transfer. Reviews and suggestions for modifications to library procedures and policies that affect the provision of services to specialized patrons. helps with the logistical management of books and other library resources (Michigan Civil Service Commission, 2023).

Publishing Manager

offers long-form and digital project publication services at WU Libraries, including client services, content management, system configuration, and optimization. develops policies and service plans for publishing services offered or facilitated by the libraries, as well as processes and workflows for producing works on digital publishing platforms and strategies for publication dissemination. Collaborates with subject-matter experts, faculty, staff, and students at WU. Provides training on publishing platforms. Workers who are students may be supervised. Works together with suppliers and library partners on platform development and improvements to enable academic works and digital collections in a variety of formats (Educopia Institute, 2023).

Learning Resource Center Librarian

These facilities promote electronic information resources in addition to traditional learning resources like books, journals, software, and audiovisual assets. Examples include databases, free websites, subscription electronic journals, and other web-based services. The traditional librarian role has been taken over by the LRC Manager, an information professional with credentials recognized by the Chartered Institute of Library and Information Professionals. To provide coworkers and students with accurate and timely information, the LRC Manager usually focuses on maintaining the LRC's website and participating in the online learning community in addition to supervising the physical space of the LRC. LRCs usually have an obligation to teach study skills and/or information literacy inside the organization they work for. Only since the release of the "Key

Stage 3 National Strategy" in 2003 has the Secondary School LRC addressed this responsibility seriously (Learning Resource Center, 2023).

Web Content Strategist

Although the term may change based on the circumstances, a web content strategist is responsible for overseeing all content for a particular project. We thought it would be a good idea to provide a general summary of the online content strategy's new post for universities. In order to encourage content creation throughout a project, the web content strategist will serve as a liaison and engage with important stakeholders, product owners, subject matter experts, developers, information architects, user experience professionals, and SEO specialists. Make recommendations based on the needs of users and the commercial objectives of the library. Create and revise content in accordance with web writing standards to ensure that the editorial norms and standards, standards for voice and tone as well as accessibility and usability, are in line with Penn State's editorial standards. Build content best practices in collaboration with writers and content developers

Law Librarianship

A law librarian provides assistance to a variety of clientele, such as judges, attorneys, law students, legal assistants, and occasionally members of the general public. Law libraries can be found in a variety of legal settings, such as government libraries, private legal firms, law schools, and legal technology enterprises. There is a strong job market for law librarians with only a master's degree, particularly in law firms, even though certain law librarian positions demand both a JD and a master's degree (University of Washington, 2023).

Public Librarianship

Put aside your preconceived notions about public libraries. These days, a librarian's duties go much beyond simply checking out books and stocking shelves. A public librarian's role as a technology specialist is just one of many. Information detective, manager, literacy specialist, trainer, coordinator of community programs, reader's consultant, children's storyteller, material reviewer, and buyer are among

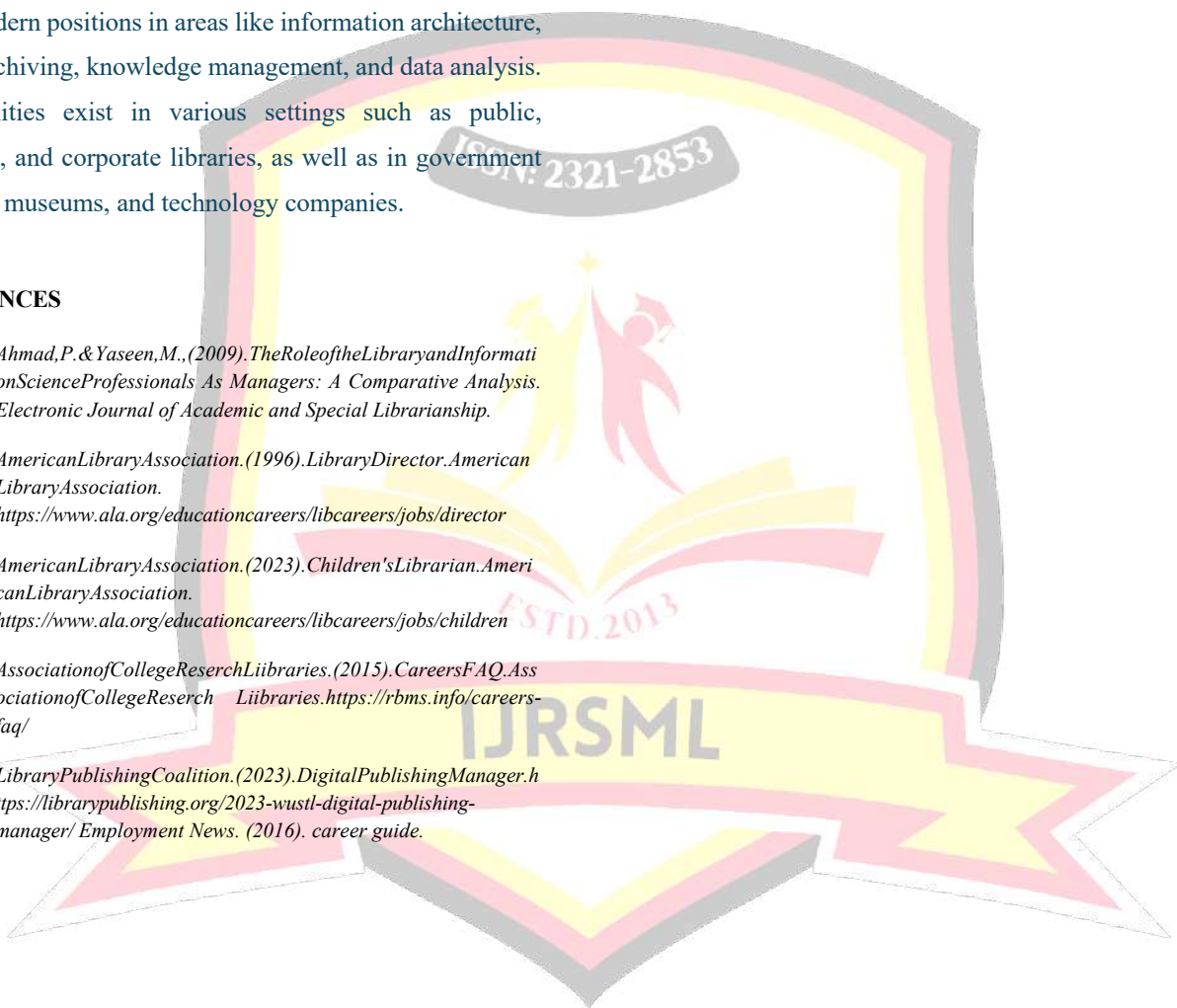
the others. Today's public library occupations offer a wide range of demanding responsibilities, opportunities, and projects (American Library Association, 2023).

CONCLUSION

Graduates in Library and Information Science have diverse career options, including traditional roles like librarians, archivists, and library technicians, as well as more modern positions in areas like information architecture, digital archiving, knowledge management, and data analysis. Opportunities exist in various settings such as public, academic, and corporate libraries, as well as in government agencies, museums, and technology companies.

REFERENCES

- Ahmad, P. & Yaseen, M., (2009). *The Role of the Library and Information Science Professionals As Managers: A Comparative Analysis*. *Electronic Journal of Academic and Special Librarianship*.
- American Library Association. (1996). *Library Director*. American Library Association. <https://www.ala.org/educationcareers/libcareers/jobs/director>
- American Library Association. (2023). *Children's Librarian*. American Library Association. <https://www.ala.org/educationcareers/libcareers/jobs/children>
- Association of College Research Libraries. (2015). *Careers FAQ*. Association of College Research Libraries. <https://rbms.info/careers-faq/>
- Library Publishing Coalition. (2023). *Digital Publishing Manager*. <https://librarypublishing.org/2023-wustl-digital-publishing-manager/> Employment News. (2016). *career guide*.



Effect of Body Scan Technique on Academic Stress and Physical Discomfort among School Students

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ABSTRACT

School children are frequently exposed to intense academic pressure, which is often experienced not only as stress but also as physical pain, illustrating the interconnected nature of mind and body. According to Franz Alexander's Psychosomatic Theory, Psychological stress can trigger or intensify physical symptoms. Using certain relaxation techniques can improve the well-being of the individual by reducing the stress and pain. In this context the present research proposes the use of body scan meditation technique as an intervention to manage academic stress and stress related or induced pain among school children. It proposes body scan technique as a practical strategy to improve student's coping abilities. Body scan promotes intentional awareness of bodily sensations by guiding attention sequentially from head to toe, helping individuals recognize tension patterns, activate relaxation and develop a mindful connection between emotional states and physical experiences. Understanding mind-body dynamics is important as pain and academic pressure can negatively affect student's concentration, motivation and overall well-being. This framework aims to integrate mindfulness strategies like body scan technique to enhance student's academic ease, emotional balance and physical comfort.

KEYWORDS: Academic stress, Pain, Body Scan Technique, Student support.

INTRODUCTION

Academic stress

Academic stress refers to the emotional, psychological and physical strain experienced by students when academic demands exceed their perceived ability to cope. It arises when students feel pressured by heavy workloads, exams, time bound tasks, competition and expectation of high performance. Academic stress is strongly associated with failure, fear of judgement, comparison with peers and pressure from parents or teachers. It will not only affect students attention and concentration but also emotionally leading to anxiety, low self esteem and irritability. Research consistently shows that academic pressure affects students mental and physical well being. According to a study by Deb, Strodl & Sun (2015) in India, students experiencing high academic stress are more likely to report symptoms of anxiety and depression along with physical symptoms of headaches and fatigue. Body reacts to stress by activating the autonomic nervous system, releasing stress hormones such as cortisol, which can contribute to psychosomatic symptoms. Academic stress creates a negative cycle that is initially the stress reduces the focus and productivity, which then impacts academic performance which cause even more stress.

Managing academic stress is important not only for maintaining academic efficiency but also for protecting emotional balance and physical health. Individuals must adopt healthy coping strategies themselves such as mindfulness practices, time management, emotional regulation and realistic goal settings to build resilience against academic pressure.

Pain

Pain is a multidimensional experience which involves physical, emotional and cognitive components. It serves as a protective mechanism that alerts the body to injury, illness, or potential damage. According to the International Association for the Study of Pain (IASP, 2020), Pain is associated with actual or potential tissue damage. It emphasizes both physical and psychological elements. Pain is processed by the brain and spinal cord. When the body senses any threat or injury then the signals travels through the nerves to the brain. The brain interprets these signals decides how severe the pain is and triggers a response. As pain is subjective two different individuals may experience different levels of pain from the same stimulus. Psychological states such as anxiety, stress, fear or emotional distress can increase or intensify the perception of pain. Research shows that mental stress can worsen the physical pain that supports the mind body connection. A study by Edward et al. (2016) suggested that individuals experiencing high emotional stress has the stronger pain, it is due to the activation of the sympathetic nervous system and elevated cortisol level. Stress induces reduced blood flow, muscle tension and increased sensitivity in the nervous system which can induce pain sensation. Pain can be of two types acute pain and chronic pain. Acute pain is for short term and is caused by injury or illness. Chronic pain persists for more than three months, even after the healing. Pain can disrupt sleep, concentration, academic performance, and emotional well-being. Long-term pain can lead to fear, avoidance behaviour, and reduced functioning.

Body Scan Technique

The body scan technique is a mindfulness-based relaxation practice that is designed to create awareness of bodily sensations and promote deep physical and mental relaxation. It was developed by Jon Kabat-Zinn as part of Mindfulness-Based Stress Reduction (MBSR), this technique involves mentally scanning the body in a slow, systematic manner, usually from the feet to head. During the session the individuals either lie down or sit comfortably, close their eyes, and gently direct their attention to different areas of the body, noticing sensations such as tension, warmth, tingling, pressure, or even the absence of sensation as per the command. Rather than trying to change these sensations, individuals learn to observe them and accept the present moment as it is. This intentional awareness activates the parasympathetic nervous system, which reduces muscle tension, slows heart rate and lowers stress hormones like cortisol. By repeatedly redirecting attention to the body, the mind becomes calmer, mental chaos decreases, and ruminative thinking is also reduced. The body scan is particularly effective for individuals experiencing stress-related physical discomfort or psychosomatic pain as it helps them identify where emotional stress is being held in the body and gradually release that tension. Research suggests that regular practice of body scan meditation reduces perceived stress, enhances emotional regulation, improves pain tolerance, and increases feelings of relaxation and well-being. In school settings the body scan helps students become more aware of the relationship between their academic stress and physical symptoms such as headaches, muscle tightness, or fatigue. By fostering a mindful connection between mind and body, the body scan becomes a simple yet powerful intervention that encourages self-awareness, emotional balance, and physical ease.

Review of Literature:

The study by Bouchard, G., & Gallant, J. (2024) aimed to find differential effects of a brief body scan session on pain and anxiety levels. They found that a short body scan mindfulness session was more effective at reducing pain and anxiety for individuals with higher baseline symptom severity than for

those with lower levels, suggesting that symptom-severity moderates the effectiveness of body scan interventions. The study by Gan, R., Zhang, L., & Chen, S. (2022) aimed to find the effect of body scan meditation through a systematic review and meta analysis. They found when body scan meditation technique alone is used it produced only a small effect on mindfulness and was not sufficiently effective for improving broader health related outcomes, they suggested that context, population, or combination with other interventions may be necessary for an effective outcome. The study by Ditto, B., et al. (2006) aimed to find the short-term autonomic and cardiovascular effects of mindfulness through body scan meditation. They found a brief session of body-scan meditation led to significant changes in autonomic and cardiovascular measures such as increased heart-rate variability and altered blood pressure, compared to simple sitting or other relaxing activities, suggesting that body scan meditation has marked physiological effects beyond general relaxation. The study by Corbett et al. (2019) aimed to conduct a randomised comparison of two stress control programmes that is progressive muscle relaxation versus mindfulness body scan. They found differential outcomes, suggesting that the specific technique of mindfulness body scan may offer distinct benefits in the process of stress reduction compared to other more traditional relaxation approaches. This was found on comparing two different intervention in large group settings. The study by Schultchen et al. (2019) aimed to assess the effects of an eight week body scan intervention on individually perceived psychological stress and related steroid hormones in hair. They found that participants on completing an eight week body scan meditation programme showed significant reductions in the biological stress hormone cortisol and improvements in the cortisol/DHEA ratio, which indicates that sustained body scan practice can reduce chronic physiological stress even when psychological self-report changes are moderate.

The study by Johles et al. (2023) aimed to find if a brief body scan helpful for adolescent athletes sleep problems and anxiety symptoms. They found that a brief body scan intervention among adolescent athletes led to the reduction of

anxiety symptoms and improvements in sleep problems over time. However, the differences between the body scan and active relaxation control groups were not statistically significant, this suggests that while body scan is beneficial its effects may not surpass like other relaxation-based practices. The Study by Eva, A. L., & Thayer, N. M. (2017) aimed to conduct a pilot study of a mindfulness based intervention to support marginalized youth. They found that a six-week mindfulness based program for marginalized adolescents led to statistically significant improvements in self-esteem and the selected items of perceived stress. Qualitative focus-group feedback identified the body scan technique as the most valued daily practice and highlighted themes of self-regulation, positive thinking and attention awareness.

Methodology Aim

To examine the effectiveness of the Body Scan Meditation technique in reducing academic stress and physical discomfort among school students.

Objectives

1. To examine the impact of academic stress on inducing physical pain in school students.
2. To evaluate the effectiveness of Body Scan Meditation in reducing academic stress and physical discomfort.

Hypotheses

H1: Body Scan Meditation will significantly reduce academic stress among school students.

H2: Body Scan Meditation will significantly reduce physical pain among school students.

Inclusion Criteria

1. Studies published between 2017 and 2025 related to body scan meditation, academic stress, and physical pain.
2. Studies focusing on mindfulness-based stress reduction (MBSR) and physical pain reduction.

3. Populations ranging from adolescents to adults.

Exclusion Criteria

1. Studies lacking theoretical or empirical support
2. Studies that do not include body scan intervention
3. Studies unrelated to stress or pain.

Procedure

Relevant studies were identified through databases such as Google Scholar PubMed, and ResearchGate using the key terms: Body scan meditation, academic stress, mindfulness, stress reduction, physical pain, and discomfort. Over 200 studies were initially reviewed. Irrelevant studies and those lacking empirical value were excluded. Only evidence-based and relevant papers were included for analysis.

DISCUSSION

Across the reviewed studies, Body Scan Meditation consistently demonstrates beneficial effects on stress reduction, physiological regulation, and emotional well-being. Research findings indicate that body scan meditation can: Reduce anxiety and pain effectively, particularly among individuals with mild symptoms (Bouchard & Gallant, 2024). Improve biological stress markers such as cortisol levels (Schultchen et al., 2019). Induce autonomic and cardiovascular relaxation responses beyond general relaxation effects (Ditto et al., 2006). When compared with other relaxation techniques, body scan meditation shows unique advantages in promoting internal awareness and self-regulation (Corbett et al., 2019) and is often regarded as one of the most preferred mindfulness practices for enhancing attention and emotional control (Eva & Thayer, 2017). However, research gaps remain. Meta-analytic evidence suggests that body scan meditation alone often produces small to moderate effects, and combining it with other mindfulness practices may yield stronger outcomes (Gan et al., 2022). Additionally, some studies report no significant differences between body scan and other

relaxation techniques (Johles et al., 2023), indicating uncertainty about its standalone efficacy.

CONCLUSION

Body Scan Meditation is an effective, low-cost intervention for reducing stress, anxiety, and physiological discomfort, particularly in individuals with high symptom levels. It promotes emotional regulation, bodily relaxation, and self-awareness. However, its effectiveness depends on practice duration, consistency, and whether it is used alone or integrated with other mindfulness-based techniques. Despite some limitations, Body Scan Meditation remains a promising and accessible intervention for stress and pain management.

Implications

1. A low-cost, easily teachable stress management strategy.
2. Encourages individuals to develop greater body and emotional awareness, aiding in the management of discomfort.
3. Demonstrates enhanced effectiveness when combined with other mindfulness-based practices.

Limitations

1. Limited number of studies specifically examining school students and academic stress.
2. Many studies use small sample sizes, making it difficult to generalize findings.
3. Most studies rely on self-report measures of stress and pain, which may be subject to bias or inaccuracy.

REFERENCES:

- Aherne, D., Farrant, K., Hickey, L., Hickey, E., McGrath, L., McGrath, D., Aherne, D., Farrant, K., Hickey, L., Hickey, E., McGrath, L., & McGrath, D. (2016). Mindfulness based stress reduction for medical students: optimising student satisfaction and engagement. *BMC Medical Education*, 16(1), 209. <https://doi.org/10.1186/s12909-016-0728-8>
- APA PsycNet. (n.d.). <https://psycnet.apa.org/record/2015-46676-001>

- Bouchard, G., Gallant, J., Bouchard, G., & Gallant, J. (2024). Differential effects of a brief body scan session on pain and anxiety levels. *Counselling and Psychotherapy Research*, 24(3), 1069–1075. <https://doi.org/10.1002/capr.12785>
- Corbett, C., Deyo, M., Feldman, G., Daele, T. V., Benson, H., Desro-siers, A., Faul, F., Frewen, P., & Jain, S. (2019). Progressive muscle relaxation versus mindfulness body scan: A randomised comparison of two “stress control” programmes. *Mental Health & Prevention*, 14, 100173. [https://doi.org/10.1016/S2212-6570\(18\)30061-8](https://doi.org/10.1016/S2212-6570(18)30061-8)
- Daya, Z., Hearn, J. H., Daya, Z., & Hearn, J. H. (2017). Mindfulness interventions in medical education: A systematic review of their impact on medical student stress, depression, fatigue and burnout. *Medical Teacher*, 40(2), 146–153. <https://doi.org/10.1080/0142159x.2017.1394999>
- Ditto, B., Eclache, M., & Goldman, N. (2006). Short-term autonomic and cardiovascular effects of mindfulness body scan meditation. *Annals of Behavioural Medicine*, 32(3), 227–234. https://doi.org/10.1207/s15324796abm3203_9
- Dreeben, S. J., Marnberg, M. H., & Salmon, P. (2013). The MBSR body scan in clinical practice. *Mindfulness*, 4(4), 394–401. <https://doi.org/10.1007/s12671-013-0212-z>
- Eva, A. L., & Thayer, N. M. (2017). Learning to BREATHE: a pilot study of a Mindfulness- Based intervention to support marginalized youth. *Journal of Evidence-Based Complementary & Alternative Medicine*, 22(4), 580–591. <https://doi.org/10.1177/2156587217696928>
- Gan, R., Zhang, L., Chen, S., Gan, R., Zhang, L., & Chen, S. (2022). The effects of body scan meditation: A systematic review and meta-analysis. *Applied Psychology Health and Well-Being*, 14(3), 1062–1080. <https://doi.org/10.1111/aphw.12366>
- Johles, L., Norell, A., Lundqvist, C., Jansson-Fröjmark, M., Mehlig, K., Johles, L., Norell, A., Lundqvist, C., Jansson-Fröjmark, M., & Mehlig, K. (2023). Is a brief body scan helpful for adolescent athletes' sleep problems and anxiety symptoms? *Mindfulness*, 14(6), 1522–1530. <https://doi.org/10.1007/s12671-023-0214w>
- Schultchen, D., Messner, M., Karabatsiakos, A., Schillings, C., Pollatos, O., Schultchen, D., Messner, M., Karabatsiakos, A., Schillings, C., & Pollatos, O. (2019). Effects of an 8- Week body scan intervention on individually perceived psychological stress and related steroid hormones in hair. *Mindfulness*, 10(12), 2532–2543. <https://doi.org/10.1007/s12671-019-01222-7>
- Tarrasch, R. (2014). Mindfulness meditation training for graduate students in Educational Counselling and Special Education: A Qualitative analysis. *Journal of Child and Family Studies*, 24(5), 1322–1333. <https://doi.org/10.1007/s10826-014-9939-y>
- University of Southampton. (2006). An investigation into the effectiveness of two mindfulness techniques : mindful breathing and the body scan - ePrints Soton. <https://eprints.soton.ac.uk/467118/>

Academic Procrastination among Higher Secondary Students: Causes and Insights

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ABSTRACT:

Academic procrastination is major factor among students of higher education and also complex issue to work on it. Several factors which contribute to it, including poor time management, lack of motivation, low self-regulation, and low self-esteem fear of failure, and distractions. Students feeling overwhelmed by more work and students distracted from technology, and this can be happened by stress and anxiety. Now a day's student is increased the use of technology and time pressure in academic performance that delay the course actions. The purpose of study was to know the causes of academic procrastination among student of higher secondary and how to work on it and reduce the anxiety and stress level. Procrastinators perceive to reduce this behavior of identity because sometime it is very negative impact on academic and mind health issues. Due to this student were not much interest to do work in specific time. When Student engaging them in any particular task this may give the benefited from the mental stress and work pressure situation when the teacher, academician, policy maker designed the syllabus and curriculum. They need to focuses on work distribution Content according to their choice.

KEYWORD: Academic Procrastination, Causes

INTRODUCTION:

As we know the present era is become increasing rapidly grow with scientific and technological advancements. The idea of achievement is growing more significant in society. The accomplishment has had an impact on every aspect of life, including education, social science, physical

science, literature and the arts. Over the past few decades, the field of psychology has given more empirical attention to the academic procrastination, its effects and psychological characteristics associated with academic procrastination. Generally speaking, procrastination has long been recognized as a bad habits, and those who engage in it. It's a problem that they wish to lesson due to the grave consequences.

Procrastination changes the behavioral mood and nature bust most probably it effect on academic performance. It is talking about knowledge of student has to finish their task within time and administration of activities with their knowledge. For examples class test final exam, completing class project and submitting class assignment on before time. Procrastination is nothing but a delay and poor performance in academic achievements. In this study researcher focuses on the how to reduce the procrastination among the students while improving and practicing on self-efficacy and self-regulation in school daily performance. According to Channawar (2023) stated that self-efficacy measured the strength of one's belief in his or her ability to execute the requisite activities and every individual needs a requisites knowledge and skills of purpose for perform a task and for that self-efficacy beliefs functioning effectively in human core activities. The self-regulation is a practice to perform in any type of activity and this activity shows the performing result in the positive way through performance (Channawar 2023). Academic procrastination breaks students' academic achievement. Individual procrastinators tend to be lazy to participate in academic activities, namely in the form of learning activities (Drajat 2024). This type behavior will have reduces the growth of individual academic achievement. According to Burka & Yuen, procrastination creates external problems, such as delaying doing assignments making us

unable to do our assignments properly and getting warnings from teachers, and causes internal problems, such as feeling guilty or regretful (Grant, 2009), this sentence framed in journal of Drajat (2024). According to Quinn (2019) studied academic procrastination and the role of stress, self-efficacy, self-esteem, age, gender, and hours worked, and found that stress was positively connected to procrastination while self-efficacy was negatively related. According to Mostafa (2018) examine the relationship between academic procrastination, self-efficacy beliefs, and academic achievement. Revealed significant negative relationship between self-efficacy beliefs and academic procrastination. A study to explore the association between academic procrastination, self-efficacy and academic performance among university students in Malaysia. The finding showed that most students are prone to procrastinate in their academic life by Baka & Khan (2016).

Definition:

According to Silver (1974), 'procrastination' is to finish a job after the completion of optimal time, where optimal time means the most appropriate time to finish a job. This definition features the essence of procrastination.

According to Ferrari (1998) described procrastination as a behavioral style that reflects self-regulation failure.

Causes of Academic Procrastination:

The root cause of academic procrastination is sometimes emotional response to perceive a task. Fear, failure in academic accountability, fear in completing task, leading the mind like stuck in one position. Because of this it create a boredom anxiety, stress loneliness and low motivation over completing the long term goal for career

1. Poor Time Management: Work inability generated boredom and Inability to prioritize tasks, set realistic goals,

and manage time effectively. Difficult to face the academic pressure to completing the task.

2. Lack of Motivation: Negligence increase toward work and assignment which raises the lack of motive for completing the task. Insufficient interest in academic tasks, lack of clear goals, and absence of rewards or recognition. All these decrease the self-efficacy which not good for academic achievement.

3. Fear of Failure: Individual suffering the unwanted threaten about the failure, hesitation and facing issues were reflected the result of individual which is breaks down in failure mood. Anxiety about not meeting expectations, fear of failure, and perfectionism.

4. Distractions: Today's teenage groups are distracted very fast due to the technology, Social media, socializing, and entertainment options. There are numerous online factors which is demotivating from their studies.

5. Learning Style: Teaching and learning are essential factors for the teacher and teacher is the facilitator of the all students who regulate the students by their teaching style, method and maxims. Difficulty with traditional teaching methods or learning styles.

6. Personal Issues: Sometime the students faces the another level of problem which was affected the academic procrastination that is Family problems, Economic issues, physical appearance, health issues, and personal crises.

7. Lack of Support: Apart from that, sometimes it work like insufficient guidance from teachers, parents, or peers. This is also emotionally breakdown phase which effect the academic procrastination.

Emotional and Psychological roots	Cognitive and behavioral roots	Other contributing factors

Fear and anxiety: Many people procrastinate due to fear of failure, fear of success, or general anxiety about a task's outcome. Negative feelings: Tasks that evoke dread, stress, or boredom are more likely to be avoided. This avoidance provides temporary relief from uncomfortable emotions. Cognitive distortions: Negative thought patterns like self-doubt, unrealistic expectations, and catastrophizing can lead to procrastination as a coping mechanism. Low self-esteem: Individuals with lower self-esteem may procrastinate because they are more prone to self-doubt and fear of failure.	Task perception: If a task seems overwhelming, complex, or difficult, it can trigger a desire to avoid it. Not knowing how to start or what to do can also be a factor. Poor time management: A lack of structure or an ineffective approach to managing time can contribute to putting off tasks. Habitual behavior: Procrastination can be a learned behavior, and if one is used to waiting until the last minute, it can become a difficult habit to break.	Physical state: Fatigue and exhaustion, caused by factors like lack of sleep, can significantly impact your ability to start and complete tasks. Environmental distractions: A distracting environment can make it harder to focus and increase the likelihood of procrastination.
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CONCLUSION

Academic procrastination is a common issue among higher secondary students, and addressing it requires understanding its causes. By recognizing the factors that contribute to procrastination, students can take steps to overcome it and achieve their academic goals. Understanding these causes can help students, teachers, and parents address academic procrastination. By identifying the root causes, students can develop strategies to overcome procrastination, such as improving time management, seeking help, and finding ways to make learning more engaging. Teacher can help such type students firstly to set their clear goals and break down large tasks into smaller, achievable goals. Secondly create a Schedule: Plan out your day, week, and month, and stick to it. Thirdly use time management Techniques: Use techniques like time blocking, and prioritization. Seek Help: Talk to teachers, classmates, or a tutor for support and guidance. Stay Motivated: Find ways to make learning enjoyable, and reward yourself for achievements. Minimize Distractions: Turn off notifications, log out of social media, and create a

conducive study environment. Overcoming Procrastination by Identify and understanding what triggers the procrastination and develop the new strategies to overcome it. Take small and smart steps: give them manageable tasks to build the sequence. Be kind and calm the situation and don't be too hard on yourself when you procrastinate.

By understanding the causes of academic procrastination and implementing these solutions, students can overcome procrastination and achieve their academic goals.

REFERENCES:

- Baka, A. Z., & Khan, U. M., (2016). Relationships between self-efficacy and the academic procrastination behavior among university students in Malaysia: A General Perspective. *Journal of Education and Learning*, 10,265-274.
- Channawar, S. (2023). Teacher self-efficacy: influences pedagogical skill among students learning. *Madhya Bharti Humanities and social science research journal*, ISSN: 0974-0066 Vol- 83. No.23, 183-187.
- Ferrari, J.R. (1998). Procrastination. *Encyclopedia of Mental Health*, 5-1.

- Grant, C. (2009). *The Relationshipbetween Procrastination and in College Students. Intra-personal Intelligence.*
<https://commons.und.edu/theses>
- Kurniawan, Drajat. (2024). *Analysis of Factors Causing Academic Procrastination in Students. IJEDR: Indonesian Journal of Education and Development Research.* 2. 639-646.
10.57235/ijedr.v2i1.1917.DOI:10.57235/ijedr.v2i1.1917
- Mostafa, A. A. (2018). *Academic procrastination, self-efficacy beliefs, and academic achievement among middle school first year students with learning disabilities. Psycho-Educational Research Reviews,* 7(2), 87-93.
- Quinn, W. (2019). *Academic procrastination: the role of stress, self-esteem, self-efficacy, age and gender on undergraduate students.*
- Silver, M. 1974. *Procrastination. Centerpoint* 1: 49-54.



शिक्षार्थियों की भावनात्मक बुद्धिमत्ता और डिजिटल कल्याण

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सारांश:-

भावना मनुष्य के जीवन को एक आधार प्रदान करती है। प्रस्तुत अध्ययन में शिक्षार्थी अपनी भावनात्मक बुद्धिमत्ता से किस प्रकार आज के डिजिटल युग में संघर्ष कर अपना सर्वांगीण विकास कर सकता है, यह शोध किया गया है। आज आये दिन कुछ नया परिवर्तन देखने को मिलता है। सोशल मीडिया के द्वारा शिक्षार्थी बहुत सी ऐसी बातों को देखता सुनता है, जिसका सीधा असर शिक्षार्थियों के जीवन पर पड़ता है। यदि शिक्षार्थी भावनात्मक रूप से मजबूत नहीं हो तो नकारात्मक प्रभाव भी देखने को मिलता है, और यदि शिक्षार्थी में भावनात्मक बुद्धिमत्ता है तो डिजिटल उपकरण जैसे मोबाइल, लैपटॉप, इंटरनेट का संतुलित, सहज और सुरक्षित प्रयोग कर अपने ज्ञान में वृद्धि करता है, जिससे शिक्षार्थी को सीखने को बहुत कुछ मिलता है तथा वह अपना सर्वांगीण विकास करता है। भावनात्मक रूप से बुद्धिमान शिक्षार्थी डिजिटल तनाव को समझता है तथा उससे उबरने का रास्ता भी निकाल लेता है।

भावनात्मक बुद्धिमत्ता का विकास अत्यंत आवश्यक है, यह शिक्षार्थियों को आत्म जागरूकता, आत्मनियंत्रण, सामाजिक जागरूकता और समय प्रबंधन को सुधरता है, जिससे आत्मनियंत्रण एक महत्वपूर्ण घटक है, जो शिक्षार्थी को तनाव पूर्ण परिस्थितियों में अपनी भावनाओं और प्रतिक्रियाओं को नियंत्रित करने की क्षमता प्रदान करता है। इसके द्वारा शिक्षार्थी नकारात्मक भावनाओं को नियंत्रित कर सोच समझकर प्रतिक्रिया प्रदान करता है। भावनात्मक बुद्धिमत्ता के विकास एवं संवर्धन के फल स्वरूप शिक्षार्थी डिजिटल उपकरणों का

उपयोग कर अपना समग्र कल्याण संयमित होकर कर सकता है। इसके कुशल एवं संतुलित प्रयोग से शिक्षार्थी समस्या को समझ कर उसका समाधान करता है। इस परिस्थिति में शिक्षार्थी अपनी भावना को व्यक्त करता है तथा दूसरे की भावनाओं को समझने का प्रयास भी करता है।

अध्ययन से पता चलता है की भावनात्मक बुद्धिमत्ता का स्तर यदि अच्छा होगा तो शिक्षार्थी सरलता से अपने डिजिटल अनुभव को सकारात्मक रूप से स्वीकार कर लेगा। भावनात्मक बुद्धिमत्ता से शिक्षार्थी में आत्म जागरूकता, समस्या समाधान, लचीलापन, सहानुभूति आदि गुणों को विकसित होते हैं इसके द्वारा डिजिटल उपकरणों के साथ शिक्षार्थी संतुलन स्थापित कर लेता है यही संतुलन उसे एक विशेष पहचान देगी।

शब्द कुंजी:- भावनात्मक बुद्धिमत्ता, डिजिटल कल्याण सर्वांगीण विकास, आत्म जागरूकता, संवर्धन।

भावनात्मक बुद्धिमत्ता - भावनात्मक बुद्धिमत्ता व्यक्ति में तनाव प्रबंधन का एक अत्यंत महत्वपूर्ण उपकरण है। इसके माध्यम से व्यक्ति में अपनी भावनाओं को पहचानने, समझने, नियंत्रित करने और प्रभावी ढंग से व्यक्त करने की क्षमता विकसित होती है। जब व्यक्ति जीवन में किसी प्रकार का दबाव, सामाजिक अपेक्षाएं और व्यक्तिगत परिवर्तन का सामना करता है भावनात्मक बुद्धिमत्ता व्यक्ति को इन चुनौतियों का सामना अधिक कुशलता एवं संतुलित दृष्टिकोण के साथ करने योग्य बनाती है। आत्म जागरूकता, आत्म नियंत्रण, सामाजिक जागरूकता और समय प्रबंधन जैसी क्षमताओं से व्यक्ति तनावपूर्ण परिस्थितियों का सामना सरलता एवं कुशलता

से कर लेता है। भावनात्मक बुद्धिमत्ता का विकास एक व्यक्ति के लिए बहुत आवश्यक है क्योंकि भावनात्मक रूप से कुशल व्यक्ति चिंता, अवसाद एवं अन्य मानसिक स्वास्थ्य संबंधित समस्या का सामना करने में अधिक सफल होते हैं ऐसी परिस्थिति में व्यक्ति अपने भावनाओं को नियंत्रित कर लेते हैं तथा तनावपूर्ण स्थिति में कुशलता में समस्या का समाधान करते हैं। भावनात्मक बुद्धिमत्ता व्यक्ति को भावनात्मक रूप से मजबूत बनाती है व्यक्ति इससे अपने जीवन में संतुलन की प्राप्ति करता है। उच्च भावनात्मक बुद्धिमत्ता वाले व्यक्ति अच्छे संबंध बनाने और बनाए रखने में सक्षम होते हैं क्योंकि वह अपने भावनाओं को प्रभावी ढंग से व्यक्त कर सकते हैं तथा दूसरे की भावनाओं को समझ सकते हैं।

डिजिटल कल्याण शिक्षार्थियों को तकनीक के साथ एक संतुलित संबंध खोजने में मदद करने के लिए कलाकृतियों की डिजाइन प्रदान करता है। पॉजिटिव टेक्नोलॉजी पॉजिटिव कंप्यूटिंग शब्द एक डिजिटल कोचिंग की भूमिका निभाते है। जो शिक्षार्थी को लक्ष्य हासिल करने और उनके जीवन को काम से संबंधित व्यवहार को बेहतर बनाने में मदद करते हैं। डिजिटल करने ऐसे इलेक्ट्रॉनिक उपकरण होते हैं जो डाटा को डिजिटल रूप में प्रोसेस करते हैं जैसे कंप्यूटर, स्मार्टफोन, लैपटॉप, टैबलेट, स्मार्टवॉच, टीवी. आदि। इन उपकरणों का प्रयोग कर शिक्षार्थी जीवन के कई पहलुओं को सुविधाजनक तरीके से कम समय में हल कर लेते हैं। शिक्षार्थी डिजिटल उपकरणों का प्रयोग कर डाटा संसाधित कर सकते हैं और उपयोग जानकारी प्राप्त करते हैं तथा सरलता से अपने लक्ष्य की प्राप्ति कर सकते हैं। इन उपकरणों के प्रयोग से शिक्षार्थी को सीखने में सहायता मिलती है जिससे डिजिटल कल्याण देखने को प्राप्त होता है।

संबंधित साहित्य अध्ययन -

1. सुजैन ए. डेनहम (2016) ने अध्ययन किया स्कूल की तैयारी के लिए समर्थन के रूप में सामाजिक भावनात्मक बुद्धि यह है इसका आकलन कैसे करते हैं? व्यक्त किया निर्णय में पाया गया कई निर्माण भावनात्मक और सामाजिक क्षमता सिद्धांत विशेष रूप से भावनात्मक अभिव्यक्ति भावना विनियमन, भावना ज्ञान, सामाजिक

समस्या समाधान और सकारात्मक और नकारात्मक सामाजिक व्यवहार।

अध्ययन का उद्देश्य - शिक्षार्थियों की भावनात्मक बुद्धिमत्ता और डिजिटल कल्याण अध्ययन करना।

परिकल्पना -

1. शोध अध्ययन में शिक्षार्थी अपनी भावनात्मक बुद्धिमत्ता का प्रयोग कर अपना डिजिटल कल्याण करता है सार्थक प्रभाव दिखाई देगा।

शोध विधि -

प्रस्तुत अध्ययन हेतु वर्णनात्मक एवं विश्लेषणात्मक शोध पद्धति का प्रयोग करते हुए सर्वेक्षण द्वारा आंकड़े संकलित किए जाएंगे।

जनसंख्या-

प्रस्तुत शोध अध्ययन अंबिकापुर शहर के महाविद्यालय के शिक्षार्थियों को चयनित किया गया है। जिसमें 50 शिक्षार्थी का चयन किया गया है।

न्यादर्श

25 पुरुष

25 महिला

शोध उपकरण -

आवश्यक शोध अध्ययन में शोध उपकरण के रूप में स्वनिर्मित प्रश्नावली का प्रयोग किया गया है।

प्रश्न 1- आप भावनात्मक बुद्धिमत्ता का प्रयोग सामान्य तौर पर व्यवस्थित कर पाते हैं?

हां-80%

नहीं -20%

प्रश्न 2 - क्या डिजिटल उपकरण के प्रयोग से आपके व्यवहार में परिवर्तन आता है?

हां- 95%

नहीं- 5%

प्रश्न 3- क्या डिजिटल उपकरण आपकी भावनात्मक बुद्धिमत्ता को प्रभावित करते हैं?

हां -90%

नहीं -10%

प्रश्न 4- क्या बिना डिजिटल उपकरण के आप असहज महसूस करते हैं?

हां- 60%

नहीं-40%

प्रश्न 5 - क्या आप भावनात्मक बुद्धिमत्ता से डिजिटल उपकरण के प्रयोग के हैं?

हां -40%

नहीं- 60%

आंकड़ों का विश्लेषण -

प्राप्त परिणाम से यह सिद्ध होता है कि जब शिक्षार्थी डिजिटल उपकरण का प्रयोग करता है तो वह उपकरण के वश में चला जाता है अर्थात अपनी भावनात्मक बुद्धिमत्ता का उपयोग नहीं कर पाता। वह अधिक से अधिक समय सोशल मीडिया, स्मार्टफोन, लैपटॉप में खो जाता है जिससे बहुत समय व्यर्थ हो जाता है।

शैक्षिक उपयोगिता -

शिक्षार्थी की भावनात्मक बुद्धिमत्ता को डिजिटल उपकरण का अधिक प्रयोग प्रभावित करता है। स्मार्टफोन का अति प्रयोग विशेष रूप से उपयोगकर्ता के जीवन की गुणवत्ता पर नकारात्मक प्रभाव डालता है जिससे उपयोगकर्ता के नींद में गड़बड़ी एवं उत्पादकता में कमी आदि देखने को मिलता है। यदि डिजिटल उपकरण का उपयोग हेतु जागरूकता करायी जाए जिससे शिक्षा शिक्षार्थी आवश्यकता अनुरूप सीमा निर्धारित करने और उपयोगकर्ताओं को सचेत करने में सक्षम बनाते हैं। साथ ही शिक्षार्थी यदि डिजिटल उपकरण का प्रयोग सीमा में रहकर भावनात्मक बुद्धिमत्ता का प्रयोग

कर करते हैं तो शिक्षार्थी का डिजिटल कल्याण निश्चित ही होता है शिक्षार्थी को सीखने हेतु बहुत से प्लेटफार्म मिलते हैं और शिक्षार्थी अपना सर्वांगीण विकास करता है।

भविष्य हेतु सुझाव -

डिजिटल उपकरण का प्रयोग एक ऐसा माध्यम है जिसकी सहायता से शिक्षार्थी बहुत आसानी से सूचनाओं को प्राप्त करता है। शिक्षार्थी अपनी भावनात्मक बुद्धिमत्ता का प्रयोग कर डिजिटल उपकरण का उपयोग करें तो संभवतः शिक्षार्थी के जीवन में आमूलचूल परिवर्तन देखने को प्राप्त होंगे।

डिजिटल उपकरण के उपयोग करने से पहले शिक्षार्थी के लिए एक जागरूकता कार्यक्रम कराया जाए जिससे शिक्षार्थी के मन में यह बात हो कि उसे कितना प्रयोग डिजिटल उपकरण का करना है।

उच्च भावनात्मक बुद्धिमत्ता शिक्षार्थी में विकसित हो ऐसे वातावरण का निर्माण घर, स्कूल और आसपास के परिवेश में स्थापित हो सके।

संदर्भित ग्रंथ:-

- तनेजा, वी. वी. (1958) फर्स्ट कोर्स इन गाइडलाइंस एंड काउंसलिंग, महिंद्रा कैपिटल पब्लिशर, चंडीगढ़।
- फिपस सर्वे ऑफ रिसर्च इन एजुकेशन (1988-1992) एम.बी.बुच एन.सी.ई.आर.टी. नई दिल्ली।
- Phil's Law of Research in Education (1988-1992) M.B. Book N.C.E.R.T. New Delhi.
- सिंह योगेश कुमार बी.एड. छात्रों की भावनात्मक और आध्यात्मिक बुद्धिमत्ता तथा उनके शैक्षणिक प्रदर्शन के बीच संबंध का अध्ययन। JASRAE Vol-20, Issue No-04, October 2023, ISSN 2230-7540.

A Review on Machine Learning in Healthcare-Classification, Opportunities, and Their Challenges

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ABSTRACT

Machine learning (ML) has become a pivotal technology in modern healthcare, enabling accurate disease classification, personalized treatment, and efficient clinical decision-making.

In healthcare area Machine learning uses artificial Intelligent to evaluate data for enhanced diagnosis, personalized treatment, and Clinical efficiency.

Through advanced algorithms, machine learning assists in diagnosing illnesses from medical images, evaluating patient susceptibility to diseases, expediting drug discovery, and enhancing clinical data handling and workflow efficiency. Machine learning has assist with diagnosis, prognosis, and operational decision making. This review synthesizes recent advances in ML-driven healthcare classification, examines methodological and opportunities, and analyzes persistent challenges related to data quality, model interpretability, accurecy, security, and deployment in real-world clinical settings.

KEYWORDS: Breast Cancer Detection, Support Vector Machine (SVM), Machine Learning, GridSearchCV, Feature Scaling, Medical Data Classification, Supervised learning, Healthcare AI

1. Introduction

The integration of ML methods into healthcare has accelerated due to increasing availability of medical data, advances in computational power, and the growing need for automated, scalable decision-support tools. ML-based healthcare classification spans diagnostic imaging, risk prediction, pathology, genomics, and remote monitoring. Despite promising results, gaps remain between research performance and safe, equitable clinical adoption.

2. Machine Learning in Healthcare Classification

This section provides a deeper examination of the methodological underpinnings of ML-driven healthcare classification, including data modalities, preprocessing pipelines, model architectures, and evaluation protocols. Beyond traditional supervised learning, recent studies emphasize semi-supervised, self-supervised, and transfer learning approaches that overcome labelled data scarcity in clinical domains.

2.1 Types of Healthcare Data

Electronic Health Records (EHRs)

Medical imaging (MRI, CT, X-ray)

Wearable and sensor data

Genomic and proteomic data

Clinical notes and unstructured text

2.2 Common ML Algorithms for Classification

Logistic regression

Support Vector Machines (SVM)

Decision trees and Random Forests

Gradient Boosting Machines (XGBoost, LightGBM)

Neural networks (CNNs for imaging, RNNs/Transformers for sequential data)

2.3 Application Domains

Disease diagnosis (e.g., cancer, diabetes, cardiovascular disorders)

Medical image interpretation

Patient risk stratification

Outcome prediction

Drug response classification

3. Opportunities

The expansion of ML across healthcare ecosystems is creating both methodological and operational opportunities. In addition to diagnostic accuracy, ML supports workflow optimization, multi-modal fusion, continuous remote monitoring, and improved clinical decision support. Broader adoption of distributed learning frameworks enables cross-institutional collaboration without compromising privacy.

3.1 Improved Diagnostic Accuracy

ML models can process multimodal clinical data to detect early-stage diseases that may elude human clinicians.

3.2 Personalized Medicine

ML enables individualized predictions for treatment response, pharmacological, and precision care pathways.

3.3 Operational Efficiency

Automation of administrative tasks and workflow optimization enhances healthcare system performance.

3.4 Integration with Wearables and internet of Things (IoT)

Continuous monitoring data supports predictive alerts and behavior-driven interventions.

3.5 Advances in Deep Learning and Foundation Models

Large-scale pre-trained models can generalize across diverse clinical tasks with limited fine-tuning.

4. Challenges

Despite rapid progress, several systemic challenges impede translation of ML models from research to clinical practice. These challenges span computational, ethical, regulatory, and operational dimensions. Addressing them requires coordinated efforts among data scientists, clinicians, regulatory bodies, and healthcare institutions.

4.1 Data Quality and Heterogeneity

Healthcare data often contains missing values, noise, and inconsistencies across institutions.

4.2 Bias, Fairness, and Equity

ML models risk perpetuating disparities when trained on unrepresentative populations.

4.3 Interpretability and Trust

Clinicians require explainable models to validate predictions and support transparent clinical decisions.

4.4 Privacy, Security, and Compliance

Strict regulatory frameworks (e.g., HIPAA, GDPR) impose constraints on data sharing and model development.

4.5 Deployment and Generalizability

Models trained on narrow datasets may fail in real-world settings due to distribution shifts.

5. The future of machine learning in healthcare

As ML continues to evolve, several trends are poised to shape the future of healthcare. Emerging research trends indicate a shift toward more robust, interpretable, and clinically aligned ML systems. This includes hybrid symbolic–neural systems, causal inference models, digital twins, federated analytics, and advanced validation frameworks that simulate real-world conditions. Future work must also integrate post-deployment monitoring and longitudinal model maintenance.

- Explainable AI (XAI): Efforts to make ML models more transparent and interpretable will foster trust and wider adoption by clinicians and patients.
- Integration with IoT and wearables: The combination of ML and the Internet of Medical Things (IoMT) will enable continuous, real-time remote patient monitoring and proactive interventions.
- Blockchain for data security: Blockchain technology may be used to secure healthcare data, giving patients more control over their medical records while ensuring data integrity.
- Addressing health equity: ML can help identify health disparities and guide public health policies to provide more accessible services to underserved communities.
- Combined AI systems: Hybrid systems that combine ML with other AI approaches like natural language processing (NLP) and computer vision will provide more comprehensive healthcare solutions.

5. Future Directions

Emerging research trends indicate a shift toward more robust, interpretable, and clinically aligned ML systems. This includes hybrid symbolic–neural systems, causal

inference models, digital twins, federated analytics, and advanced validation frameworks that simulate real-world conditions. Future work must also integrate post-deployment monitoring and longitudinal model maintenance.

- Federated and privacy-preserving learning
- Causal ML approaches for robust clinical inference
- Multimodal foundation models
- Regulatory frameworks for ML governance in healthcare
- Human–AI collaboration paradigms

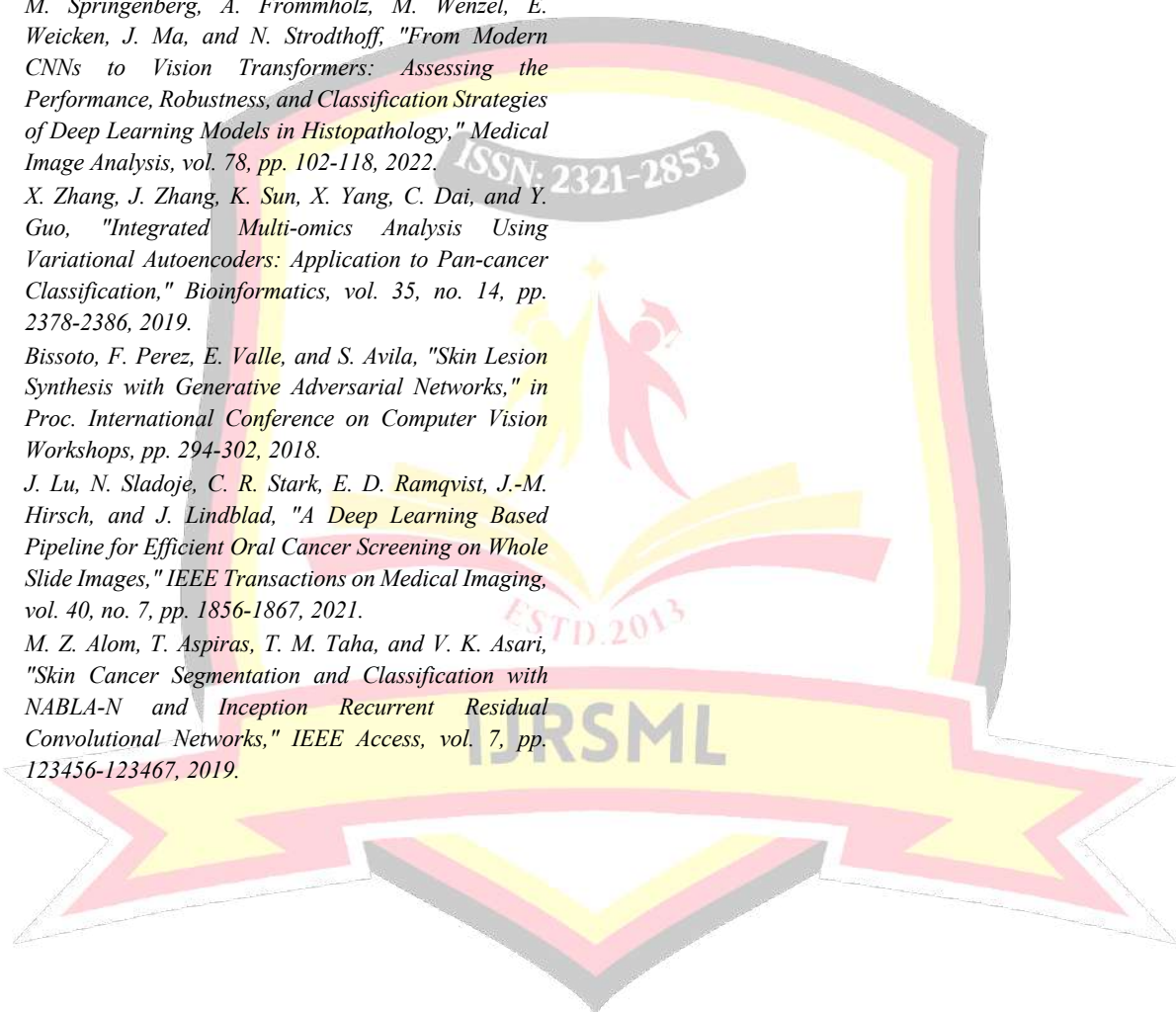
CONCLUSION

Machine learning offers transformative potential for healthcare classification, but realizing this potential requires addressing technical, ethical, and operational challenges. Future work must prioritize fairness, transparency, and real-world validation to ensure reliable and equitable clinical impact.

REFERENCES

- F. Uysal and M. M. Köse, "Classification of breast cancer ultrasound images with deep learning-based models," *Eng. Proc.*, vol. 31, no. 1, p. 8, 2022.
- Rajpurkar, P., et al. "Deep learning for chest radiograph diagnosis: A retrospective comparison of the CheXNeXt algorithm to practicing radiologists." *PLOS Medicine* 15(11): e1002686 (2018).
- Topol, E. "High-performance medicine: the convergence of human and artificial intelligence." *Nature Medicine* 25, 44–56 (2019).
- Miotto, R., et al. "Deep learning for healthcare: review, opportunities and challenges." *Briefings in Bioinformatics* 19(6): 1236–1246 (2018).
- JE. Briola, C. C. Nikolaidis, V. Perifanis, N. Pavlidis, and P. Efraimidis, "A federated explainable AI model for breast cancer classification," in *Proc. Eur. Interdiscipl. Cybersecurity Conf.*, Jun. 2024, pp. 194–201.
- Chen, M., et al. "Wearable 2.0: Enabling human-cloud integration in next generation healthcare systems." *IEEE Communications Magazine* 55(1): 54–61 (2017).
- F. B. Ashraf, S. M. M. Alam, and S. M. Sakib, "Enhancing breast cancer classification via histopathological image analysis: Leveraging selfsupervised contrastive learning and transfer

- learning," *Heliyon*, vol. 10, no. 2, Jan. 2024, Art. no. e24094.
- Rieke, N., et al. "The future of digital health with federated learning." *NPJ Digital Medicine* 3, 119 (2020).
 - Obermeyer, Z., et al. "Dissecting racial bias in an algorithm used to manage the health of populations." *Science* 366(6464): 447–453 (2019).
 - Holzinger, A., et al. "Causability and explainability of artificial intelligence in medicine." *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery* 9(4) (2019).
 - M. Springenberg, A. Frommholz, M. Wenzel, E. Weicken, J. Ma, and N. Strodthoff, "From Modern CNNs to Vision Transformers: Assessing the Performance, Robustness, and Classification Strategies of Deep Learning Models in Histopathology," *Medical Image Analysis*, vol. 78, pp. 102-118, 2022.
 - X. Zhang, J. Zhang, K. Sun, X. Yang, C. Dai, and Y. Guo, "Integrated Multi-omics Analysis Using Variational Autoencoders: Application to Pan-cancer Classification," *Bioinformatics*, vol. 35, no. 14, pp. 2378-2386, 2019.
 - Bissoto, F. Perez, E. Valle, and S. Avila, "Skin Lesion Synthesis with Generative Adversarial Networks," in *Proc. International Conference on Computer Vision Workshops*, pp. 294-302, 2018.
 - J. Lu, N. Sladoje, C. R. Stark, E. D. Ramqvist, J.-M. Hirsch, and J. Lindblad, "A Deep Learning Based Pipeline for Efficient Oral Cancer Screening on Whole Slide Images," *IEEE Transactions on Medical Imaging*, vol. 40, no. 7, pp. 1856-1867, 2021.
 - M. Z. Alom, T. Aspiras, T. M. Taha, and V. K. Asari, "Skin Cancer Segmentation and Classification with NABLA-N and Inception Recurrent Residual Convolutional Networks," *IEEE Access*, vol. 7, pp. 123456-123467, 2019.



A Study on Awareness regarding safety issues of digital platform in biological sciences

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ABSTRACT

Day by day, information and communication technology is surpassing traditional knowledge in data processing and educational methods. The digitization of higher education and research is vital for a global approach but poses challenges, including data privacy, illegal use of personal data, copyright violations, and plagiarism. These issues threaten the integrity of research submissions. Factors such as poor writing skills, low legal awareness, and academic responsibilities contribute to academic misconduct in biological sciences and other fields. A questionnaire analyzed 200 students' awareness of digital laws; results showed 55% were knowledgeable while 45% lacked information. The study concludes that increased efforts are necessary to promote responsible digitization in biological sciences.

KEYWORDS

Superseding, digitization, students, biological science, law, policies, popularizing, awareness.

INTRODUCTION: The rapid adoption of digital platforms in biological sciences has transformed research management and dissemination, making digital tools vital. However, this reliance raises safety and security concerns, including data breaches and unauthorized access, undermining data confidentiality and research integrity. Researchers may lack awareness of data protection best practices amid potential digital threats. This study aims to assess the knowledge of biological science professionals regarding digital platform safety, promote responsible digital behaviour, enhance cyber security literacy, and encourage safe data management

practices, thereby ensuring the legitimacy and security of biological research [1,4,5 & 7].

METHODOLOGY: Methodology includes [1, 9, 10 & 12]

Research Design and Sampling: The present study adopts a descriptive research design to assess the level of awareness among students of biological sciences regarding digital laws and policies. This design is suitable for obtaining factual and systematic information about the current state of knowledge, attitudes, and practices related to digital safety and legal frameworks among the target population. The target population for this study comprises undergraduate and postgraduate students enrolled in various biological science programs such as biotechnology, microbiology, biochemistry, and related fields. A sample size of approximately 200 students selected using a stratified random sampling technique to ensure representation from different academic years and disciplines within the biological sciences.

Data collection and analysis: A structured questionnaire will be created for data collection, featuring closed-ended and Likert-scale questions divided into four sections: demographic details, awareness of digital laws and policies, attitudes toward digital safety, and sources of information regarding digital laws. Validation will involve expert reviews and a pilot study with some selected students. The final questionnaire will be distributed electronically and in hard copy, ensuring confidentiality and voluntary participation.

Collected data analysed using both descriptive statistics (frequency, percentage, mean, and standard deviation) for summarizing demographic information and awareness levels,

and inferential statistics (Chi-square tests or t-tests) to explore differences in awareness based on factors such as gender, academic level, and field of specialization. Analysis will be conducted with SPSS or Microsoft Excel.

Ethical Considerations: All participants provided informed consent and assured that their responses will be used solely for academic purposes.

RESULTS: The analysis of collected data indicated that 55% of biological science students are aware of digital laws and policies, including data protection and plagiarism. They have a basic understanding of digital safety and legal frameworks. In contrast, 45% lack sufficient knowledge or awareness of these laws, showing uncertainty in ethical practices and implications of digital misconduct. Overall, there is a moderate awareness level among students, emphasizing the need for increased educational initiatives to enhance understanding of digital regulations and promote responsible behaviour in academic and research activities.

Statistical Analysis

To analyze the level of awareness regarding digital laws and policies among students of biological sciences, descriptive statistical methods were employed. The data obtained from the survey responses were coded and tabulated for analysis.

Descriptive Statistics: A total of 200 students were considered for analysis (for simplicity of percentage representation). The frequency and percentage distribution of awareness levels are shown in table 1.

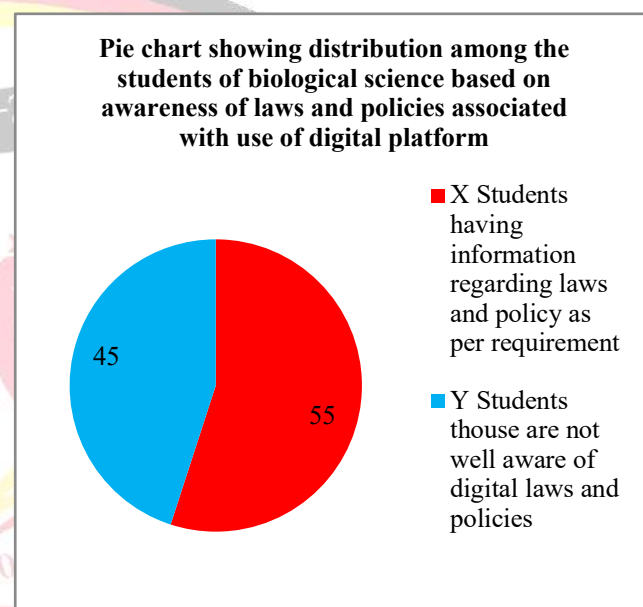
Table 1. Awareness of Digital Laws and Policies among Students of Biological Sciences

Awareness Level	Frequency (n)	Percentage (%)
Awareness of digital laws and policies	110	55%

Lack of Knowledge regarding digital laws and policies	90	45%
Total	200	100

The results show that a majority (55%) of students possess awareness of digital laws and policies, while a significant proportion (45%) have limited or no knowledge in this area.

Graph 1: Showing awareness among the students of biological science regarding use of digital platform



The data were represented through a **pie chart** for better visualization. The **pie chart** illustrates that over half of the students are aware of digital laws and policies.

Statistical Interpretation: To further interpret the data, the **mean awareness score** was calculated based on a binary coding system (1 = aware, 0 = not aware).

$$\text{Mean awareness score} = \frac{(55 \times 1) + (45 \times 0)}{100} = 0.55$$

This indicates that the mean awareness level is 0.55 or 55%, signifying a moderate level of awareness among the student population. The standard deviation (SD) was also computed to determine variability in awareness levels:

$$\begin{aligned} SD &= \sqrt{p(1-p)} \\ &= \sqrt{0.55(1-0.55)} \\ &= \sqrt{0.2475} \\ &= 0.497 \end{aligned}$$

The relatively high SD (≈ 0.50) suggests **moderate variability** among respondents, indicating that awareness is not uniformly distributed across the group.

4. Summary of Findings: Awareness level was 55% of students are aware of digital laws and policies. On the other hand lack of Awareness among the students of biological science was found to be 45% have insufficient or no knowledge. Mean Awareness was 0.55 and standard deviation was 0.497. These results highlight that while over half of the students demonstrate awareness, a substantial proportion remains uninformed, emphasizing the need for awareness programs, workshops, and integration of digital law education into biological science curricula [2,4,5,6,& 11].

REFERENCES:

- [1] Archambault, S. G., (2021). Student privacy in the digital age. In William H. Hannon Library at Loyola Marymount University, *BYU Education & Law Journal*. (6). pp. 1-50. https://scholarsarchive.byu.edu/byu_elj/vol2021/iss1/6
- [2] Ayyoub, H. Y., AlAhmad, A. A., Al-Serhan, A., Al-Abdallat, M. F., Al-Muheisen, E., Boshmaf, H., Abu-Taleb, Y. A., Alqudah, Y. O., & Alshamaileh, Y. (2022). Awareness of electronic crimes related to E-learning among students at the University of Jordan. *Heliyon*, 8(10). pp. 1-11. e10897. <https://doi.org/10.1016/j.heliyon.2022.e10897>
- [3] Aydinlar, A., Mavi, A., Kütükçü, E., Kırımlı, E. E., Alış, D., Akın, A., & Altıntaş, L. (2024). Awareness and level of digital literacy among students receiving health-based education. *BMC Medical Education*, 24(1), 38. pp. 1-13. <https://doi.org/10.1186/s12909-024-05025-w>.
- [4] Sharma, R., Goyal, A., Bansal, R., Yadav, C., Lipika, & James, E.R. (2024). Digital empowerment and cybersecurity: understanding public awareness of digital india initiatives. . In *Journal of Theoretical and Applied Information Technology* (Vol. 102, Issue 21). pp.7763-7779. Little Lion Scientific. <https://www.jatit.org>
- [5] Gallego-Arrufat, M.-J., García-Martínez, I., Romero-López, M.-A., Torres-Hernández, N., University of Granada, & University of Jaen. (2024). Digital Rights and Responsibility in Education: A scoping review. In *Education Policy Analysis Archives* (Vol. 32, Issue 3). pp. 1-27. <https://files.eric.ed.gov/fulltext/EJ1425368.pdf>
- [6] Jana, A., Pradhan, S., Ajmera, Z., Harish, H., & Shah, D. (2022). Online privacy and safety of young adults. In Internet Freedom Foundation & Young Leaders for Active Citizenship, *Young Researchers for Social Impact (YRSI) Program*. pp. 1-25.
- [7] Kumar, S., & Bansal, G. (2025). Cybersecurity awareness and digital literacy in the context of digital India. *International Journal of Applied Research*, 11(4). pp. 434-439. <https://doi.org/10.22271/allresearch.2025.v11.i4f.12568>
- [8] Lievens, E., Livingstone, S., McLaughlin, S., O'Neill, B., & Verdoodt, V. (n.d.). *Children's rights and digital technologies*. pp.1-25. https://eprints.lse.ac.uk/84871/1/Children%27srightsanddigitaltech_revised_clean%20final.pdf.
- [9] Martzoukou, K., Kostagiolas, P., Lavranos, C., Lauterbach, T., Fulton, C., Robert Gordon University, Ionian University, & University College Dublin. (2022). A study of university law students' self-perceived digital competences. In *Journal of Librarianship and Information Science*. 54(4). pp. 751-769. <https://doi.org/10.1177/09610006211048004>
- [10] Montañez, J. J. F. & Bicol State College of Applied Science and Technology. (2023). *Copyright Awareness and Management in Flexible Learning: Challenges and initiatives in the new normal*. pp. 626-638. <https://doi.org/10.2991/978-2-38476-008-4>.
- [11] OJHA, D., Surendranath Law College, & University of Calcutta. (2024). Right to education and legal framework for digital education in INDIA. In *International Journal of Creative Research Thoughts (IJCRT)*. 12(8). pp. 530-531. <https://www.ijcrt.org>
- [12] Paludi, M., Università degli Studi D'Annunzio, & Università degli Studi di Foggia. (2024). The right to privacy and data protection for high school students in the context of digital learning models and learning analytics. In *LASI Europe 2024 DC: Doctoral Consortium of the Learning Analytics Summer Institute Europe*. pp.1-10. CEUR. <https://ceur-ws.org/Vol-3738/paper6.pdf>.
- [13] Wulandari, W., Triastuti, R., Gunawati, D., & Fajari, L. E. W. (2022). Student's Digital Law knowledge about hoax. *International Journal of Asian Education*, 3(1). pp. 70-78. <https://doi.org/10.46966/ijae.v3i1.279>

Blockchain Applications for Data Integrity and Digital Trust

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ABSTRACT

Blockchain technology has become a revolutionary advancement capable of reshaping how digital data is recorded, verified, and exchanged across networks. Utilizing cryptographic algorithms and decentralized consensus models, blockchain guarantees the authenticity, transparency, and permanence of information. This paper examines how blockchain contributes to improving data reliability and digital trust in different sectors. It explains the fundamental concepts of blockchain, its role in safeguarding digital assets, and its ability to remove the need for intermediaries, thereby fostering trust within decentralized environments. Additionally, the study reviews practical implementations, existing challenges, and future opportunities for blockchain-based systems in creating secure and tamper-resistant digital infrastructures.

KEYWORDS

Blockchain, Data Integrity, Digital Trust, Cryptography, Distributed Ledger, Cybersecurity.

INTRODUCTION

In today's digital age, data has emerged as one of the most critical resources driving modern society. Ensuring the protection, accuracy, and reliability of this data is essential for the effective operation of governments, organizations, and individuals alike. However, with the exponential growth of online transactions, cyberattacks, and data breaches, preserving data integrity and fostering digital trust have become significant challenges. Blockchain technology presents an innovative solution by offering a decentralized,

transparent, and highly secure approach to data management. Initially introduced as the underlying framework for cryptocurrencies such as Bitcoin, blockchain has since developed into a versatile technology with applications across finance, healthcare, supply chains, governance, and numerous other sectors.

Data integrity refers to maintaining the correctness, consistency, and authenticity of information throughout its lifecycle—whether in storage, transmission, or processing. Digital trust, conversely, denotes the level of confidence that users have in digital systems and online interactions. Blockchain effectively addresses both aspects through the use of cryptographic algorithms, consensus protocols, and distributed ledgers that prevent unauthorized alterations and ensure transparency. This study explores the potential of blockchain technology to strengthen data integrity and enhance digital trust across diverse fields.

LITERATURE REVIEW

Various studies have emphasized the potential of blockchain in ensuring data authenticity and reliability. According to Nakamoto (2008), blockchain introduced a decentralized model that eliminates the need for third-party verification by using consensus algorithms. Tapscott and Tapscott (2016) described blockchain as the foundation of the 'trust protocol,' capable of reshaping the digital economy. Similarly, Swan (2015) highlighted blockchain's utility beyond cryptocurrency, extending its value to identity management, record keeping, and digital governance. In addition, research by Crosby et al. (2016) outlined the advantages of blockchain for data security, transparency, and accountability, all of which contribute to digital trust. However, scholars also

noted challenges related to scalability, energy consumption, and regulatory uncertainty, which remain significant barriers to mainstream adoption.

Blockchain Technology: Overview

Blockchain is a distributed ledger technology (DLT) that records transactions across multiple nodes in a network. Each block in the chain contains a list of transactions, a timestamp, and a cryptographic hash of the previous block, creating an immutable chain of records. Because the ledger is distributed across many participants, no single entity controls the data, reducing the risk of corruption or manipulation.

Key components of blockchain include:

1. Blocks: Contain data and are linked to form a continuous chain.
2. Nodes: Computers that maintain and verify copies of the ledger.
3. Consensus Mechanisms: Protocols like Proof of Work (PoW) or Proof of Stake (PoS) used to validate transactions.
4. Cryptography: Ensures secure communication and verification between nodes.

These features collectively enable blockchain to offer tamper-proof, transparent, and verifiable data management.

Applications of Blockchain in Data Integrity

Blockchain enhances data integrity through immutable records and transparent data validation. Every transaction added to the blockchain is cryptographically signed and verified by multiple nodes, making unauthorized alterations virtually impossible. This makes blockchain highly suitable for industries where accuracy and immutability are essential.

1. Healthcare: Blockchain ensures the integrity of patient records by creating tamper-proof medical data histories. Healthcare providers can securely share data while maintaining patient confidentiality.
2. Finance: Banking institutions use blockchain to authenticate transactions, prevent fraud, and ensure that transaction histories are accurate.
3. Supply Chain Management: Blockchain enables real-time

tracking of goods, preventing data manipulation related to product origin, authenticity, or status.

4. Education: Academic institutions use blockchain for secure certification and verification of credentials, preventing the creation of fake degrees.
5. Government Records: Land titles, identity documents, and legal contracts can be secured using blockchain to ensure integrity and transparency.

Blockchain for Digital Trust

Digital trust is the foundation upon which users engage with digital systems. In centralized systems, trust is typically placed in third-party intermediaries such as banks, certification authorities, or governments. Blockchain, by contrast, creates a 'trustless' system where users can transact directly with one another while relying on cryptographic validation instead of institutional trust.

Key ways blockchain builds digital trust include:

1. Transparency: All transactions are visible to authorized participants, ensuring openness.
2. Security: Cryptographic methods make it difficult for malicious actors to alter or forge information.
3. Accountability: Every action is recorded permanently, creating verifiable audit trails.
4. Decentralization: Removes single points of failure and reduces dependency on central authorities.

Challenges and Limitations

Despite its promise, blockchain technology faces several challenges:

1. Scalability: Public blockchains like Bitcoin face limitations in transaction speed and volume.
2. Energy Consumption: Consensus mechanisms such as Proof of Work consume significant computational power.
3. Regulatory Concerns: The lack of clear legal frameworks poses challenges for blockchain adoption.
4. Privacy Issues: While blockchain provides transparency, it may conflict with data protection laws like GDPR.
5. Integration Complexity: Integrating blockchain with

existing IT systems requires technical expertise and infrastructure changes.

Future Prospects

The future outlook for blockchain technology appears exceptionally promising, with continuous research directed toward enhancing scalability, privacy, and interoperability. Innovative developments such as hybrid blockchains, sidechains, and zero-knowledge proofs are being explored to address the limitations of current systems. Furthermore, the convergence of blockchain with emerging technologies like Artificial Intelligence (AI), the Internet of Things (IoT), and big data analytics is expected to enable smarter, more secure, and autonomous digital infrastructures.

In the field of governance, blockchain holds the potential to transform electoral processes, digital identity verification, and the management of public records by ensuring transparency and security. Within the financial sector, it can simplify international transactions, minimize operational costs, and accelerate payment settlements. As global regulatory frameworks evolve and become more defined, businesses and government institutions are anticipated to increasingly adopt blockchain solutions as a trusted mechanism for maintaining data integrity and reinforcing digital trust.

Conclusion

Blockchain technology represents a significant leap forward in achieving data integrity and digital trust in the information age. By decentralizing data management and introducing cryptographic verification, blockchain eliminates the need for intermediaries and mitigates risks of tampering or fraud. Although the technology faces challenges related to scalability, regulation, and privacy, its potential benefits far outweigh its limitations. With continuous advancements and cross-industry adoption, blockchain is poised to redefine the way digital systems operate, ensuring transparency, accountability, and trust in the global digital ecosystem.

REFERENCES

- Nakamoto, S. (2008). *Bitcoin: A Peer-to-Peer Electronic Cash System*.
- Tapscott, D., & Tapscott, A. (2016). *Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business, and the World*.
- Swan, M. (2015). *Blockchain: Blueprint for a New Economy*. O'Reilly Media.
- Crosby, M., Pattanayak, P., Verma, S., & Kalyanaraman, V. (2016). *Blockchain Technology: Beyond Bitcoin*. *Applied Innovation Review*.
- Zheng, Z., Xie, S., Dai, H., Chen, X., & Wang, H. (2017). *An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends*.
- Yaga, D., Mell, P., Roby, N., & Scarfone, K. (2018). *Blockchain Technology Overview*. NIST Special Publication 800-282.

Gender and Diversity Perspectives in STEM: The Impact of Cyber Empowerment on Inclusive Participation

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ABSTRACT – Science, Technology, Engineering and Mathematics (STEM) play a vital role in driving innovation and sustainable development, yet gender and diversity imbalances continue to hinder equal participation. Women and other marginalized/minority groups in India still face challenges such as social bias, limited access to digital devices to enhance their skills, knowledge, confidence and limited opportunities in STEM education and careers. In this context, cyber empowerment the strategic use of digital technology, online platform and e-learning tools has emerged as an effective means to enhance inclusivity. The study follows a descriptive and analytical research design based on secondary data collected from journals, scholarly articles, Policy reports and global digital inclusion initiatives supported by thematic analysis of gender and cyber empowerment trends in STEM. This paper examines how cyber empowerment fosters digital literacy, confidence and leadership amount women and diverse communities. It also explores national and international initiatives that promote equitable access and representation in STEM field. The discussion shows that technology enables education mentorship programs and virtual collaborations to significantly contribute to reducing the gender gap. However, persistent barriers such as unequal internet access, digital security issues and socio-cultural restrictions still need to be addressed. The study concludes that gender-sensitive digital education policies, along with awareness and institutional support, are essential to achieve long-term equity and inclusive growth in the digital STEM ecosystem.

KEYWORDS: STEM inclusion, Gender diversity, Cyber empowerment, Digital literacy, Inclusive innovation.

INTRODUCTION:

STEM education serves as a critical pillar of socio-economic progress in the 21st century. Nations that successfully promote innovation in science and technology often experience higher economic growth and stronger human-development indices. However, the participation of women and other underrepresented groups in STEM remains disproportionately low across both developing and developed countries. Gender and diversity perspectives are, therefore, essential for understanding the structural and cultural factors that influence inclusion in these fields. Gender diversity in STEM fields has remained a persistent global challenge, despite significant advancements in education and technology. According to UNESCO (2022), women constitute less than 30% of the world's STEM workforce, reflecting persistent gender gaps in participation in science and technology. The emergence of cyber empowerment, the strategic use of digital tools, e-learning, and technology platforms, offers new opportunities for inclusive growth. As STEM fields shape the future economy, ensuring equal participation becomes a matter of social justice, innovation, and sustainable development (World Bank, 2023). In India, initiatives under the Digital India and NEP 2020 frameworks have emphasized gender inclusion through ICT-enabled education.

In recent years, digital transformation has revolutionized the way knowledge is accessed and shared. The emergence of online education, open-source learning platforms, and virtual

labssuch as SWAYAM, MOOCs, INFLIBNET, ONOS, and N-Listhas opened up new opportunitiesfor engagement in STEM fields. Cyber empowerment, defined as the process of enabling individuals through the use of digital technology, has emerged as a potential equalizer. When effectively implemented, it reduces barriers related to geography, cost, and social stereotypes, allowing more inclusive engagement in STEM. This paper examines the intersection of gender, diversity, and cyber empowerment, focusing on how digital inclusion can promote equitable growth and representation.

Objectives of the Study:

- To explore gender and diversity perspectives in STEM education and employment.
- To examine the role of cyber empowerment in enhancing inclusive participation.
- To identify the challenges faced by women and marginalized groups in accessing digital STEM opportunities.
- To propose strategies that promote gender-sensitive and inclusive growth through digital means.

RESEARCH METHODOLOGY

The study follows a descriptive and analytical design, relying on secondary data from journals, policy reports, and digital databases. The analysis focuses on trends in gender representation, cyber initiatives, and digital literacy in STEM education. Thematic interpretation is applied to identify the relationships between gender inclusion and technology-driven empowerment.

Limitations:

- **Based on Secondary Data:** The study mainly depends on secondary sources such as reports, articles, and digital publications. The absence of extensive primary data may limit the depth of real-time insights.

- **Quality and Reliability of Sources:** The accuracy of the findings depends on the credibility of the secondary sources used. Any bias or limitation in those sources may influence the overall conclusions.

Review of Literature:

Previous research consistently highlights a gender gap in STEM disciplines. Studies show that socio-cultural factors, gender bias, and lack of mentoring contribute to women's under-representation. UNESCO and UN Women reportemphasize that, although women constitute nearly half of higher education enrolments, their participation in STEM remains significantly lower. Initiatives such as Women Who code, Girls in Tech, and the Digital India programmedemonstrate how online training and mentorship can help overcome these barriers. Many researchers also identify cyber empowerment as a catalyst for women's participation,as it improves access to information, facilitates self-learning, and enhances digital networking. However, issues such as online safety, limited internet access in rural areas, and persistent gender stereotypes continue to restrict progress.

STEM:

STEMrefers to the four key disciplines of Science, Technology, Engineering, and Mathematics. Together, these areas form the foundation of modern knowledge and innovation. STEM education focuses on helping learners to develop critical thinking, logical reasoning, creativity, and problem-solving abilities. These skills are essential in today's digital and technology world.

STEM fields play an important role in national progress because they support scientific research, technology advancement, and economic growth. From health care to communication and from engineering to data science, STEM influences almost every sector of society. Societies can build a future-ready workforce capable of adapting to new technologies and contributing to sustainable development by strengthening STEM learning.

Cyber Empowerment:

Cyber empowerment is the process of providing individuals and communities with the necessary knowledge, skills, tools, and resources to effectively, safely, and confidently access, understand, and use digital technologies to improve their lives and gain greater control over their circumstances.

Key components of Cyber Empowerment:

Technology Access: Ensuring equitable and affordable access to digital infrastructure such as Computers, Smartphones, and Reliable internet connectivity, especially for marginalized and rural-urban populations.

Digital Literacy and Skills: Imparting the skills needed to navigate the online world effectively, including critical thinking to evaluate information, create digital content, and use online communication and collaboration tools.

Cyber Safety and Security Awareness: Educating people on how to protect their privacy and personal information online, recognize and prevent cyber threats (such as Phishing and Malware), and behave ethically in online world.

Economic Opportunity: Enabling access to online education, job markets, financial services, and entrepreneurship opportunities that can lead to economic growth and better livelihoods.

Gender and STEM: Global and Indian perspectives:

Global Overview –

- According to the World Economic Forum (2024), Women make up only 28.2% of the global STEM workforce, compared to 47.3% in non-STEM categories.
- Female participation in fields like Computing (18.6%), Physics (24.1%), and Maths (37.3%) remains low, while disciplines like Biology (64% female) and Environmental Science (50.1% female) show progress.
- Although absolute numbers are improving due to policy pushes, persistent biases remain in STEM

career choice and retention, particularly at higher academic and leadership levels.

Indian's Overview –

- India saw a significant rise in the number of female STEM graduates and in the workforce, yet faces a steep drop in female participation between secondary education and technical careers.
- Social norms and gender roles directly shape young women's aspirations and opportunities in STEM, influenced by family, the education system, and societal expectations.
- Initiatives like **Vigyan Jyoti**, **Beti Bachao-Beti Padhao**, and targeted scholarships increasingly promote STEM for girls, but rural-urban and socio-economic divides persist.

Barriers to gender Diversity in STEM:

Societal and Cultural Norms –

- The perception of engineering and technology as “masculine” disciplines discourages girls from early engagement.
- Lack of visible female role models in leadership positions compounds self-doubt and aspiration gaps.

Educational Access and Structure –

- Course design and teaching materials often ignore inclusive pedagogies, further alienating minority gender students.
- Early exposure to STEM is crucial; research shows that interventions before grade 3 have a lasting impact on diversity.

Workplace and Career Progression –

- Gender bias in hiring, promotion, and workplace culture obstructs advancement for women in STEM.

- Lower representation of women in executive boards and decision-making perpetuates systemic inequities.

The Promise and Practice of Cyber Empowerment:

Defining Cyber Empowerment –

Cyber empowerment encompasses the skills, tools, and opportunities enabled by digital technology, including online learning platforms, remote collaboration, and digitally inclusive communities.

For underrepresented groups, cyber empowerment can mean:

- Access to MOOCs and e-learning resources tailored to individual pace.
- Participation in virtual mentor networks and peer-support groups.
- Safe spaces for expression, skill-building, and networking, even in restrictive real-world contexts.

Impact Analysis –

Pilot studies demonstrate that digital literacy programs dramatically improve confidence, cybersecurity awareness, and interest in tech-related careers among women and minorities. This ripple effect translates into:

- Increasing participation in digital-enabled technical certifications.
- More secure online habits are spreading through families and communities, led by digitally empowered women.
- Enhanced innovation pipelines, as diversity brings heterogeneous problem-solving perspectives into STEM research teams.

Findings and Discussion

This descriptive analysis finds that cyber empowerment contributes positively to gender inclusion in STEM in multiple ways. First, digital education platforms offer flexible, affordable learning opportunities for women who

may otherwise lack access to conventional classrooms. Massive Open Online Courses (MOOCs), coding boot camps, and virtual laboratories enable skill development beyond institutional boundaries. Secondly, cyber empowerment enhances professional networking such as LinkedIn, Research Gate, enabling women to collaborate, publish, and share innovations beyond geographical limitations.

Third, the availability of online mentorship and peer-learning networks creates supportive ecosystems. These virtual communities encourage women and marginalized students to pursue STEM careers confidently. The study also reveals that cyber empowerment promotes leadership by providing access to decision-making tools, entrepreneurship resources, and start-up platforms. Digital spaces thus become channels for innovation and social change.

Despite these advances, several challenges remain. A significant digital divide persists between urban and rural populations, often aligned with economic and gender differences. Many women still face inadequate access to high-speed internet or digital devices, which limits their participation in online STEM initiatives. Concerns about cyber security, online harassment, and privacy discourage some women from active engagement. Furthermore, gender bias in technology design, such as algorithms trained on non-inclusive datasets, can perpetuate existing inequalities.

Institutional and cultural barriers also influence participation. Societal expectations, family responsibility, and lack of role models discourage many women from pursuing STEM fields. Educational institutions sometimes fail to provide gender-neutral environments or adequate career counselling. Therefore, while cyber empowerment provides tools for inclusion, it cannot achieve full equality without supportive policies, safe digital environments, and awareness programs.

Suggestions and Recommendations

- Integrate gender-sensitive digital policies:
Governments and institutions should incorporate

gender equality principles in their digital education and STEM policies.

- Expand digital literacy initiatives: Training programs that focus on basic and advanced digital skills for women must be implemented, particularly in rural and semi-urban areas.
- Develop mentorship and networking platforms: Online mentoring, collaborations, and career-development programs should be strengthened to enhance confidence and leadership among women in STEM.
- Ensure safe cyber environments: Cybersecurity training and strict measures against online harassment are essential for encouraging women's participation.
- Promote inclusive curriculum design: STEM education should include examples and case studies highlighting contributions from diverse genders and communities.
- Institutional support and recognition: Universities and colleges should create awards, scholarship, and incentives for women and marginalized students who excel in digital learning and research.
- Public-private partnerships: Collaboration among government, industry, and academia can generate greater resources for digital infrastructure and inclusive innovation.

CONCLUSION

Cyber empowerment offers a transformative pathway toward achieving gender equity and diversity in STEM. Digital tools, when used effectively, can dismantle traditional barriers related to access geography and social norms. The growing use of e-learning platforms, online mentorship, and virtual collaboration demonstrates that technology has the power to democratize education and innovation. However, inclusion cannot rely solely on digital availability; it also depends on

equitable access, a safe online environment, and supportive institutional frameworks.

The analysis suggests that empowering women and marginalized groups through technology contributes directly to sustainable development and national progress. By implementing gender-responsive digital strategies and promoting awareness at both policy and institutional levels, societies can cultivate an inclusive STEM ecosystem where every individual, regardless of gender or background, can learn, innovate, and lead.

Ethical Consideration:

This study uses only publicly available secondary data and adheres to standard ethical guidelines. No human participants were involved. All sources are properly acknowledged, and online tools are used for language translation, and structuring of content without influencing the interpretation of findings.

Conflict of Interest:

I declare that there is **no conflict of interest** related to the conduct, analysis, or publication of this study. The research has been carried out independently, without any financial, personal, or institutional influence that could affect the objectivity or integrity of the findings.

REFERENCES

- Rajvala. (2025). "Digital Learning and Women Empowerment". *International Journal in Management and Social Science*. Vol. 13 (4).
- Kumar, S. (2023). *Digital Empowerment: Need and Challenges* In 2023. *IOSR Journal of Business and Management*. Vol. 25 (5), 44-49.
- The Institution of Engineering and Technology (Press Release 2025), "A level uptake in STEM grows, but calls for greater gender equity".
- Mabica, A. P., Mabasso, R. A., Godoy Pena, M. T., Lasekan, O. A., & Mendez Alarcon, C. M. (2025). *Gender Norms and Female STEM Participation in Mozambique*. *International Research Journal of Multidisciplinary Scope*, 06(01), 1019–1030. <https://doi.org/10.47857/irjms.2025.v06i01.01928>
- Genua-Olmedo, A., Poblador, S., Lecina-Díaz, J., Sánchez-Montoya, M. M., Rodríguez-Lozano, P., Bartrons, M., Hernández-del Amo, E., Anton-Pardo, M., Catalán, N., Pastor, A., Cañedo-Argüelles, M., Freixa, A., & Bernal, S. (2025). *Breaking barriers: Ten essential steps to achieve gender*

equality in academia through scientific societies. Npj Biodiversity, 4(1), 37. <https://doi.org/10.1038/s44185-025-00105-6>

- Thu, H. L. T., Hong, C. N. T., Huy, V. N., & Thi, B. L. (2024). *A Systematic Review of Research on Gender Diversity in STEM Education. International Journal of Learning, Teaching and Educational Research*, 23(4). <https://www.ijlter.org/index.php/ijlter/article/view/9974>.
- Ministry of Education, PIB Delhi (2023), "Steps taken by the Government to promote women participation in STEM Courses".
- Smith, J. & Gupta, R. (2020). "Cyber empowerment and Gender in Digital Learning". *Journal of gender studies*, 15(4), 233-245.
- UN Women. (2023). "Digital Empowerment and Gender Equality Report."



