



CHETANA
International Journal of Education (CIJE)

Peer Reviewed/Refereed Journal
ISSN : 2455-8279 (E)/2231-3613 (P)

Impact Factor
SJIF 2024 - 8.029



Prof. A.P. Sharma
Founder Editor, CIJE
(25.12.1932 - 09.01.2019)

[Conference Special-NTMAE-24]

**Reformation of Pedagogy of Integrating Technology in
Teacher Education for Quality Teaching-Learning Processes**

Diksha Tiwari

Research Scholar

Dr. Pratibha Sagar

Assistant Professor

*Department of B.Ed./ M.Ed. (IASE), M.J.P. Rohilkhand University, Bareilly
Email- diksha.dev.tiwari@gmail.com, Mobile- 9528704561*

First draft received: 20.05.2024, Reviewed: 30.05.2024, Final proof received: 08.06.2024, Accepted: 26.06.2024

Abstract

In the era of rapid technological advancements, the amalgamation of technology in pedagogy has turned up as a pivotal force in reshaping teaching and learning processes by evolving educational paradigms. The integration of technology into teacher education has become incumbent in the rapidly evolving landscape of teacher education. Once, Education confined to traditional classroom settings, now it is undergoing a profound revolution propelled by digital innovation. This research paper investigates the transformative potential of reformed pedagogical approaches that utilizes technology to magnify the quality of education. The consolidation of technology into education has triggered a pedagogical reformation. It revolves around the student-centred learning and the development of innovative teaching practices (Al-Khatib, 2009; Hedberg, 2011). With the effective pedagogical strategies, the meaningful integration of technology remains a challenge (Murthy, 2017). A model for teacher professional development programs has been initiated to negotiate this challenge. This model highlights the need for teachers to go beyond knowledge about teaching and learning to develop meta-cognitive, social, and socio-metacognitive capacities (Law, 2008). This paper prescribes for the reformation of pedagogy by way of integration of technology in education. It features the significance of endorsing a learner-centred approach that utilizes the power of technology to create dynamic and inclusive learning environments conducive to quality teaching and learning experiences.

Keywords: *Technology, Pedagogy, Teacher education, Teaching-Learning process etc.*

Introduction

In the era of rapid technological advancements, the amalgamation of technology in pedagogy has turned up as a pivotal force in reshaping teaching and learning processes by evolving educational paradigms. The integration of technology into teacher education has become incumbent in the rapidly evolving landscape of teacher education. Once, Education confined to traditional classroom settings, now it is undergoing a profound revolution propelled by digital innovation. The evolution in the nature of pedagogy is considerably mentioned in the long run. The approaches have been shifted from teacher-centric to student-centric, which highlights active learning, cooperation, and the

expansion of critical thinking and problem-solving skills. It has a greater attention on imparting practical, interpersonal, and cognitive skills beyond just conflict resolution, teamwork, initiative, and innovation. The initiation of technology has renovated pedagogy, enabling the use of online resources, flipped classrooms, recorded lectures, and learning analytics to enhance the learning experience and provide more personalized and self-directed learning prospects.

Pedagogy is the profession of teaching, which encompasses instructional ideas and techniques. Pedagogy is that, which tells the teachings of skills and knowledge in an educational setting while taking into account the interactions that occur during the learning

process. Pedagogy is the salient constituent of education. It put the accent on the role of the instructor in curriculum design, student progress assessment, learning organization and facilitation, and educational outcome promotion. It has been validated that integrating technology into teacher education has many expansions. According to Clift (2001), a techno-pedagogical model is visibly looked-for to direct the amalgamation of technology into teacher education. According to Yelland (2000), early childhood education can support from the integration of information and communication technology (ICT). According to Estes (2017), virtual reality has the aptitude to advance the teaching-learning process. It is decisive that teachers receive technical knowledge and skill training. In the end, Nagarajan (2013) recommends creating courses that make use of these tools. The combined findings of these researches support the notion that incorporating technology into teacher education can improve both student learning and instructional procedures.

The aim of this paper is to discourse the prerequisite for teacher educators to augment their technological pedagogical skills to integrate technology into the classroom effectively. This paper also put emphasis on the reputation of educating teachers on technology integration, as long as proficient development prospects to ensure successful execution of technology in teaching. It places of interest of the correlation between a teacher's digital proficiency and student learning consequences, featuring the impact of equipping teachers with the indispensable skills to navigate the complexities of education in the 21st century.

Evolution of Pedagogy and Technology Integration

In the initial days of educational technology, oral communication and memorization were the only primary means of transferring knowledge. Over the years, a number of technologies were familiarized to upkeep and enrich education. The occurrence of computer assisted instruction and computer based training were witnessed in the 1960s and 1970s. Implementing such technologies positioned the footing for the integration of technology in education. Following this, many personal computers, educational software, and multimedia applications were introduced in classrooms in the 1980s and 1990s. The historical perspective of pedagogy and technology integration exposes a substantial progression in educational performs over the decades. In the beginning, technology integration in education was scarcely professed, hampering teachers' indulgent of its full potential. The traditional methods were widely used in the educational institutions, although they were often criticized for not adequately preparing students as per the need of the time. These approaches refer to that of teacher centred, which lay emphasis on the sovereignty of the teacher within the classroom situation. Under the appearance of these approaches, the teacher is the solitary cause of knowledge. He has the full control over the learning atmosphere, teaching methodology, and the course curriculum. Students acquire through reiteration and memorization. Traditional teaching methods are dependent profoundly on textbooks as the

primary learning means. Learning takes place at a predetermined leap and plan. Face-to-face interaction between the teacher and students is the prime mode of instruction. Students are usually unreceptive of knowledge and with inadequate prospects for active involvement and assignment.

But as technology industrialized, educators instigated to diagnose the prominence of integrating technology in the form of digital pedagogy as a fundamental part of the instructional process. Digital pedagogy progressed along with technological improvements, such as educational TV programs, radio broadcasts, and telecourses in the 1970s. The universalization of the Internet in the late 20th century cemented the way for online education, leading to the integration of digital technologies in teaching and learning surroundings. Digital pedagogy focuses on employing existing digital technologies to augment educational performs in online, hybrid, and face-to-face situations. It comprises the learning of how digital tools can be excellently utilized in teaching and learning, accentuating open education, self-directed student projects, and the sympathetic use of digital tools to enhance learning consequences. Digital pedagogy is not just about exhausting technology for teaching but also about determining when not to use digital tools and bearing in mind their impression on learning. Immersive technologies like 3D modelling and collaborative world-building are the illustrations of how digital pedagogy can boost student assignment and learning practices.

Today, the 21st century has been marked by a swift extension of digital technologies, including the internet, online learning platforms, social media, mobile devices etc. These improvements have impacted teaching and learning, leading to a paradigm shift in educational observes expressively. This shift underlined the necessity for teachers to select appropriate technologies, design instruction that integrates technology from the inception, and appraise and adapt technology routine to discourse instructional challenges effectively.

Pedagogical Theories Supporting Technology Integration

Pedagogical theories provide a foundation for understanding how students learn and how technology can be effectively integrated to enhance the learning process. These theories support technology integration by emphasizing the importance of active learning, collaboration, and the use of technology to facilitate learning. They provide a framework for educators to design and implement effective technology-enhanced learning experiences that cater to diverse learning needs and styles.

Integrating technology into education is increasingly recognized as essential for modern learning environments. Several pedagogical theories underpin this integration, enhancing teaching and learning experiences. The integration of technology in education is influenced by a variety of factors, including pedagogical beliefs, ease of use, and alignment with learning theory (Justus, 2017). Challenges in this

integration can be conceptualized using Activity Theory and System 1 and System 2 thinking theory, with transformative learning theory providing a framework for understanding these influences (Blundell, 2015). In basic education, pedagogical models that incorporate digital technologies can enhance teacher performance and student learning (Frasseto, 2022). The essential role of pedagogical knowledge in technology integration for transformative teaching and learning cannot be overstated (Benson, 2015).

Constructivism

This theory emphasizes the active role of learners in constructing their own knowledge through experiences and interactions. Technology can facilitate this process by providing tools for collaboration, communication, and knowledge construction. Technology, through interactive simulations, collaborative online platforms, and multimedia resources, provides tools for learners to explore, experiment, and engage actively with content.

Connectivism

In the digital age, learning is not just about acquiring knowledge but also about connecting with vast networks of information and experts. Connectivism suggests that learning happens through networks, and technology enables learners to connect with diverse perspectives, resources, and communities, facilitating collaborative learning and knowledge creation.

Cognitive Load Theory

This theory explores how the working memory processes information and suggests that learning is optimized when cognitive load is managed effectively. Technology can help manage cognitive load by presenting information in multimedia formats, offering interactive activities, and providing immediate feedback, thus supporting efficient learning.

By integrating technology in alignment with these pedagogical theories, educators can create dynamic and effective learning environments that cater to diverse learners' needs and promote meaningful engagement, collaboration, and knowledge construction.

Models for Integrating Technology in Education

The models for integrating technology in education encompass a range of frameworks and approaches that aim to enhance teaching and learning through the effective use of digital tools. These models address the integration of technology by combining pedagogical knowledge, content knowledge, and technological knowledge to benefit all learners in diverse educational contexts. They provide lasting frameworks for evaluating and implementing digital tools to enrich literacy classrooms, promoting active learning, interaction, and engagement through various applications and resources. Through a comprehensive understanding of multiliteracies and technology integration, these models empower teachers to become agents of change, shaping learning environments that support the diverse needs and desires of literacy learners.

A range of models have been proposed for integrating technology in education. Thomas (1996) and Strudler (2014) both emphasize the importance of addressing issues of access, training, and context, with Strudler specifically highlighting the role of technology coordinators. Hodges (2017) and Ziegel (2004) focus on the need for deliberate preparation of teachers to use technology effectively, with Hodges suggesting the use of digital literacies and modeling, and Ziegel advocating for a policy agenda to support teachers. These models collectively underscore the need for a comprehensive approach that addresses both the practical and pedagogical aspects of technology integration in education.

TPACK (Technological Pedagogical Content Knowledge)

Developed by Mishra and Koehler, TPACK emphasizes the intersection of technological, pedagogical, and content knowledge. It provides a framework for teachers to effectively integrate technology into lesson planning by considering how technology supports instructional strategies and content standards.

SAMR (Substitution, Augmentation, Modification, Redefinition)

The SAMR model categorizes technology use into four levels - substitution, augmentation, modification, and redefinition. It helps educators understand how technology can either enhance or transform learning experiences, moving beyond simply substituting traditional methods with technology.

TIM (Technology Integration Matrix)

Developed by the Florida Centre for Instructional Technology, the TIM model consists of five levels of technology integration - entry, adoption, adaptation, infusion, and transformation. It provides a comprehensive framework for educators to reflect on their technology integration practices and progress towards more sophisticated and transformative use of technology in instruction.

These models offer educators structured approaches to integrating technology in education, guiding them in leveraging technology to enhance teaching practices, engage students, and achieve learning objectives effectively.

Advantages of Integrating Technology in Education

Enhancing student engagement is a decisive aspect of effective teaching, as it comprises capturing and maintaining students' interest in the learning process. Engaged students are more likely to recall information, make connections between concepts, put on their learning in real-world scenarios, and team up with their peers positively. Research designates that student engagement impacts academic success and student outcomes considerably. By fostering engagement in the classroom, educators can help students grasp their full potential, advance a love for learning, and create a supportive and interactive learning environment that profits all learners.

Facilitating personalized learning involves tailoring educational experiences to meet each student's unique strengths, needs, skills, and interests. It goes beyond the traditional one-size-fits-all approach to education by providing individualized learning plans based on how students learn best. In a personalized learning environment, students work with teachers to set goals, take ownership of their learning, and progress at their own pace. This approach aims to engage students more effectively, balance focus on strengths and weaknesses, and foster self-advocacy skills. By combining personalized learning with technology, educators can create a dynamic and inclusive learning environment that supports student growth and success.

Fostering Collaboration and Communication involves creating a positive and inclusive classroom environment by establishing clear expectations and norms, encouraging respect and empathy, and promoting active participation and equal opportunities. It also includes incorporating cooperative learning activities like group projects, role-playing, and collaborative problem-solving tasks to enhance students' collaborative communication skills. This approach emphasizes the importance of equipping students with the necessary skills to succeed in the 21st century by fostering effective collaboration, active listening, empathy, and problem-solving abilities.

Expanding access to education is a critical endeavour that involves ensuring that all individuals, regardless of their background or circumstances, have the opportunity to acquire knowledge and skills. This includes initiatives to provide universal access to quality early learning experiences, support for competency-based preparation for teachers, and the promotion of online and blended learning opportunities. Efforts to expand access to education encompass various levels, from pre-school to post-secondary education, and involve strategies such as funding universal pre-school programs, supporting middle-grade STEM preparation, and providing flexible funding for extended learning time. Additionally, expanding access to education involves addressing barriers such as limited broadband access and leveraging online resources to reach underserved communities. By embracing innovative models and technologies, education can be made more accessible and inclusive, empowering individuals worldwide to pursue learning and personal growth.

Improving assessment and feedback mechanisms is crucial in enhancing the learning process and student outcomes. Assessment in education involves evaluating students' knowledge, skills, and understanding to identify areas of strength and improvement. Effective assessment practices, such as formative and summative assessments, provide valuable feedback to guide students in their learning journey. Feedback, whether from teachers, peers, or self-assessment, plays a vital role in helping students understand their performance, identify areas for growth, and regulate their learning process. By adopting constructive approaches, utilizing educational technologies, and employing diverse assessment methods, educators can enhance

assessment and feedback practices to support student learning, motivation, and academic success.

Challenges and Barriers

The challenges and barriers regarding the reformation of pedagogy for integrating technology in teacher education include intrinsic and extrinsic influences on teacher practices, teachers' beliefs and technology integration practices, obstacles to pedagogical changes required for technology-enabled learning, and the disruption of routines by the integration of digital technologies. These challenges stem from factors such as teacher knowledge and skill, teacher vision and design thinking, teacher beliefs conflicting with technology-enabled learning, and the impact of digital technologies on teacher confidence, reputation, and identity. Additionally, the gap between teachers' espoused and enacted beliefs, the disruption of existing routines by digital technologies, and the need for professional learning models to focus on developing teacher knowledge and skill pose significant barriers to the successful reformation of pedagogy for technology integration in teacher education.

Digital Divide and Access Issues

The digital divide refers to the unequal access to digital technology, including smartphones, tablets, laptops, and the internet. This divide creates a division and inequality around access to information and resources, with significant socio-economic implications. The digital divide is not just about physical access to devices but also encompasses financial, socio-demographic, cognitive, institutional, political, and cultural barriers that hinder equal access to digital technologies. It is a multifaceted issue that requires a comprehensive approach to address the various barriers to equal access to digital technologies. It is crucial to recognize the complexities of digital access and the need for innovative solutions to bridge the gap between those with and without access to digital technologies.

Resistance to Change among Educators

Educators often exhibit resistance due to various factors such as lack of digital confidence, fear of failure, fear of losing time, and scepticism about the expected results. Additionally, veteran teachers with more years of experience may be more resistant to change as they are satisfied with their current teaching methodologies and see no need for adaptation. Lack of competence in using digital technologies, limited digital skills, and a reluctance to integrate technology into teaching practices further contribute to resistance. Moreover, a lack of motivation, stemming from various underlying issues, can hinder educators from embracing technology in their teaching. Gender and cultural factors can also play a role, with societal norms and expectations influencing educators' attitudes towards technology integration. Overall, addressing educators' resistance to change requires targeted strategies to enhance digital confidence, provide adequate training and support, foster motivation, and address cultural and gender-related barriers to promote successful integration of technology in teacher education.

Concerns about Privacy and Security

The concerns about privacy and security regarding the pedagogy of integrating technology in teacher education revolve around the potential risks associated with the collection, storage, and use of personal data in educational settings. As technology becomes more integrated into teaching practices, there is a growing need to address privacy concerns related to data security, surveillance, profiling, and potential cyber-attacks. The implementation of artificial intelligence (AI) in education raises complex privacy issues, including inappropriate data use, surveillance of students' online activities, and the potential for data breaches. To mitigate these concerns, it is essential for schools and educational technology companies to adopt privacy-by-design approaches, implement robust data security practices, prioritize transparency in data usage, provide education on data privacy, and advocate for strong legal frameworks to protect students' data privacy and security. By addressing these concerns proactively, educators can ensure the responsible and ethical integration of technology in teacher education while safeguarding students' privacy and data security.

Successful Technology Integration Initiatives

The Apple Classrooms of Tomorrow (ACOT) program

This initiative, launched in the 1980s, provided teachers and students with access to cutting-edge technology, including personal computers and software. The program aimed to explore how the widespread use of technology could influence teaching and learning. The ACOT program demonstrated that when teachers are given adequate support and training, they can effectively integrate technology into their instruction, leading to improved student engagement and learning outcomes.

The Intel Teach Program

Launched in 1999, this global initiative has trained over 15 million teachers in more than 70 countries on how to effectively integrate technology into their teaching practices. The program provides professional development workshops, online courses, and resources to help teachers develop their technological, pedagogical, and content knowledge (TPACK). The Intel Teach Program has been successful in promoting the use of technology in classrooms and improving student learning.

The Partnership for 21st Century Learning (P21)

This initiative, launched in 2002, brings together educators, policymakers, and business leaders to promote the integration of 21st-century skills, including the use of technology, into education. P21 has developed a framework that outlines the skills and knowledge students need to succeed in the 21st century, including critical thinking, communication, collaboration, and creativity. The P21 framework has been widely adopted by schools and districts across the United States and has been successful in promoting the integration of technology into teaching and learning.

The Innovative Teaching and Learning (ITL) Research Project

This global research project, launched in 2010, aims to identify and promote effective practices for integrating technology into teaching and learning. The ITL Research Project has conducted studies in several countries, including the United States, Finland, Indonesia, and Mexico, to identify the factors that contribute to successful technology integration initiatives. The project has found that when teachers are provided with adequate support and resources, they can effectively integrate technology into their instruction, leading to improved student engagement and learning outcomes.

These initiatives demonstrate that when teachers are provided with adequate support and resources, they can effectively integrate technology into their instruction, leading to improved student engagement and learning outcomes. However, it is important to note that successful technology integration initiatives require a comprehensive approach that includes professional development, access to resources, and ongoing support for teachers.

Conclusion

The reformation of pedagogy for integrating technology in teacher education is fundamental for preparing educators to effectively leverage digital tools in teaching and learning. This study underscores the importance of equipping teachers with the necessary knowledge and skills to navigate the complexities of technology-enabled learning environments and promote innovative teaching approaches that leverage digital tools to enhance educational experiences. Technology integration should be guided by sound pedagogical principles, with a focus on enhancing student learning outcomes. The selection and use of technology should be based on instructional objectives, methods, and assessment strategies. Educators need a broad understanding of technology integration that goes beyond just using hardware and software. It involves selecting appropriate technologies, demonstrating their use, evaluating their effectiveness, and customizing their application to address instructional challenges. Successful technology integration requires addressing various barriers, including teacher knowledge and skills, beliefs, administrative and institutional constraints, and the disruption of existing routines. Teacher education programs should provide comprehensive support to help pre-service teachers overcome these barriers. Developing Technological Pedagogical Content Knowledge (TPACK) is crucial for effective technology integration. Teacher education programs should focus on enhancing pre-service teachers' knowledge of how to effectively integrate technology into their content areas and pedagogical practices.

Continuous professional development opportunities are essential for in-service teachers to stay updated with emerging technologies and best practices in technology integration. Schools and districts should provide sustained support and resources for teachers to enhance their technology integration skills. By

addressing the challenges, developing TPACK, and providing on-going support, teacher education programs can better prepare educators to harness the power of technology to enhance teaching and learning.

Apart of it, the findings of the Pedagogy of Integrating Technology in Teacher Education include the development of Technological Pedagogical Content Knowledge (TPCK) as a new knowledge type resulting from the intersection of technology and pedagogy domains. This knowledge framework, proposed by Mishra and Koehler, emphasizes the importance of integrating technology, pedagogy, and content knowledge to enhance teaching practices and improve student learning outcomes. Additionally, the impact of teacher education courses for technology integration on pre-service teacher knowledge has been studied through meta-analysis, highlighting the significance of these courses in shaping teachers' abilities to effectively integrate technology into their instructional practices.

The implications for pedagogy and education include the importance of understanding the conscious and unconscious sources of teachers' behaviour, the need for a pedagogy that fosters creativity and connection in learning environments, and the significance of evolving pedagogy to align with the changing landscape of education. These sources emphasize the role of pedagogy in shaping learning methodologies, fostering rapid growth within educational institutions, and empowering learners with a profound understanding of subjects. In addition, they highlight the importance of pedagogy in improving the quality of teaching and learning, boosting cooperative learning atmospheres, removing monotonous learning practices, enhancing communication, and encouraging students to learn effectively.

References

- Abedi, E.A. (2023). Tensions between technology integration practices of teachers and ICT in education policy expectations: implications for change in teacher knowledge, beliefs and teaching practices. *Journal of Computer Information*. <https://doi.org/10.1007/s40692-023-00296-6>
- Ahmed, V. & Opoku, A. (2022). Technology supported learning and pedagogy in times of crisis: the case of COVID-19 pandemic. *Education and Information Technologies*, 27(1), 365-405. <https://doi.org/10.1007/s10639-021-10706-w>
- Alam, A., & Mohanty, A. (2023). Educational technology: Exploring the convergence of technology and pedagogy through mobility, interactivity, AI, and learning tools. *Cogent Engineering*, 10(2). <https://doi.org/10.1080/23311916.2023.2283282>
- Hero, J. L. (2019). The Impact of Technology Integration in Teaching Performance. *International Journal of Sciences: Basic and Applied Research (IJSBAR)*, 48(1), 101-114
- Schlebusch, G., Bhebhe, S. & Schlebusch, L. (2024). Technology Integration in Teacher Education Practices in Two Southern African Universities. *Open Education Studies*, 6(1). <https://doi.org/10.1515/edu-2022-0223>
- Wang, C., Chen, X., & Yu, T. et al. (2024). Education reform and change driven by digital technology: a bibliometric study from a global perspective. *Humanity Social Science Communication*, 11(1). <https://doi.org/10.1057/s41599-024-02717-y>
- Wilson, M. L. & Ritzhaupt, A. D. (2020). The impact of teacher education courses for technology integration on pre-service teacher knowledge: A Meta Analysis Study. *Science Direct*, 156(1). <https://doi.org/10.1016/j.compedu.2020.103941>