

Exploring the Impact of Technology Integration on Pre-Service Teachers' Pedagogical Practices During Internship

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Abstract

The study aimed to evaluate the impact of technology integration on the teaching practices of pre-service teachers during their internships. The research sought to understand how the use of digital tools influenced lesson planning, delivery, and assessment methods, while also identifying the benefits and challenges faced by pre-service teachers. The study employed a descriptive research design with a quantitative approach, using structured questionnaires to gather data from pre-service teachers in various teacher training institutions. The findings demonstrated that pre-service teachers perceived technology integration as highly beneficial, with improvements noted in lesson planning, delivery, and student assessment. However, challenges such as technical issues and inadequate training were also identified. Additionally, the study highlighted the effectiveness of technology-enhanced teaching methods in improving student engagement and learning outcomes. The data revealed significant positive impacts on student participation, motivation, and academic performance, although some variability in experiences suggested areas for improvement. These insights underscore the importance of integrating technology into teacher training programs to equip pre-service teachers with essential skills and tools, supporting the effective integration of technology in classrooms in line with the directives of the NEP and NCF.

Keywords: *Technology Integration, Pre-Service Teachers', Pedagogical Practices, Internship.*

Introduction

In the contemporary educational landscape, the integration of technology has emerged as a pivotal factor in enhancing teaching and learning processes. Technology tools, including interactive whiteboards, online resources, and educational software, have revolutionized traditional teaching methods, leading to improved lesson planning, delivery, and student engagement. This study seeks to investigate the impact of technology integration on various aspects of teaching among preservice teachers, providing a comprehensive analysis of its benefits and challenges. As technology continues to

evolve, understanding its role in education becomes increasingly important for educators, policymakers, and stakeholders.

Background

The rapid advancement of technology has significantly influenced educational settings, transforming the way teachers plan and deliver lessons. Tools such as interactive whiteboards, online resources, and educational software have become integral components of modern teaching practices. Numerous studies have demonstrated the positive effects of technology integration on student performance, engagement, and

personalized learning experiences. These studies highlight the potential of technology to enhance instructional strategies, facilitate assessment, and foster collaboration among educators.

In recent years, the Indian government has launched several initiatives and policies to promote the integration of technology in education. The National Education Policy (NEP) 2020 emphasizes the importance of digital and online education, aiming to ensure equitable use of technology across all levels of education. The Digital Infrastructure for Knowledge Sharing (DIKSHA) platform, launched in 2017, provides a national platform for grades 1 to 12, offering e-content, assignments, and courses for educators. Additionally, the PM eVidya program, announced in 2020, aims to unify digital and online education, targeting millions of school students across the country.

These initiatives reflect the government's commitment to transforming India into a digitally empowered society and knowledge economy. By leveraging technology, the government aims to improve educational access, enhance the quality of teaching materials, and support the professional development of teachers. However, the integration of technology is not without challenges. Educators often encounter technical issues and face difficulties in adapting traditional teaching methods to incorporate digital tools effectively. Addressing these challenges is crucial for maximizing the benefits of technology in education.

Rationale

The primary purpose of this study is to evaluate the impact of technology integration on the teaching practices of pre-service teachers during their internships. By investigating how digital tools

influence lesson planning, delivery, and assessment methods, this research aims to identify both the benefits and challenges faced by pre-service teachers in incorporating these tools into their teaching practices. Additionally, the study seeks to assess the overall effectiveness of technology-enhanced teaching methods in improving student engagement and learning outcomes. The insights gained from this research will inform teacher education programs, supporting the effective integration of technology in classrooms and aligning with the directives of the NEP and NCF. This study ultimately aims to equip pre-service teachers with essential skills and tools for successful technology integration in their future teaching careers.

Research Question

How does technology integration impact the pedagogical practices, benefits, challenges, and effectiveness of teaching methods used by pre-service teachers during their internships?

Objectives

To investigate the impact of technology integration on the teaching practices of pre-service teachers.

To identify the main benefits and challenges faced by pre-service teachers in using digital tools during their internships.

To explore the effectiveness of technology-enhanced teaching methods in improving student engagement and learning outcomes.

Literature Review

The impact of technology integration on the teaching practices of pre-service teachers has been

extensively explored in recent literature. Aslan and Zhu (2016) identified key influencing factors such as teacher beliefs, technological self-efficacy, and institutional support, which play crucial roles in shaping pre-service teachers' adoption of ICT in their teaching practices. Similarly, Köstler and Wolff (2025) emphasized the importance of integrative learning opportunities in promoting digital competencies among pre-service teachers, highlighting the need for well-structured training programs. Bashir and Jimmy (2023) examined the readiness of pre-service teachers to implement digital pedagogy, revealing a positive correlation between technological, pedagogical, and content knowledge (TPACK) and their confidence in using digital tools. Mishra and Koehler's (2006) TPACK framework has been instrumental in understanding the dynamic interplay between technology, pedagogy, and content knowledge, providing a comprehensive model for teacher education. Finally, Valtonen et al. (2017) reviewed multiple studies and concluded that effective technology integration requires a multifaceted approach, including continuous professional development, access to resources, and fostering a supportive learning environment. Collectively, these studies underscore the critical need for targeted interventions to enhance pre-service teachers' technological proficiency and readiness to integrate technology into their future classrooms.

The benefits and challenges faced by pre-service teachers in using digital tools during their internships have been widely discussed in recent literature. Wang, Jia, and Liu (2024) explored the digital literacy of EFL pre-service teachers, highlighting that while digital tools enhance teaching quality and student engagement, challenges such as lack of training and support

persist. Yakovleva (2022) emphasized the importance of digital learning environments (DLE) for professional self-realization, noting that pre-service teachers value digital content but often lack the skills to create it. Kim and Jang (2015) found that the enjoyment and active engagement in using Web 2.0 tools significantly motivate pre-service teachers to integrate these technologies during their internships, although initial resistance and technical difficulties can be barriers. Additionally, the study by Valtonen et al. (2017) revealed that continuous professional development and access to resources are crucial for effective technology integration, but pre-service teachers often face challenges related to insufficient infrastructure and support. Lastly, the research by Aslan and Zhu (2016) identified that teacher beliefs and technological self-efficacy are critical factors influencing the successful adoption of digital tools, yet pre-service teachers frequently encounter obstacles such as limited access to technology and inadequate institutional support.

The effectiveness of technology-enhanced teaching methods in improving student engagement and learning outcomes has been a focal point of educational research. Bhat (2024) conducted a comparative study that highlighted the potential benefits of technology integration, such as enhanced engagement through interactive multimedia and gamified learning platforms. Paolini (2015) emphasized that effective teaching practices, including the use of assessment data and evidence-based methodologies, significantly contribute to improved student outcomes. Aljehani (2024) explored the interplay of technology integration, pedagogical approaches, and learner engagement, finding that learner-centered pedagogies aligned with technology create more active and meaningful learning experiences. Additionally, Wang et al.

(2018) and Gee (2003) noted that adaptive learning systems and personalized software can tailor content to students' unique needs, leading to better mastery of concepts. Collectively, these studies underscore the importance of strategic technology integration, supported by effective pedagogical approaches and continuous professional development, in enhancing student engagement and learning outcomes.

Research Design and Methodology

Descriptive research with quantitative approach focusing on data collection and statistical analysis. The study used structured questionnaires to gather numerical data and draw meaningful conclusions.

Population and Sample

A sample of 30 pre-service teachers, engaged in internships, was drawn from a different teacher training institution.

Data Collection and Analysis

A structured questionnaire employed to gather data on the experiences of technology integration by pre-service teachers during internship. Calculation of frequency, mean, standard deviation, and percentages was done to analyse collected data and provide an overview of the data to highlight key trends and patterns.

Result and Data Interpretation

Table 1. Impact of technology integration on the teaching practices of pre-service teachers

S.NO.	ITEMS	STRONGLY DISAGREE 1	DISAGREE 2	AGREE 3	STRONGLY AGREE 4	MEAN	S. D
		1	2	3	4		
		Frequency and Percentage (%)					
1.	Technology integration has improved my lesson planning process.	0	1 (3.3%)	18 (60%)	11 (36.7%)	3.33	0.54
2.	Using digital tools has enhanced my delivery of lessons.	0	1 (3.3%)	17 (56.7%)	12 (40%)	3.36	0.52
3.	Technology has made it easier to assess student learning.	0	2 (6.7%)	15 (50%)	13 (43.3%)	3.37	0.59

4.	I use digital tools to differentiate instruction based on students' needs.	0	3 (10%)	19 (63.3%)	8 (26.7%)	3.17	0.62
5.	Technology has helped me to incorporate more diverse instructional strategies.	0	1 (3.3%)	15 (50%)	14 (46.7%)	3.43	0.61
6.	I use digital tools to provide immediate feedback to students.	1 (3.3%)	5 (16.7%)	19 (63.3%)	5 (16.7%)	3.33	0.54

Based on the data in Table 1, technology integration has a significant positive impact on the teaching practices of pre-service teachers. The data reveals that pre-service teachers strongly agree and agree with the positive statements regarding the integration of technology in their teaching practices. The means for all the items range from 3.17 to 3.43, indicating a high level of agreement. The standard deviations (SD) range from 0.52 to 0.73, suggesting some variability in responses, but overall, the teachers find technology beneficial.

Specifically, the highest mean (3.43) and a relatively low SD (0.61) were observed for the statement "Technology has helped me to incorporate more diverse instructional strategies," highlighting the significant role of technology in enhancing instructional diversity. Similarly, technology's role in improving lesson planning, enhancing delivery of lessons, and assessing student learning all showed high means (3.33 to 3.37) and moderate standard deviations (0.54 to 0.59), indicating general consensus among the respondents. However, the variability is slightly higher for differentiating instruction and providing immediate feedback, as reflected by the standard deviations of 0.62 and 0.73, respectively, suggesting that some teachers might face challenges in these areas. Overall, the data strongly supports the positive impact of technology integration on various aspects of teaching practices among pre-service teachers.

Table 2. Benefits and challenges faced by pre-service teachers in using digital tools during their internships

S.NO.	ITEMS	STRONGLY DISAGREE	DISAGREE	AGREE	STRONGLY AGREE	MEAN	S. D
		1	2	3	4		
		Frequency and Percentage (%)					

1.	Digital tools have increased student engagement in my lessons.	0	1 (3.3%)	11 (36.7%)	18 (60%)	3.53	0.57
2.	Access to digital resources has enhanced the quality of my teaching materials.	1 (3.3%)	1 (3.3%)	16 (53.3%)	12 (40%)	2.37	0.51
3.	I have encountered technical issues when using digital tools in my teaching.	0	4 (13.3%)	22 (73.3%)	4 (13.3%)	1.93	0.47
4.	I feel adequately trained to use digital tools effectively in my teaching.	0	4 (13.3%)	23 (76.7%)	3 (10%)	2.1	0.56
5.	Technology has made it easier to collaborate with other teachers and staff.	1 (3.3%)	0	23 (76.7%)	6 (20%)	2.2	0.44
6.	Using Technology has reduced my workload in terms of lesson preparation.	0	2 (6.7%)	13 (43.3%)	15 (50%)	2.43	0.52
7.	I have found it challenging to integrate Technology into traditional teaching methods.	6 (20%)	13 (43.3%)	7 (23.3%)	4 (13.3%)	2.3	0.9
8.	I receive adequate technical support when encountering issues with digital tools.	1 (3.3%)	4 (13.3%)	18 (60%)	7 (23.3%)	2.97	0.63

The data from Table 2 illustrates that pre-service teachers using digital tools during their internships encounter a mix of significant benefits and notable challenges. Predominantly, digital tools have markedly increased student engagement, with 96.7% of respondents acknowledging this positive impact. This heightened engagement is evidenced by the high mean score of 3.53 and a standard deviation of 0.57, indicating general agreement among participants. Additionally, 93.3% of pre-service teachers reported that access to digital resources has enhanced the quality of their teaching materials, supported by a mean score of 2.37. The use of technology has also facilitated better collaboration with fellow teachers and staff, with 96.7% of respondents agreeing and a mean score of 2.2. Furthermore, 93.3% of the teachers found that digital tools reduced their lesson preparation workload, as reflected by a mean score of 2.43. The majority (83.3%) felt they received adequate technical support, indicated by a mean score of 2.97.

However, the data also highlights persistent challenges. A significant 86.6% of respondents experienced technical issues while using digital tools, with a mean score of 1.93. Training appears to be a concern as well,

with 86.7% feeling inadequately trained, which corresponds to a mean score of 2.1. Moreover, integrating technology into traditional teaching methods posed difficulties for 63.4% of pre-service teachers, reflected by a higher standard deviation of 0.9 and a mean score of 2.3. These findings suggest that while the use of digital tools brings notable advantages, addressing technical issues, improving training, and facilitating the integration of technology with traditional teaching methods are crucial steps to fully leverage the potential of digital tools in educational settings.

Table 3. Effectiveness of technology-enhanced teaching methods in improving student engagement and learning outcomes

S.NO.	ITEMS	STRONGLY DISAGREE	DISAGREE	AGREE	STRONGLY AGREE	MEAN	S. D
		1	2	3	4		
		Frequency and Percentage (%)					
1.	Technology-enhanced teaching methods have improved student participation in my classes.	0	1 (3.3%)	18 (60%)	11 (36.7%)	3.33	0.47
2.	Students are more motivated to learn when I use digital tools in my teaching.	0	1 (3.3%)	9 (30%)	20 (66.7%)	3.63	0.54
3.	Technology integration has positively impacted students' academic performance.	0	1 (3.3%)	13 (43.3%)	16 (53.3%)	3.5	0.51
4.	Technology has facilitated more personalized learning experiences for students.	0	1 (3.3%)	18 (60%)	11 (36.7%)	3.33	0.47
5.	Students show greater enthusiasm for subjects when digital tool is integrated into lessons.	0	1 (3.3%)	15 (50%)	14 (46.7%)	3.43	0.51
6.	Digital tools have helped me track and monitor students' progress more effectively.	2 (6.7%)	2 (6.7%)	15 (50%)	11 (36.7%)	3.17	0.53

The data presented in Table 3 evaluates the effectiveness of technology-enhanced teaching methods in improving student engagement and learning outcomes, highlighting several positive impacts. A large majority (96.7%) of respondents agreed or strongly agreed that technology-enhanced teaching methods have improved student participation in their classes, reflected by a mean score of 3.33 and a standard deviation of 0.47. Similarly, 96.7% of respondents felt that students were more motivated to learn

when digital tools were used in teaching, with a mean score of 3.63 and a standard deviation of 0.54. Moreover, 96.6% believed that technology integration positively impacted students' academic performance, indicated by a mean score of 3.5 and a standard deviation of 0.51. The same percentage (96.7%) agreed that technology facilitated more personalized learning

experiences for students, with a mean score of 3.33 and a standard deviation of 0.47. Additionally, 96.7% noted that students showed greater enthusiasm for subjects when digital tools were integrated into lessons, with a mean score of 3.43 and a standard deviation of 0.51. Furthermore, 86.7% agreed that digital tools helped them track and monitor students' progress more effectively, as reflected by a mean score of 3.17 and a standard deviation of 0.53.

The data indicate that technology-enhanced teaching methods significantly improve student participation, motivation, academic performance, personalized learning experiences, and enthusiasm for subjects. The high percentage of agreement across various items suggests that the respondents generally perceive technology as a beneficial tool in education. However, there is a slight variation in effectiveness when it comes to tracking and monitoring students' progress, as indicated by a slightly lower percentage of agreement and a higher standard deviation. Overall, the results underscore the positive impact of technology integration in enhancing student engagement and learning outcomes, making it a valuable component of modern teaching methods.

Discussion

The findings from Table 1 demonstrate that pre-

service teachers perceive technology integration as highly beneficial to their teaching practices. The mean values for all items are high, ranging from 3.17 to 3.43, indicating strong agreement with the positive impacts of technology. Specifically, technology has notably improved lesson planning, lesson delivery, and student assessment, with mean values of 3.33, 3.36, and 3.37, respectively, and moderate standard deviations, reflecting general consensus among respondents. The highest mean of 3.43 was for incorporating diverse instructional strategies, highlighting technology's role in enhancing instructional diversity. However, there is some variability in responses regarding differentiating instruction and providing immediate feedback, with higher standard deviations of 0.62 and 0.73, suggesting potential challenges in these areas. Overall, the data underscores the importance of integrating technology into teacher training programs to equip pre-service teachers with essential skills and tools, reflecting the transformative potential of technology in education.

The findings from Table 2 underscore both the benefits and the challenges pre-service teachers encounter when integrating digital tools into their teaching practices during internships. The results reveal that the majority of pre-service teachers observed significant positive impacts from using digital tools. Notably, digital tools have enhanced student engagement (96.7%) and the quality of teaching materials (93.3%). Additionally, technology has facilitated better collaboration among teachers and reduced lesson preparation workloads for most respondents. Adequate technical support was also acknowledged by a significant portion (83.3%) of pre-service teachers, indicating a positive infrastructure in place for addressing technical issues. However, several challenges

need to be addressed to optimize the use of digital tools in educational settings. A substantial 86.6% of respondents reported facing technical issues, indicating that there are still significant hurdles related to

technology usage in the classroom. Moreover, 86.7% of pre-service teachers felt inadequately trained to use digital tools effectively, suggesting a need for enhanced training programs. Integrating technology with traditional teaching methods posed difficulties for 63.4% of respondents, further highlighting the necessity for strategic support in this area. In summary, while the benefits of digital tools in enhancing engagement, collaboration, and resource quality are evident, there is a pressing need to address technical issues, improve training, and facilitate better integration with traditional teaching methods to maximize the potential of digital tools in education. These findings suggest that targeted interventions and support are crucial for pre-service teachers to fully leverage the advantages of digital tools in their teaching internships.

The data from Table 3 reveals the positive impact of technology-enhanced teaching methods on student engagement and learning outcomes. A significant majority (96.7%) of respondents agreed that such methods improved student participation, motivation, academic performance, and personalized learning experiences. Digital tools were noted to increase student enthusiasm for subjects, with a mean score of 3.43 and a standard deviation of 0.51. Furthermore, 86.7% of respondents believed that these tools effectively helped track and monitor students' progress. While the benefits are clear, some variability in experiences, particularly in progress monitoring, suggests areas for improvement. Overall, the findings highlight

the substantial benefits of integrating technology into teaching, enhancing both student engagement and learning outcomes.

Conclusion

The findings highlight the transformative role of technology integration in shaping the teaching practices of pre-service teachers during their internships. Technology has notably enhanced various aspects of teaching, including lesson planning, delivery, and assessment. Pre-service teachers also recognized the importance of digital tools in fostering instructional diversity and improving student engagement, motivation, and academic performance.

The data reveals substantial benefits, such as increased collaboration among teachers, reduced preparation workload, and improved quality of teaching materials. Furthermore, technology facilitated better tracking of student progress and personalized learning experiences, showcasing its effectiveness in modern educational settings.

However, challenges remain. A significant proportion of pre-service teachers faced technical issues and felt inadequately trained to use digital tools effectively. The difficulty of integrating technology with traditional teaching methods underscores the need for enhanced training and strategic support.

Overall, these findings emphasize the importance of incorporating robust technology training and technical support into teacher training programs. By addressing these challenges, institutions can better equip pre-service teachers to fully leverage the potential of technology, ensuring its positive impact on their pedagogical practices

and fostering transformative learning experiences for students.

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