Teachers' Digital Competence: Insights into Technical Skills, Pedagogical Integration, Communication, and Student Engagement

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ABSTRACT

Digital technology has significantly transformed education, requiring teacher educators to develop robust digital competencies to navigate 21st-century classrooms. Digital competence, defined by the European Commission's DigComp framework, includes information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving. These competencies include designing digitally enriched lessons, facilitating collaborative online learning, critically evaluating digital resources, and fostering a safe, inclusive digital learning environment. However, challenges persist, such as inadequate infrastructure and limited training opportunities, particularly in developing countries like India. The National Educational Policy (NEP) 2020 emphasises the integration of technology across all educational levels, emphasising the need for teacher educators to serve as exemplary models in utilising digital tools. The National Professional Standards for Teachers (NPST) also serve as a foundation for designing pre-service teacher education programs. This study aims to evaluate the digital competence, including technical skills, pedagogical use of digital tools, communication, and professional development of teacher educators, and bridge the gap between their skills and pre-service teachers' expectations, enhancing the quality of teacher education. Using survey data, the study evaluates these areas through mean scores, standard deviations, and scale reliability (Cronbach's alpha). Teacher educators demonstrate strong digital literacy, using multimedia and online platforms effectively. They integrate digital tools into pedagogy but need improvement in critical thinking, collaborative learning, and technical troubleshooting. The study concludes that while teacher educators demonstrate considerable strengths in digital competence, targeted professional development, enhanced feedback mechanisms, and the sharing of best practices are essential to address gaps and foster consistency.

KEYWORDS: *Digital Competence, Teacher Educator, Pre-Service Teacher, Digital, Tools, Teacher Education Programme.*

INTRODUCTION

The advent of digital technology has profoundly transformed education, redefining teaching methodologies, learning processes, and the roles of educators and learners. In the current era of rapid digitalisation, equipping teacher educators with robust digital competencies is essential to ensuring that pre-service teachers are well-prepared to navigate the challenges of 21st-century classrooms. The COVID-19 pandemic underscored the importance of digital tools in education, exposing gaps in digital literacy among educators and reaffirming the need for comprehensive digital skill development in the education (Marais, 2023).

Digital competence, as defined by the European Commission's *DigComp* framework, refers to the confident, critical, and responsible use of digital technologies for learning, work, and participation in society. This encompasses a combination of knowledge, skills, and attitudes across five key areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving (European Commission: Directorate General for Education, Youth, Sport and Culture., 2019; Vuorikari et al., 2022). For teacher educators, these competencies translate into designing and delivering digitally enriched lessons, facilitating collaborative online learning, critically evaluating digital resources, and fostering a safe, inclusive digital learning environment (Punie & Redecker, 2017). The DigCompEdu framework further organises digital competencies into six areas: professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competence. This structured approach ensures that teacher educators are well-equipped to integrate technology effectively, thereby enhancing the learning experience and fostering digitally literate future generations (Punie & Redecker, 2017).

The integration of digital tools in teacher education presents numerous opportunities. Platforms such as Moodle, Google Classroom, and Zoom have revolutionised interactions between teacher educators and pre-service teachers, offering real-time feedback and diverse assessment methods. These tools promote personalised learning, interactive pedagogies, and global collaboration (Dayal, 2023). However, challenges persist, including inadequate infrastructure, limited training opportunities, and resistance to change. These barriers are particularly prevalent in developing countries like India, where inequities in access to technology often exacerbate the digital divide (Nair & Hindle, 2013). Moreover, deficiencies in digital competence among teacher educators can adversely impact student outcomes, emphasising the need for targeted professional development (Gümüş & Kukul, 2023).

The National Educational Policy (NEP) 2020 represents a transformative initiative aimed at overhauling India's educational framework to meet the demands of the 21st century. The policy underscores the imperative integration of technology across all educational levels, with a particular emphasis on enhancing teachers' capacities. NEP 2020 explicitly advocates for building capacity in digital competencies, highlighting the necessity for teacher educators to serve as exemplary models in the effective utilisation of digital tools (Ministry of Education, 2020). Central to this vision is the establishment of the National Educational Technology Forum (NETF), intended as a platform for the free exchange of innovative ideas and strategies to leverage technology for improved learning outcomes (National Educational Technology Forum, 2023). Moreover, the policy promotes the development and implementation of online teacher training modules, along with the incorporation of Information and Communication Technology (ICT) in pre-service teacher education curricula (Ministry of Education, 2020). This comprehensive approach aims to foster a digitally competent teaching workforce capable of navigating and integrating advanced technological resources to enhance the educational experience and outcomes for students.

The National Professional Standards for Teachers (NPST) articulate the competencies, ethics, and standards expected of educators across different career stages. These standards outline the role of teachers at varying levels of expertise and the competencies required for each stage. Additionally, they include criteria for performance appraisals, which are to be conducted periodically. NPST also serves as a foundation for designing pre-service teacher education programs. Teacher educators, who are instrumental in shaping the pedagogical skills of pre-service teachers, must embody these competencies to instill confidence and proficiency in future educators (National Council for Teacher Education, 2022). Through these standards, NPST aims to ensure that teacher educators not only meet the required competencies but also serve as role models in effectively integrating digital tools in their teaching practices, thereby enhancing the overall quality of education.

Pre-service teachers, as the primary beneficiaries of teacher education programs, offer valuable insights into the digital competence of their educators. Studies indicate that pre-service teachers strongly prefer technology-rich learning environments, citing benefits such as enhanced engagement, accessibility, and relevance (Tondeur et al., 2012; Valtonen et al., 2023). However, they also highlight challenges such as inconsistent use of technology by teacher educators and insufficient hands-on training in the digital tools (Albion et al., 2015; Hughes et

al., 2020). This study addresses a critical need to evaluate the digital competence of teacher educators as observed by pre-service teachers. Understanding the proficiency and effectiveness of teacher educators in utilising digital tools is essential for enhancing teacher training programs. Furthermore, it explores the extent to which teacher educators integrate digital tools to support learning objectives and foster interactive experiences, aiming to identify effective strategies and highlight areas needing additional support. By identifying the professional development needs in digital competence, this study ensures teacher educators are equipped to integrate advanced technological resources effectively. Their perspectives are instrumental in identifying strengths and areas for improvement, guiding professional development initiatives, and informing curriculum design. This study strives to bridge the gap between the digital skills of teacher educators and the expectations of pre-service teachers, enhancing the quality of teacher education and preparing future educators for a digitally integrated world.

OBJECTIVES OF THE STUDY

The objectives of this study are to:

1. To study the digital literacy and technical skills of teacher educators as perceived by pre-service teachers.
2. To study the pedagogical use of digital tools by teacher educators as perceived by pre-service teachers.
3. To study the communication and interaction of teacher educators using digital tools, as perceived by pre-service teachers.
4. To study the ability of teacher educators to promote student learning and engagement using digital tools, as perceived by pre-service teachers.
5. To study the professional development needs of teacher educators in digital competence, as perceived by pre-service teachers.

RESEARCH METHODOLOGY

- **Sample**: The study will be conducted using a convenience sample of 34 pre-service teachers from various teacher education programs at MANNU and JMI.
- **Data Collection:** A closed-ended questionnaire comprising multiple questions for each objective was utilised to collect data on the digital competence and practices of teacher educators, as perceived by pre-service teachers.

- **Data Analysis**: The responses will be analysed using descriptive statistics to assess the digital competence of teacher educators.

ANALYSIS AND INTERPRETATION OF DATA

The analysis has been presented in accordance with the study's objectives.

Objective 1. To study the digital literacy and technical skills of teacher educators as perceived by pre-service teachers.

Table 1: *Responses of Preservice Teachers on Digital Literacy and Technical Skills of Teacher Educators*

Items	Mean	SD
My teacher is proficient in using digital platforms (e.g., learning management systems, online classrooms).	3.79	0.770
My teacher is able to effectively use multimedia (videos, images, etc.) in their teaching.	4.03	0.627
My teacher is capable of troubleshooting technical issues that arise during online classes.	3.71	0.719
My teacher uses a variety of digital tools (e.g., online quizzes, forums, webinars) to enhance learning.	3.53	1.051
My teacher is comfortable navigating online teaching platforms and software.	3.71	0.906
Overall	3.75	0.589

Table 1 shows the responses of pre-service teachers regarding digital literacy and technical skills of teacher educators. The highest mean (Mean = 4.03, SD = 0.627) indicates that pre-service teachers agree with the statement, "*My teacher is able to effectively use multimedia (video, images, etc.) in their teaching,"* and the relatively low SD shows consistency among respondents, reinforcing the perceived strength in this area. The second highest mean (Mean = 3.79, SD = 0.770) indicates that pre-service teachers agree with the statement, "*My teacher is proficient in using digital platforms (e.g., learning management systems, online classrooms)."* The moderate SD suggests some variation in responses. The third highest mean (Mean = 3.71, SD = 0.719) indicates that pre-service teachers agree with the statement, "*My teacher is capable of troubleshooting technical issues that arise during online classes."* The moderate SD suggests variability in perceived troubleshooting skills. The mean (Mean = 3.71, SD = 0.906) indicates that pre-service teachers agree with the statement, "*My teacher is comfortable navigating online teaching platforms and software."* However, the relatively high SD highlights differences in perceived comfort levels. The lowest mean of the scale's items (Mean = 3.53, SD = 1.051) indicates that pre-service teachers agree with the statement, "*My teacher*

uses a variety of digital tools (e.g., online quizzes, forums, webinars) to enhance learning." The higher SD of this statement indicates significant variability in responses, suggesting that not all teachers are equally adept at employing diverse digital tools to enhance learning.

The reliability of the scale measuring Teacher educators' digital literacy and technical skills was assessed using Cronbach's alpha ($\alpha = 0.756$). This value indicates an acceptable level of internal consistency among the items in the scale. The overall mean score for the scale is 3.75, with a standard deviation (SD) of 0.589, indicating that participants generally agree that teachers demonstrate digital literacy and technical skills. The low SD suggests that responses are fairly consistent across participants.

Objective 2. To study the pedagogical use of digital tools by teacher educators as perceived by pre-service teachers.

Table 2: *Responses of Preservice Teachers on Pedagogy Use of Digital Tools by Teacher Educators*

Items	Mean	SD
My teacher effectively integrates digital tools to support learning objectives.	3.74	0.828
My teacher uses digital tools to foster interactive learning experiences (e.g., group discussions, peer feedback).	3.85	0.821
My teacher provides clear instructions on how to use digital tools for assignments and assessments.	4.00	0.778
The digital content provided by my teacher (e.g., slides, PDFs, videos) is well-organized and easy to access.	4.12	0.844
My teacher encourages student engagement through digital platforms (e.g., by asking questions, assigning group work).	4.15	0.610
Overall	3.97	0.587

Table 2 shows the responses of pre-service teachers on the pedagogical use of digital tools by teacher educators. The highest mean (Mean = 4.15, SD = 0.610) indicates that pre-service teachers agree with the statement, "*My teacher encourages student engagement through digital platforms (e.g., by asking questions, assigning group work)."* The low SD demonstrates strong consistency among participants, indicating widespread satisfaction with this aspect. The second highest mean (Mean = 4.12, SD = 0.844) indicates that pre-service teachers agree with the statement, "*The digital content provided by my teacher (e.g., slides, PDFs, videos) is well-organized and easy to access."* While the SD indicates slight variability, this is likely due to differences in individual teacher practices. The third highest mean (Mean = 4.00, SD = 0.778)

indicates that pre-service teachers agree with the statement, "*My teacher provides clear instructions on how to use digital tools for assignments and assessments."* The SD is relatively low, highlighting consistency in perceptions. The mean (Mean = 3.85, SD = 0.821) indicates that pre-service teachers agree with the statement, "*My teacher uses digital tools to foster interactive learning experiences (e.g., group discussions, peer feedback),"* and the moderate SD indicates some variability in perceptions. The lowest mean score of the item of the dimension (Mean = 3.74 SD = 0.828) indicates that pre-service teachers agree with the statement, "*My teacher effectively integrates digital tools to support learning objectives."* However, the SD suggests moderate variability in responses, reflecting differences in teachers' approaches.

The reliability of the scale measuring teacher educators' pedagogical use of digital tools was assessed with Cronbach's alpha ($\alpha = 0.807$). This value demonstrates good internal consistency, indicating that the items effectively measure a coherent construct. The scale's overall mean is 3.97, with a standard deviation (SD) of 0.587, reflecting a high level of agreement among respondents regarding the effective pedagogical use of digital tools. The relatively low SD signifies consistent perceptions across participants.

Objective 3. To study the communication and interaction of teacher educators using digital tools, as perceived by pre-service teachers

Table 3: *Responses of Preservice Teachers on Communication and Interaction Using Digital Tools of Teacher Educators*

Items	Mean	SD
My teacher responds promptly to emails and messages on digital platforms (e.g., learning management systems, chat groups).	3.74	0.710
My teacher maintains clear and consistent communication through digital platforms (e.g., announcements, reminders, feedback).	3.82	0.716
My teacher actively engages with students during online classes through discussion forums, chats, or polls.	3.74	0.828
My teacher adapts their communication style effectively for online or digital learning environments.	3.85	0.558
My teacher provides regular and constructive feedback on digital assignments and quizzes.	3.50	0.788
Overall	3.73	0.456

Table 3 shows the responses of pre-service teachers regarding communication and interaction using digital tools of teacher educators. The highest mean (Mean = 3.85, SD = 0.558) indicates that pre-service teachers agree with the statement, "*My teacher adapts their communication style effectively for online or digital learning environments."* This item has the lowest SD, indicating consistency in responses suggests this is a strength for most teachers. The second highest mean (Mean = 3.82, SD = 0.716) indicates that pre-service teachers agree with the statement, "*My teacher maintains clear and consistent communication through digital platforms (e.g., announcements, reminders, feedback)."* The moderate SD reflects slight variability in practices across teachers. The mean score of 3.74 (SD = 0.710) indicates that pre-service teachers generally agree with the statement, "*My teacher responds promptly to emails and messages on digital platforms (e.g., learning management systems, chat groups).*" The standard deviation suggests some variability in the promptness of teachers' responses, indicating that while many teachers are responsive, there is a range of response times. Similarly, the mean score of 3.74 (SD = 0.828) reflects that pre-service teachers agree with the statement, "*My teacher actively engages with students during online classes through discussion forums, chats, or polls*." However, the higher standard deviation in this case suggests greater variability in the effectiveness of teacher engagement, with some teachers demonstrating more active involvement than others. The lowest mean (Mean = 3.50, SD = 0.788) indicates that pre-service teachers agree with the statement, "*My teacher provides regular and constructive feedback on digital assignments and quizzes."* The relatively higher SD suggests variability in the frequency and quality of feedback provided by different teachers, making it a potential area for improvement.

The reliability of the scale measuring teacher educators' communication and interaction using digital tools was assessed using Cronbach's alpha ($\alpha = 0.617$). While this value is below the commonly accepted threshold of 0.70 for exploratory research, it may still indicate moderate reliability, particularly for a small set of diverse items. However, the lower reliability suggests some inconsistency among the items, which may warrant further refinement of the scale. The overall mean score for the scale is 3.73, with a standard deviation (SD) of 0.456, reflecting general agreement among respondents regarding teachers' communication and interaction skills. The low SD suggests consistent responses across participants.

Objective 4. To study the ability of teacher educators to promote student learning and engagement using digital tools, as perceived by pre-service teachers.

Table 4: *Responses of Preservice Teachers on Teacher Educators' Ability to Promote Student Learning and Engagement Using Digital Tools*

Items	Mean	SD
My teacher uses digital resources (videos, websites, articles) to enhance my understanding of the subject.	3.76	0.955
My teacher creates a positive and interactive learning environment in online classes.	3.82	0.797
The digital tools used by my teacher make it easier for me to understand complex topics.	3.88	0.769
My teacher provides opportunities for collaborative learning through digital tools (e.g., group projects, discussion boards).	3.76	0.781
My teacher effectively uses digital tools to encourage critical thinking and problem-solving.	3.76	0.855
Overall	3.80	0.634

Table 4 shows the responses of pre-service teachers regarding teacher educators' ability to promote student learning and engagement using digital tools. The highest mean (Mean = 3.88, SD = 0.769) indicates that pre-service teachers agree with the statement, "*The digital tools used by my teacher make it easier for me to understand complex topics."* The moderate SD indicates some variation in responses, but the overall perception is positive. The second highest mean (Mean = 3.85, SD = 0.797) indicates that pre-service teachers agree with the statement, "*My teacher creates a positive and interactive learning environment in online classes."* The moderate SD indicates a generally consistent perception of this practice. The mean score of 3.76 (SD = 0.781) suggests that pre-service teachers generally agree with the statement, "*My teacher provides opportunities for collaborative learning through digital tools (e.g., group projects, discussion boards).*" The mean, coupled with the moderate standard deviation, indicates general agreement but also suggests some variability in the consistency of these collaborative opportunities across different teachers. Similarly, the mean score of 3.76 (SD = 0.955) reflects agreement with the statement, "*My teacher uses digital resources (videos, websites, articles) to enhance my understanding of the subject.*" However, the relatively high standard deviation indicates variability in how effectively teachers are perceived to use these resources, with some teachers leveraging them more effectively than others. Lastly, the mean score of 3.76 (SD = 0.855) shows that pre-service teachers agree with the statement, "*My teacher effectively uses digital tools to encourage critical thinking and problem-solving.*" Again, the higher standard deviation points to differences in how effectively teachers apply these digital tools to foster critical thinking and problem-solving skills among students.

The reliability of the scale measuring teacher educators' ability to promote student learning and engagement using digital tools was assessed using Cronbach's alpha ($\alpha = 0.818$). This value indicates strong internal consistency, suggesting that the items effectively measure the intended construct. The overall mean score for the scale is 3.80, with a standard deviation (SD) of 0.634, reflecting a general agreement among participants regarding teachers' ability to use digital tools to promote learning and engagement. The moderate SD indicates some variation in responses but overall consistency.

Objective 5. To study the professional development needs of teacher educators in digital competence, as perceived by pre-service teachers.

Table 5: *Responses of Preservice Teachers on Professional Development in Digital Competence of Teacher Educators*

Items	Mean	SD
My teacher demonstrates an interest in improving their digital teaching skills.	3.85	0.436
My teacher participates in professional development activities related to digital education.	3.74	0.618
My teacher encourages students to use digital tools to enhance their own learning and skills.	4.00	0.651
My teacher is open to feedback regarding their use of digital tools and teaching methods.	3.91	0.570
My teacher seeks help or resources to improve their digital competence when needed.	3.82	0.797
Overall	3.86	0.380

Table 5 shows the responses of pre-service teachers regarding professional development in digital competence of teacher educators. The highest mean (Mean = 4.00, SD = 0.651) indicates that pre-service teachers agree with the statement, "*My teacher encourages students to use digital tools to enhance their own learning and skills.*" The SD reflects moderate variability in the degree of encouragement provided. The second highest mean (Mean = 3.91, SD = 0.570) indicates that pre-service teachers agree with the statement, "*My teacher is open to feedback regarding their use of digital tools and teaching methods.*" The high mean and moderate SD suggest general agreement with some variation in individual teacher practices. The third highest mean (Mean = 3.85, SD = 0.436) indicates that pre-service teachers agree with the statement, "*My teacher demonstrates an interest in improving their digital teaching skills."* The high mean and low SD indicate widespread agreement and consistency in this perception. The mean (Mean = 3.82, SD = 0.797) indicates that pre-service teachers agree with the

statement, "*My teacher seeks help or resources to improve their digital competence when needed.*" However, the relatively higher SD indicates greater variability in how frequently teachers seek such support. The lowest mean (Mean = 3.74, SD = 0.618) indicates that pre-service teachers agree with the statement, "*My teacher participates in professional development activities related to digital education."* However, the slightly higher SD suggests some variability in teacher participation rates.

The reliability of the scale measuring teacher educators' professional development in digital competence was assessed using Cronbach's alpha ($\alpha = 0.574$). This value is below the acceptable threshold of 0.70, suggesting limited internal consistency among the items. This could indicate that the items may not fully capture a single cohesive construct or that further refinement of the scale is necessary. The overall mean score for the scale is 3.86, with a standard deviation (SD) of 0.380, indicating that participants generally agree that teachers demonstrate professional development in digital competence. The relatively low SD suggests a high level of consistency in responses across participants.

DISCUSSION AND CONCLUSION

The results from this study provide valuable insights into teacher educators' digital competence, particularly in the context of promoting student learning, engagement, and satisfaction. Teacher educators demonstrated a strong proficiency in digital literacy and technical skills, particularly in using multimedia and digital platforms to support teaching. However, variability was observed in troubleshooting technical issues and diversifying the use of digital tools for learning. This suggests a need for targeted support in areas that require technical problem-solving and creative integration of diverse tools. Teacher educators were effective in integrating digital tools to meet learning objectives, foster interactive experiences, and provide well-organised content. The strong internal consistency of the scale indicates alignment in how teachers use digital tools to enhance pedagogy. Nonetheless, further improvements in fostering collaborative learning and critical thinking using digital tools could enhance student outcomes.

Teacher educators generally maintained clear communication and engaged students effectively in online environments. Strengths were observed in adapting communication styles to digital platforms and ensuring responsiveness. However, the scale exhibited moderate reliability, highlighting the need to refine measurement instruments or address variability in teacher practices, particularly in providing constructive feedback. Teacher educators were commended

for creating positive and interactive environments, simplifying complex topics using digital tools, and promoting collaborative learning. The high reliability of this scale underscores the consistency of these practices. However, variability in the use of resources and promotion of critical thinking suggests opportunities to further align teaching practices. Teacher educators displayed a commitment to professional development, actively seeking resources, participating in training, and being receptive to feedback. However, the relatively low reliability of the scale indicates that professional development practices might vary widely. Structured and consistent approaches to digital competence training are recommended to ensure uniformity in teacher educators' growth.

This study highlights the strengths and areas for improvement in teacher educators' digital competence across multiple dimensions, including technical skills, pedagogical integration, communication, and professional development. Teacher educators are generally proficient and effective in using digital tools to support learning, but there is room for growth in fostering collaboration, critical thinking, and consistency in professional development practices.

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