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An Exploratory Study of Awareness and Attitude Towards Digital Learning Tools among Student Teachers

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Abstract

Digital learning tools have become indispensable in contemporary teacher education, enabling student teachers to access educational resources, collaborate effectively and develop technology-enabled pedagogical competencies. Understanding prospective teachers' awareness and attitudes towards these tools is essential for strengthening teacher education programmes. The present study examined the awareness and attitudes towards digital learning tools among student teachers in Colleges of Education across Tamil Nadu. A quantitative cross-sectional survey design employing an exploratory approach was used. Using stratified random sampling, 13 Colleges of Education were selected from a population of 214 colleges, and 1,058 student teachers participated in the study. Data were collected using investigator-developed instruments that measured awareness and attitudes towards digital learning tools. The collected data were analyzed using descriptive statistics and independent-samples *t*-tests. The findings revealed that the student teachers possessed moderate awareness and attitudes towards digital learning tools. Furthermore, no statistically significant differences were observed in awareness or attitudes with respect to gender and student education ($p > .05$). These findings indicate that demographic characteristics exert only a limited influence on student teachers' perceptions of digital learning technologies. The study concludes that teacher education institutions should strengthen digital competency through systematic technology-integrated training, practical exposure to digital learning environments, and curriculum reforms that promote effective technology integration in teacher education. The findings have useful implications for teacher educators, curriculum developers, and educational policymakers seeking to enhance digital readiness among future teachers. Future research may employ longitudinal or mixed-method research designs, include student teachers from other states, and examine additional variables such as digital competence, technology acceptance, self-efficacy, and techno-pedagogical competency to obtain a more comprehensive understanding of digital learning readiness among prospective teachers.

Keywords: Digital Learning Tools, Student Teachers, Digital Awareness, Attitude towards Technology, Teacher Education, Educational Technology, Technology Integration

Introduction

Digital technologies have fundamentally transformed teaching and learning by enabling flexible, interactive, and learner-centered educational experiences. The rapid expansion of digital learning tools, including learning management systems, cloud-based collaboration platforms, virtual classrooms, mobile learning applications, and artificial intelligence-supported educational technologies, has influenced curriculum delivery and instructional practices in higher education institutions. These technologies facilitate personalized learning, enhance learner engagement, encourage collaborative knowledge construction, and provide opportunities for continuous access to educational resources beyond traditional classroom settings (Bond et al., 2024; Castillo-Martínez et al., 2024).

Teacher education institutions have an important responsibility to prepare future teachers to effectively integrate digital technologies into classroom instruction. Contemporary teacher preparation extends beyond basic digital literacy to include the pedagogically meaningful use of technology for instructional planning, assessment, classroom management, communication, and collaborative learning. Consequently, student teachers require not only technical proficiency but also awareness, confidence, and appropriate attitudes towards the educational applications of digital learning technologies ([Chan, 2023](#); [UNESCO, 2023](#)).

Recent research has shown that digital learning environments can enhance learner autonomy, critical thinking, collaborative learning, creativity, and self-directed learning when technology is purposefully integrated into teaching. However, the effectiveness of digital learning depends largely on teachers' awareness, readiness, and willingness to adopt technology-supported pedagogical approaches rather than merely on the availability of digital infrastructure ([Yusuf, 2024](#); [Nikolic et al., 2024](#)). Therefore, educational institutions need to strengthen digital competencies among prospective teachers through systematic training, institutional support, and curriculum innovation.

In India, [the National Education Policy \(2020\)](#) emphasizes technology-enabled learning and recommends integrating digital technologies into teacher education programmes to improve educational quality and learner outcomes. Similarly, the increasing adoption of digital platforms in Colleges of Education highlights the need to understand how future teachers perceive and utilize digital learning tools in their professional preparation. Therefore, assessing student teachers' awareness and attitudes is important for designing evidence-based interventions that promote meaningful technology integration in teacher education.

Although previous studies have examined online learning, e-learning acceptance, and digital competence, comparatively limited research has simultaneously investigated awareness and attitudes towards digital learning tools among student teachers across Colleges of Education in Tamil Nadu. Therefore, this study examines these

constructs among student teachers and seeks to provide empirical evidence that can contribute to strengthening technology integration within teacher education programmes.

Significance of the Study

The study's findings may provide useful insights for curriculum developers and policymakers in reviewing teacher education programmes and considering the integration of digital learning and techno-pedagogical skills as components of professional preparation. The findings may also assist teacher educators and Colleges of Education in designing appropriate training programmes and learning experiences that strengthen student teachers' awareness and attitudes towards digital learning tools. In addition, this study may provide a basis for future research on digital learning readiness and technology integration in teacher education.

Review of Literature

Digital learning has become an important component of teacher education, particularly as prospective teachers are increasingly expected to use technology for instructional planning, communication, resource development, assessment, and classroom interactions. Earlier research on teacher education has emphasized the importance of student teachers' exposure to electronic learning resources and their preparedness to use technology in educational settings. [Yucel \(2006\)](#) examined the e-learning approach in teacher training and highlighted the relevance of technology-supported learning experiences in preparing future teachers for changing educational environments.

[Behera et al. \(2016\)](#) investigated the attitudes of B.Ed. student teachers towards e-learning and highlighted the importance of understanding prospective teachers' perceptions of technology-supported learning. Such studies are particularly relevant to the present investigation because attitudes towards digital learning tools may influence student teachers' willingness to engage with technology during their professional preparation.

[Nithya and Malathi \(2017\)](#) examined the awareness of electronic resources among B.Ed. student teachers. Their work demonstrates the

importance of assessing prospective teachers' familiarity with electronic learning resources as part of teacher preparation. Awareness represents an important foundation for effective technology use because student teachers need to recognize available digital resources before they can meaningfully integrate them into their teaching and learning activities.

[Olaniran et al. \(2017\)](#) investigated the utilization of e-learning resources among pre-service teachers. This study draws attention to the relationship between teacher preparation and the practical use of technology-supported learning resources. Similarly, Udaya and Kalaiyarasan (2017) examined the awareness of e-learning among B.Ed. student teachers, reinforcing the relevance of digital awareness as an area of investigation in teacher education.

More recent research has expanded the discussion from conventional e-learning to broader digital learning environments and emerging technologies. Prakasha et al. (2022) examined university students' attitudes towards e-learning and reported differences in attitudes across selected student groups. This study illustrates the continuing relevance of attitude as a factor in understanding students' engagement with technology-supported educational environments.

Acua et al. (2021) investigated students' opinions on online-based learning systems and identified several dimensions of students' perceptions, including engagement, convenience, satisfaction, technology acceptance, adaptability, interaction, self-regulation, and control. The findings demonstrate that attitudes towards technology are multidimensional and extend beyond simple acceptance or rejection of digital learning.

Jyothi and Vijayabhinandana (2020) examined students' attitudes towards online learning during the COVID-19 period and developed an instrument to assess attitudes towards online education. Their study reflects the increased importance of understanding learners' perceptions of technology-mediated education during periods of rapid educational transformation.

Digital technologies have become an increasingly important component of contemporary teacher education, requiring student teachers to develop not

only basic technological skills but also the capacity to use digital resources appropriately in pedagogical contexts. Research on pre-service teachers indicates that their technology-related knowledge, beliefs, attitudes, and opportunities for practical experience are important dimensions of their readiness for technology integration. [Camilleri et al. \(2021\)](#) examined student teachers' attitudes towards information and communication technologies across three countries and demonstrated the importance of understanding prospective teachers' perceptions of ICT within teacher education. The findings suggest that teacher preparation programmes need to provide appropriate opportunities for student teachers to develop positive and purposeful orientations towards educational technologies.

Digital competence represents another important dimension of prospective teachers' preparedness for technology integration. Çebi and Reisoğlu (2020) examined digital competence from the perspective of pre-service teachers and highlighted the importance of developing the knowledge and skills required for effective participation in digitally mediated educational environments. Their findings indicate that digital competence should be considered an integral component of contemporary teacher preparation, rather than an additional technical skill. This perspective is particularly relevant to the present study because awareness of available digital learning tools constitutes an important foundation for their meaningful use in education.

[Reisoğlu and Çebi \(2020\)](#) further examined how the digital competencies of pre-service teachers could be developed through teacher education. Their findings indicate that structured teacher education experiences can contribute to the development of digital competencies when technology is connected to pedagogical practice. This suggests that exposure to digital tools alone may not be sufficient; prospective teachers require opportunities to apply technology in authentic educational settings. Such findings support the examination of student teachers' awareness and attitudes towards digital learning tools as part of their professional preparation.

The relationship between teacher education experiences and technology-related beliefs has also received attention. [Nelson and Voithofer \(2022\)](#)

examined coursework, field experiences, and preservice teachers' technology beliefs and practices. Their study emphasizes the role of teacher education coursework and practical field experiences in shaping prospective teachers understanding and use of technology. The findings indicate that technology integration is influenced not simply by access to digital tools but also by the experiences through which prospective teachers develop their beliefs and practices concerning educational technology.

[Heine et al. \(2024\)](#) examined preservice teachers' professional knowledge of ICT integration in the classroom and its relationship with teacher education. Their findings highlight the importance of integrating ICT-related professional knowledge into teacher preparation. Effective technology integration requires prospective teachers to connect their technological knowledge with pedagogical and instructional considerations. This supports the view that teacher education institutions should provide opportunities for student teachers to develop an understanding of how digital technologies can be applied meaningfully in teaching and learning.

Research has also examined digital competence from a broader, systematic perspective. [Yang et al. \(2023\)](#) reviewed the digital competence of pre-service and in-service teachers and identified it as an increasingly important component of teachers' professional preparation. This review highlights the need for teacher education programmes to respond to the changing digital demands of contemporary classrooms. Therefore, developing digital competence among prospective teachers may contribute to their readiness to select, evaluate, and use appropriate digital learning resources.

[Shokeen and Kaur \(2022\)](#) systematically reviewed the factors influencing pre-service teachers' digital competence. Their review indicates that digital competence is associated with several contextual and individual factors, including teacher education experiences, opportunities for technology use, and institutional conditions. The findings reinforce the need for teacher education programmes to create supportive environments in which prospective teachers can develop their digital capabilities through structured learning and practice.

The practical application of technology in teacher preparation is also important. [Sharma \(2020\)](#) examined technology-pedagogy integration by pre-service teachers during an internship programme, with particular attention to science teaching. This study demonstrates the importance of practical teaching experience in enabling prospective teachers to connect technological resources with subject-specific pedagogy. This finding is relevant to the present study because student teachers' awareness and attitudes towards digital learning tools may influence their willingness to employ such resources during professional teaching experiences.

[Padmavathi \(2016\)](#) examined student teachers' readiness to use computers in teaching and highlighted the importance of preparedness for technology use among prospective teachers. Readiness involves more than access to computers; it includes the willingness and confidence to incorporate technology into instructional activities. This study provides an early foundation for understanding technology readiness among student teachers and supports the continued relevance of investigating their perceptions of digital learning tools.

More recent research has also considered student teachers' engagement with online learning. [Sundararasan \(2024\)](#) examined the behavioral intention of student teachers towards online learning following the COVID-19 pandemic. The study reflects the continuing importance of technology-mediated learning within teacher education and indicates that student teachers' willingness to engage with online learning remains an important area of investigation even after the widespread emergency adoption of digital education.

Recent research has increasingly examined artificial intelligence (AI) and other emerging technologies in higher education. [Chan \(2023\)](#) emphasized the importance of AI literacy, digital competence, ethical awareness, and institutional governance in higher education. [Kasneci et al. \(2023\)](#) examined the educational opportunities and challenges associated with large language models and highlighted the potential of AI-supported systems for personalized learning, feedback, and academic support while identifying concerns relating to academic integrity, misinformation, bias, & over reliance.

[Lo \(2023\)](#) similarly reviewed the educational implications of ChatGPT and identified the potential benefits and challenges associated with generative AI in education. [Castillo-Martínez et al. \(2024\)](#) reviewed the use of artificial intelligence in higher education and emphasized the importance of institutional readiness, teacher competence, ethical considerations, and professional development for its successful implementation. [Yusuf \(2024\)](#) further highlighted the growing role of generative AI in personalized learning, assessment, collaborative learning and instructional innovation.

Recent systematic reviews have emphasized the importance of institutional and individual factors in technology integration. [Anaconda Sterling and Boude \(2026\)](#) reported that pedagogical, technological, motivational, and institutional factors influence ICT integration in university teaching. [Baggia et al. \(2026\)](#) highlighted the importance of professional development, institutional policies, and ethical guidelines in supporting educators' adoption of generative AI. [Khalid et al. \(2026\)](#) reported improvements in digital competence, instructional planning, technological confidence, and classroom innovation following a structured AI-integrated professional development program for pre-service teachers.

Although these recent studies provide important evidence regarding emerging technologies, they primarily address AI integration, technology adoption, and broader digital competence. The present study differs in that it focuses specifically on awareness and attitudes towards digital learning tools among student teachers. This distinction is important because awareness and attitude constitute foundational dimensions of technology readiness and may influence the extent to which prospective teachers are willing and prepared to use digital resources in their future professional practices.

Critical Review of Literature

The reviewed studies collectively demonstrate that student teachers' engagement with digital technologies is influenced by several interrelated dimensions, including awareness, attitudes, digital competence, technology-related beliefs, practical experience, and teacher education opportunities.

Earlier research focused on computer readiness and e-learning, whereas more recent studies have increasingly examined digital competence and pedagogical integration of ICT ([Padmavathi, 2016](#); [Sharma, 2020](#); [Çebi & Reisoğlu, 2020](#); [Reisoğlu & Çebi, 2020](#)).

The literature also indicates that meaningful technology integration requires more than just technical access. Student teachers need opportunities to develop appropriate attitudes, understand the educational value of digital tools, and apply technological resources in authentic teaching contexts ([Camilleri et al., 2021](#); [Nelson & Voithofer, 2022](#); [Heine et al., 2024](#)). Systematic reviews further emphasize the importance of teacher education and institutional support in developing digital competence among prospective teachers ([Shokeen & Kaur, 2022](#); [Yang et al., 2023](#)).

Despite this growing body of research, relatively limited attention has been given to the combined assessment of awareness and attitudes towards digital learning tools among student teachers across Colleges of Education in Tamil Nadu. Much of the recent literature has concentrated on digital competence, ICT integration, online learning, or emerging technologies, while fewer studies have specifically examined the level of awareness and attitudes towards a broad range of digital learning tools among prospective teachers. The present study addresses this gap by examining the awareness and attitudes of 1,058 student teachers from selected Colleges of Education in Tamil Nadu.

Research Gap

A review of the available literature indicates that considerable attention has been devoted to examining students' attitudes towards e-learning, online education, technology acceptance, and digital learning in recent years, particularly following the COVID-19 pandemic. Most of these studies have focused on higher education students, online learning experiences, and the effectiveness of digital platforms in promoting academic engagement. Although these investigations have enhanced our understanding of technology-supported learning, relatively few studies have simultaneously examined both awareness and attitude towards digital

learning tools among student teachers preparing for the teaching profession. Furthermore, previous investigations have largely been conducted with comparatively smaller samples or within individual institutions, limiting the generalizability of their findings. The influence of demographic variables such as gender and student education (Undergraduate and Postgraduate) has also produced inconsistent results across different studies, indicating the need for further empirical verification using larger and more representative samples. Another important gap identified in the literature is the limited availability of studies focusing on Colleges of Education in Tamil Nadu. As teacher education institutions play a crucial role in preparing digitally competent future teachers, understanding student teachers' awareness and attitudes towards digital learning tools is essential for curriculum development and technology integration. Existing studies have seldom investigated these dimensions using a large stratified random sample representing multiple Colleges of Education across different districts of the state. The present study attempts to address these gaps by examining the awareness and attitudes towards digital learning tools among 1,058 student teachers selected from 13 Colleges of Education across Tamil Nadu. The findings are expected to provide updated empirical evidence that will contribute to strengthening teacher education programmes, enhancing digital readiness among prospective teachers, and supporting policy decisions related to technology integration in teacher-education. Accordingly, the existing literature provides substantial evidence concerning digital competence, ICT integration, technology-related beliefs, and online learning among prospective teachers. However, a specific empirical gap remains regarding the simultaneous examination of student teachers' awareness and attitudes towards digital learning tools within the context of Colleges of Education in Tamil Nadu. This study addresses this gap by examining these two dimensions and determining whether they differ according to gender and educational level.

General Objectives of the Study

The overarching goals of this study are as follows. They are

- To determine whether student teachers at education colleges have significantly different mean scores in terms of their awareness of digital learning technologies.
- To determine whether student teachers in colleges of education have significantly different mean scores regarding their attitudes toward digital learning technologies.
- To determine whether student instructors in education colleges have significantly different mean awareness scores for digital learning tools based on their a) gender and b) student education.
- To determine whether student instructors at colleges of education have significantly different attitudes toward digital learning tools based on their a) gender and b) student education.

Hypotheses of the Study

The following categories apply to the hypotheses based on the study objectives:

- H_1 : College of Education student teachers have a high level of awareness of digital learning tools.
- H_2 : Student teachers at colleges of education have a positive attitude toward digital learning tools.
- H_3 : The mean scores of student teachers' awareness and attitude toward digital learning tools did not significantly change based on their gender.
- H_4 : The mean scores of student teachers' awareness of and attitudes toward digital learning tools in relation to their student education did not differ significantly.

Operational Definition of the Key Terms

Awareness

In this study, awareness refers to whether the student teachers in the Tiruchirappalli district have heard about digital learning tools for incorporating them into their pedagogical skills.

Attitude

In the present study attitude refers to persistent tendency of student teacher towards the use of Digital learning tools in their pedagogical skills

Digital Learning Tools

Digital learning tools include a wide variety

of applications, websites, and learning platforms that facilitate learning by connecting students and teachers to learning resources.

Method Adopted for the Study

A quantitative cross-sectional survey methodology using an exploratory research technique was selected as the research design for this investigation.

Sample and Sampling Technique

The target population for this study comprised all student teachers enrolled in recognized Colleges of Education in Tamil Nadu. According to the Tamil Nadu Teachers Education University (TNTEU) records, 214 Colleges of Education constituted the sampling frame. A stratified random sampling technique was employed to ensure adequate representation.

In the first stage, the Colleges of Education were grouped into appropriate strata based on institutional characteristics (e.g., government, government-aided, and self-financing colleges) and geographical location. From these strata, 13 Colleges of Education were selected using simple random sampling in proportion to the number of colleges within each stratum.

In the second stage, the number of student teachers selected from each participating college was determined using a proportionate allocation. Colleges with larger student enrollments contributed a correspondingly larger number of participants, whereas colleges with smaller enrollments contributed fewer participants. Finally, student teachers within each selected college were chosen through simple random sampling from official enrolment registers.

Using this multistage stratified sampling procedure, a final sample of 1,058 student teachers was selected. The use of proportionate stratified random sampling enhanced the sample's representativeness and reduced sampling bias by ensuring that different institutional categories were adequately represented in the study.

Tools for the Study

The study employed two investigator-developed

instruments for data collection: (i) the Awareness towards Digital Learning Tools Scale and (ii) the Attitude towards Digital Learning Tools Scale. These instruments were developed after an extensive review of the related literature and consultation with experts in teacher education and educational technology. The Awareness Scale measured the respondents' knowledge and familiarity with digital learning tools, whereas the Attitude Scale assessed their perceptions, acceptance, and disposition towards the educational use of digital learning technologies.

Validity and Reliability of the Research Instruments

The instruments used in the present investigation were developed by the investigator after an extensive review of the related literature, existing research instruments and the study objectives. Preliminary versions of the Awareness towards Digital Learning Tools Questionnaire and the Attitude towards Digital Learning Tools Rating Scale were prepared to measure the respective constructs among student teachers.

Content Validity

To establish content validity, the draft instruments were submitted to a panel of experts comprising specialists in Educational Technology, Teacher Education, Educational Psychology, and Research Methodology. The experts examined each item for relevance, clarity, appropriateness, and alignment with the study objectives. Their suggestions regarding wording, content coverage, and sequencing of items were carefully incorporated before the instruments were finalized.

Pilot Study

A pilot study was conducted among the student teachers who were not included in the final sample. The purpose of the pilot study was to assess the clarity of the items, estimate the time required for administration, and identify any ambiguities in the questionnaire and the rating scale. Based on the responses and feedback received, necessary modifications were made to improve the quality and usability of the instrument.

Reliability of the Instruments

The internal consistency reliability of the instruments was estimated using Cronbach's alpha coefficient. The Awareness towards Digital Learning Tools Questionnaire consisted of 25 items and obtained a Cronbach's alpha coefficient of 0.801. The Attitude towards Digital Learning Tools Rating Scale consisted of 60 items and obtained a Cronbach's alpha coefficient of 0.798. The obtained reliability coefficients indicate satisfactory internal consistency of both instruments in the present investigation.

Instrument	Number of Items	Reliability Method	Cronbach's Alpha
Awareness towards Digital Learning Tools Questionnaire	25	Cronbach's Alpha	0.801
Attitude towards Digital Learning Tools Rating Scale	60	Cronbach's Alpha	0.798

The reliability coefficients were considered adequate for the purposes of the present study and indicated that the instruments demonstrated satisfactory internal consistency for measuring student teachers' awareness and attitudes towards digital learning tools.

Scoring Procedure

The Attitude towards Digital Learning Tools Rating Scale consisted of 60 statements rated on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). For the analysis, the responses to the 60 items were summed to obtain an overall attitude score. Accordingly, the possible total score ranged from 60 to 300, with higher scores indicating more favorable attitudes towards digital learning tools. The total scores were interpreted according to the classification criteria adopted for this study.

Ethical Considerations

This study was conducted in accordance with the ethical principles governing educational research. Prior to data collection, permission was obtained from the heads of the selected Colleges of Education to administer the research instruments among the student teachers. The purpose and significance of the study were clearly explained to the participants before the questionnaires were administered. Participation in the study was entirely voluntary, and respondents were informed that they could decline to participate or withdraw from the study at any stage without any adverse consequences. Informed consent was obtained from all participants before data collection. The respondents were assured that the information provided would be used solely for academic and research purposes only.

The anonymity and confidentiality of the participants were strictly maintained throughout the study. No personal identifiers, such as names, registration numbers, or institutional identities, were recorded in the research instruments. The collected data were analyzed in aggregate form, ensuring that individual participants or institutions could not be identified from the reported findings. The researcher ensured that the data were accurately recorded, analyzed and interpreted without fabrication, falsification or manipulation. The findings are presented objectively and honestly to contribute meaningfully to the fields of teacher education and educational technology.

Analysis and Interpretation of Data

Hypothesis Testing

H₁: Student teachers have a high level of understanding regarding digital learning resources.

Table 1 Descriptive Analysis of Scores of Student Teachers' Awareness of Digital Learning Tools

	N	Mean	Median	Std. Deviation
Awareness Towards Digital Learning Tools	1058	11.83	12.00	3.85

Table 1 presents the descriptive statistics for awareness of digital learning tools among the

1,058 student teachers. The mean awareness score was 11.83, with a median of 12.00 and a standard deviation of 3.85. The findings indicate a moderate level of awareness among the student teachers based on the classification criterion adopted for this instrument. The relatively close mean and median values suggest a broadly comparable distribution of awareness scores among participants.

H₂: Student teachers have a positive attitude toward digital learning tools.

Table 2 presents the descriptive statistics of student teachers' attitudes towards digital learning tools. The overall mean attitude score was 236.52, with a median of 237.00 and standard deviation of 20.91. Based on the classification criterion adopted for the scale, the findings indicate a moderate level of attitude towards digital learning tools among the

student teachers.

Table 2 Descriptive Analysis of Student Teachers' Attitudes Regarding Digital Learning Tools

Variable	N	Mean	Median	Std. Deviation
Attitude Towards Digital Learning Tools	1058	236.52	237.00	20.91

Differential Analysis

H₃: The mean scores of student teachers' awareness of digital learning tools and attitude toward digital learning do not significantly change based on their gender.

Table 3 Independent Sample t test for Awareness and Attitude with Respect to their Gender

Dimension's	gender	n	mean	sd	t	df	sig.
Awareness towards Digital Learning Tools	Male	178	11.65	4.023	0.736	1056	0.462
	Female	880	11.89	3.919			
Attitude towards Digital Learning Tools	Male	178	235.19	22.838	0.910	1056	0.363
	Female	880	236.75	20.506			

The above table shows that the t-values for awareness of Digital Learning Tools (0.736) and attitude towards Digital Learning Tools (0.910) at a level of significance 0.05, were lower than the table value. Therefore, it may be said that the attitude and awareness of digital learning tools of Student Teachers do not differ significantly with respect

to their gender. Thus, the null hypothesis H₃ is accepted.

H₄: There is no Significant difference between the mean scores of awareness of digital learning tools and attitude towards digital learning tools of student teachers with respect to their students' education.

Table 4 t test for Awareness and Attitude with Respect to the Students Education

Dimension's	Education	N	Mean	SD	t	df	sig.
Awareness Towards Digital Learning Tools	PG	313	11.72	4.116	0.707	1056	0.479
	UG	745	11.90	3.859			
Attitude Towards Digital Learning Tools	PG	313	234.55	21.880	1.949	1056	0.052
	UG	745	237.30	20.503			

The above table shows that the t-values for awareness of Digital Learning Tools (0.707) and attitude towards Digital Learning Tools (1.949) at a level of significance 0.05, were lower than the table value. Therefore, it may be said that awareness of digital learning tools and attitude towards digital learning tools of student teachers do not differ significantly with respect to their students' education.

Thus, the null hypothesis H₄ is accepted.

Findings of the Study

- The student teachers exhibited moderate awareness.
- Student teachers exhibited moderate attitudes towards digital learning tools.
- The Awareness of Digital Learning Tools and Attitude towards digital learning tools of student

teachers do not differ significantly with respect to their gender.

- The Awareness of Digital Learning Tools and Attitude towards digital learning tools of student teachers did not differ significantly with respect to their student education.

Educational Implications

The findings of this study offer several important implications for teacher education institutions, curriculum planners, policymakers, and teacher educators in promoting effective digital learning practices.

Based on the finding that student teachers demonstrated moderate awareness and attitudes towards digital learning tools, the following suggestions are proposed.

Strengthening Digital Learning Orientation: Colleges of Education should provide structured orientation programmes that familiarize student teachers with commonly used digital learning tools and their educational applications.

Provide Practical Technology Experiences: Teacher education programmes may incorporate hands-on activities through which student teachers can use digital learning platforms, online educational resources, collaborative tools, and other technology-supported learning applications.

Integrating Digital Learning Activities into Coursework: Digital learning tasks may be incorporated into existing teacher education courses to provide student teachers with regular opportunities to apply technology in academic and pedagogical contexts.

Provide Continuous Guidance from Teacher Educators: Teacher educators should provide systematic guidance and demonstrations to help student teachers understand how digital tools can support lesson preparation, instructional activities, communication, assessment, and learner engagement.

Promote Meaningful Technology Integration: Digital learning tools may be integrated into teacher education activities in ways that emphasize their educational and pedagogical value rather than focusing only on technical operations.

Encouraging Institutional Support: Colleges of Education should provide appropriate opportunities

and institutional support for student teachers to access and practice using digital learning tools as part of their professional preparation.

Strengthening Digital Confidence through Repeated Practice: As the overall awareness and attitude levels were moderate, repeated opportunities for guided practice may help student teachers become more familiar with digital learning environments and develop greater readiness to use technology in future teaching contexts.

Recommendations

Based on the findings of this study, the following recommendations are proposed to enhance awareness and positive attitudes towards digital learning tools among student teachers.

Mandatory Digital Pedagogy Courses: Teacher education programs should include compulsory courses on digital pedagogy, educational technology, and technology-enabled instructional practices.

Develop Technology-Rich Learning Environments: Colleges of Education should establish digital laboratories, smart classrooms, high-speed Internet facilities, and e-content development centers to support effective digital learning.

Conduct Regular Training Programmes: Continuous professional development programmes, workshops, and certification courses on emerging educational technologies should be organized for student teachers.

Promote Practical Technology Integration: Student teachers should be encouraged to use digital learning tools during lesson planning, micro-teaching sessions, internships, and teaching practice programs.

Provide Institutional Support: Colleges should ensure adequate technical support, access to digital resources, and mentoring services to facilitate the effective adoption of digital learning tools.

Encouraging Innovative Teaching Practices: Teacher educators should motivate student teachers to explore innovative approaches such as blended learning, flipped classrooms, collaborative online learning, and artificial intelligence-supported educational tools.

Strengthen Future Research and Evaluation: Educational institutions should periodically assess

student teachers' awareness, attitudes, and digital competencies to evaluate the effectiveness of technology integration initiatives and identify areas requiring further improvement.

These expanded sections provide a stronger practical contribution and are more suitable for submission to educational journals.

Limitations of the Study

The present study had certain limitations that should be considered when interpreting the findings. First, the investigation was confined to 1,058 student teachers selected from 13 Colleges of Education in Tamil Nadu. Although the sample was selected using a stratified random sampling technique, the findings may not be generalized to all student teachers in other states or educational contexts. Second, the study adopted a quantitative cross-sectional survey design, which provides information about the existing levels of awareness and attitudes towards digital learning tools at a particular point in time. Consequently, this study does not capture changes in these variables over time or establish causal relationships among them. Third, the data were collected using self-report instruments developed by the investigator. Therefore, the responses depend on the honesty, understanding, and perceptions of the participants and may be influenced by response bias or social desirability bias. Fourth, the investigation examined awareness and attitudes only with respect to gender and student education (Undergraduate and Postgraduate). Other factors that may influence awareness and attitudes, such as age, locality, teaching specialization, socioeconomic background, prior digital learning experience, institutional facilities, digital competence, and access to technological resources, were not included in this study. Finally, this study focused exclusively on awareness and attitudes towards digital learning tools. It did not examine the actual use of digital learning tools, digital teaching competencies, technology integration practices, learning outcomes or the effectiveness of digital pedagogy in classroom instruction. These aspects remain important areas for further research.

Future Research Directions

The present investigation provides several

opportunities for future research in digital learning and teacher education. Future studies may include student teachers from a larger number of Colleges of Education across different states in India to enhance the generalizability of the findings. Comparative investigations involving Government, Government Aided, Private, and Deemed Universities may also provide a broader understanding of awareness and attitudes towards digital learning tools across different institutional settings. Subsequent research may examine additional variables, such as digital competence, techno-pedagogical competency, digital literacy, self-efficacy, learning motivation, technology acceptance, innovation readiness, teaching effectiveness, and academic achievement, to understand their relationship with awareness and attitudes towards digital learning tools. Such studies would provide a more comprehensive understanding of the factors influencing technology integration among prospective teachers. Future researchers may employ mixed-method, qualitative, or longitudinal research designs to obtain deeper insights into the development of digital awareness and attitudes over time. Qualitative interviews, focus group discussions, and classroom observations may complement quantitative findings by exploring the experiences, perceptions, and challenges faced by student teachers in using digital learning tools.

Experimental and intervention-based studies may also be undertaken to evaluate the effectiveness of digital pedagogy training programmes, technology integration workshops, artificial intelligence-assisted learning environments, virtual classrooms, learning management systems, and blended learning strategies in improving digital competence and instructional practices among student teachers in the future. Future investigations should explore the influence of institutional support, digital infrastructure, Internet accessibility, faculty mentoring, and policy initiatives on the effective adoption of digital learning tools in teacher education institutions. Such research would contribute to the formulation of evidence-based strategies for strengthening teacher education and promoting meaningful technology integration in educational practices. Finally, advanced statistical techniques, such as multiple regression analysis, structural equation modelling (SEM), mediation

analysis, moderation analysis, and multilevel modelling, may be employed to examine the complex relationships among psychological, institutional, technological, and demographic variables associated with digital learning among prospective teachers.

Conclusion

The present study examined student teachers' awareness and attitudes towards digital learning tools in Colleges of Education across Tamil Nadu. The findings revealed that the student teachers demonstrated moderate awareness and attitudes towards digital learning tools. The study further indicated that there were no statistically significant differences in awareness or attitudes with respect to gender or educational level.

The findings suggest that although student teachers have a reasonable level of familiarity with digital learning tools, they may benefit from further opportunities to develop their awareness and meaningful use of technology in teacher education. Colleges of Education should therefore strengthen practical exposure, technology-integrated learning activities, and structured guidance within teacher preparation programmes.

The study was limited to student teachers from selected Colleges of Education in Tamil Nadu and employed a cross-sectional survey design. Future studies may use longitudinal or mixed-method approaches and examine additional dimensions, such as digital competence, technology acceptance, self-efficacy, and techno-pedagogical competency, to obtain a broader understanding of digital learning readiness among prospective teachers.

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