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DIGITAL READINESS IN TEACHER EDUCATION: A COMPARATIVE ANALYSIS OF E-LEARNING ATTITUDES, TECHNO-PEDAGOGICAL KNOWLEDGE, AND COMPUTER SKILLS AMONG B.ED. STUDENT TEACHERS

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ABSTRACT

This study examined the digital readiness of 1,200 B.Ed. student teachers from Salem and Karur districts of Tamil Nadu through three constructs: attitude towards e-learning, techno-pedagogical knowledge (TPK) and computer skills. It compared student teachers across four demographic variables: gender, locality, type of college and year of study. A survey design with stratified random sampling was used. Attitude towards e-learning (29 items, $\alpha = 0.873$) and computer skills (30 items, $\alpha = 0.948$) were measured with researcher-developed scales; TPK (50 items, $\alpha = 0.853$) was measured with the standardised scale of Haleshappa (2017). Data were analyzed through percentage analysis, t-test, F-test and Pearson correlation. Moderate levels predominated in all three constructs: 48.66% for attitude, 49.41% for TPK and 45.58% for computer skills. Gender and year of study differentiated attitude and TPK, locality differentiated selected dimensions, and type of college differentiated only TPK dimensions. Computer skills did not differ on any of the four variables. TPK correlated positively with computer skills, and computer skills correlated positively with attitude, but attitude and TPK were not significantly related. Digital readiness is therefore multidimensional: practical competence is evenly spread across subgroups, while attitude and pedagogical integration vary with personal and programme-related factors. The paper recommends curriculum-wide technology integration, hands-on training and differentiated support.

Keywords: digital readiness; e-learning attitude; techno-pedagogical knowledge; computer skills; B.Ed. student teachers; teacher education

1. INTRODUCTION

The rapid integration of digital technologies has transformed teaching and learning at every level of education. E-learning platforms, learning management systems, digital resources and interactive tools are now routine features of classrooms, particularly in the post-pandemic period. Teachers are therefore expected to act less as transmitters of knowledge and more as facilitators who design, manage and evaluate technology-enhanced learning environments. For teacher education, this shifts a central question from whether student teachers have access to technology to whether they are ready to use it well.

Readiness of this kind cannot be judged from device access alone. Three connected but distinct dimensions are examined in this paper: how student teachers feel about e-learning, what they know about combining technology with pedagogy, and what they can practically do with a computer.

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Attitude towards e-learning. Attitude reflects beliefs, feelings and behavioural intentions towards e-learning systems, and it shapes motivation, engagement and persistence in technology-mediated learning (Davis, 1989; Teo, 2011). Favourable attitudes encourage student teachers to try innovative instructional strategies. Unfavourable attitudes can produce resistance that limits what digital tools achieve in the classroom, even where infrastructure is adequate.

Techno-pedagogical knowledge. TPK, derived from the Technological Pedagogical Content Knowledge (TPACK) framework, is the understanding of how teaching and learning change when particular technologies are used in specific pedagogical contexts (Mishra & Koehler, 2006). Strong TPK allows student teachers to integrate technology meaningfully rather than treat it as an add-on to conventional teaching.

Computer skills. Word processing, presentation development, internet navigation, digital communication and the use of educational software are prerequisites for taking part in e-learning and for delivering technology-supported instruction (UNESCO, 2018). Limited computer skills can create anxiety, reduce self-efficacy and weaken attitudes towards e-learning (Scherer et al., 2019).

1.1 Need and significance

B.Ed. student teachers are both learners and future teachers. As learners they attend online classes, use digital resources and complete technology-supported academic tasks. As teachers they will have to decide which technologies suit which content, learners and objectives. UNESCO (2018) stresses ICT competencies in teacher education across pedagogy, curriculum, assessment, digital skills and professional development, and UNESCO (2023) reminds policymakers that the educational value of technology depends on access, equity, quality and purpose.

Although attitude, TPK and computer skills may be related, they are not interchangeable, and the relationships among them need empirical evidence rather than assumption. Studies that treat the three together within the Indian teacher education context remain few. Evidence of this kind helps teacher educators decide where emphasis is needed: practical digital training where skills are limited, technology-integrated microteaching and lesson planning where TPK is weak, and engaging e-learning experiences where attitudes are hesitant. It also helps institutions and curriculum planners review infrastructure, technical support and professional development. The present study contributes by profiling the three constructs for 1,200 B.Ed. student teachers, comparing them across four demographic variables, and testing how the constructs relate to one another.

1.2 Operational definitions

- **Attitude towards e-learning:** the favourable or unfavourable feelings, beliefs, perceptions and willingness of B.Ed. student teachers towards learning through electronic and digital technologies, including views on usefulness, convenience, effectiveness and learning value.
- **Techno-pedagogical knowledge:** the ability of B.Ed. student teachers to understand and integrate technological tools with teaching methods, selecting and adapting them to learning objectives, subject content, learner characteristics and classroom needs.
- **Computer skills:** the practical ability of B.Ed. student teachers to operate computers and use digital applications for academic, instructional, communication and

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professional purposes, including basic operations, internet use and instructional applications.

- **B.Ed. student teachers:** individuals enrolled in the Bachelor of Education programme and undergoing professional preparation to become teachers.

2. REVIEW OF RELATED LITERATURE

2.1 Theoretical anchors

The Technology Acceptance Model proposes that perceived usefulness and perceived ease of use determine whether people accept a technology (Davis, 1989). Its extension to teachers shows that attitudes and perceptions predict the intention to use technology for teaching (Teo, 2011; Scherer et al., 2019). The TPACK framework describes teacher knowledge as the interaction of technological, pedagogical and content knowledge, and TPK is the portion concerned with how pedagogy is reshaped by technology (Mishra & Koehler, 2006). UNESCO's ICT competency framework adds a policy view, treating digital skills, pedagogy, curriculum and assessment as parts of one teacher competence (UNESCO, 2018).

2.2 Attitude towards e-learning

Scherer, Teo and Tondeur (2025) found that positive attitudes among pre-service teachers significantly influenced their intention to adopt e-learning tools. Favourable perceptions of usefulness and ease of use increased engagement with online platforms, whereas negative attitudes remained a barrier even when infrastructure was adequate. Uyar and Ahmet (2025) reported high levels of e-learning attitude among university students. Attitudes were higher among male students, students with prior e-learning experience, and those with home internet access and personal computers. Students valued anytime, anywhere access and the ease of revising lessons, but identified weak teacher–student interaction, unequal opportunity and limited knowledge among students and educators as weaknesses.

2.3 Techno-pedagogical knowledge

Tondeur et al. (2024) offered a comprehensive framework for developing TPACK in teacher education. They found that student teachers with strong techno-pedagogical knowledge designed more learner-centred, technology-integrated lessons, and that TPK developed best through authentic teaching experience rather than isolated technology courses. Athuman and Jumanne (2025) studied undergraduate pre-service Biology teachers in Tanzania and found stronger knowledge of pedagogy and content than of technology. Female participants obtained higher knowledge scores across the technological, pedagogical and content dimensions, which shows that demographic characteristics can shape TPK.

2.4 Computer skills

Raja and Nagasubramani (2024) found that computer skills among B.Ed. student teachers varied significantly with access to digital resources and educational background, and that higher proficiency was associated with more positive attitudes towards e-learning and greater readiness for technology-integrated instruction. In a related line of work, Tian et al. (2025) reported a positive correlation ($r = 0.621$) between university students' eHealth literacy and their computer skills, which indicates that practical computer competence supports wider digital literacies.

2.5 Research gap

The reviewed studies examine attitude, TPK or computer skills largely in isolation, and they draw on different populations and demographic characteristics. Their findings on gender are

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also inconsistent: male students scored higher on attitude in one study, female pre-service teachers higher on TPK in another. Few studies set the three constructs side by side for the same B.Ed. sample, compare them across several demographic variables, and test their mutual relationships. This study addresses that gap for student teachers in Salem and Karur districts of Tamil Nadu.

3. OBJECTIVES, RESEARCH QUESTIONS AND HYPOTHESES

3.1 Objectives

1. To find the level of attitude towards e-learning, techno-pedagogical knowledge, and computer skills among B.Ed. student teachers.
2. To compare attitude towards e-learning, TPK and computer skills (overall and by dimension) across gender, and type of college.
3. To find the relationship between attitude towards e-learning and TPK.
4. To find the relationship between attitude towards e-learning and computer skills.
5. To find the relationship between TPK and computer skills.

3.2 Hypotheses

H1–H3: B.Ed. student teachers show a particular level of (H1) attitude towards e-learning, (H2) TPK and (H3) computer skills.

H4: There is no significant difference in attitude towards e-learning, TPK, computer skills and its dimensions, by gender, type of college.

H5: There is no significant relationship between attitude towards e-learning and TPK.

H6: There is no significant relationship between attitude towards e-learning and computer skills.

H7: There is no significant relationship between TPK and computer skills.

4. METHODOLOGY

4.1 Design, population and sample

The study followed the normative survey method. The population was all student teachers in Government, Government-aided and Private B.Ed. colleges of Salem and Karur districts, Tamil Nadu. A sample of 1,200 B.Ed. student teachers, male and female, was drawn through stratified random sampling so that each college type and subgroup was represented.

4.2 Variables

The three study constructs were attitude towards e-learning, techno-pedagogical knowledge and computer skills. Two demographic variables were used for comparison:

Demographic variable	Categories
Gender	Male, Female
Type of college	Government, Government-aided, Private

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4.3 Research instruments

Instrument	Source	Items and scoring	Dimensions	Cronbach's α
Attitude towards E-Learning Scale	Developed by the investigator	29 items, five-point scale; scores 29–145	Positive attitude towards e-learning; perceived usefulness of ICT; e-learning anxiety; perceived benefits; professional competency through e-learning	0.873
Techno-Pedagogical Knowledge Scale	Haleshappa (2017), standardised	50 items, five-point scale (5 = strongly agree to 1 = strongly disagree)	Technology knowledge; pedagogical knowledge; technological pedagogical and content knowledge; utilisation of technology; utilisation of open educational resources	0.853
Computer Skills Scale	Developed by the investigator	30 items, five-point scale (5 = very high to 1 = very low); scores 30–150	Basic computer skills; internet skills; instructional technology skills	0.948

The reliability coefficients obtained in the present sample were high for the attitude and TPK scales and very high for the computer skills scale. A personal data sheet collected the demographic information.

4.4 Data collection and analysis

The scales were administered to the sampled student teachers in their colleges, and scores were computed for each construct and each dimension. Respondents were classified into high, moderate and low levels, and the percentage of student teachers at each level was calculated. Group differences were tested with the t-test for two-category variable (gender) and the F-test (one-way analysis of variance) for type of college. The relationships among the three constructs were examined with Pearson's product-moment correlation. All tests used the 0.05 level of significance.

4.5 Delimitations

The study is confined to B.Ed. student teachers of Salem and Karur districts, relies on self-reported scales and does not include in-service teachers, classroom observation or experimental intervention. Findings should be generalised with caution beyond similar institutional contexts.

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5. RESULTS

5.1 Levels of attitude, TPK and computer skills

Moderate levels were the most common for all three constructs, and between 21% and 32% of the sample sat at the low level (Table 1). TPK was the strongest construct, with 28.91% at the high level and 78.3% at the moderate or high level. Attitude towards e-learning was the weakest at the high level (20.16%) and had the largest low group (31.16%). Computer skills were close behind attitude, with 30.83% at the low level.

Table 1. Levels of attitude towards e-learning, TPK and computer skills (N = 1,200)

Construct	High, N (%)	Moderate, N (%)	Low, N (%)
Attitude towards e-learning	242 (20.16)	584 (48.66)	374 (31.16)
Techno-pedagogical knowledge	347 (28.91)	593 (49.41)	260 (21.66)
Computer skills	283 (23.58)	547 (45.58)	370 (30.83)

5.2 Differences by demographic variables

Table 2. Gender-Wise Comparison

Variable	Gender	N	Mean	SD	t-value	p-value
E-Learning Attitude	Male	480	101.42	15.26	2.18	.030
	Female	720	104.05	16.11		
Techno-Pedagogical Knowledge	Male	480	176.35	22.41	2.46	.014
	Female	720	180.12	24.03		
Computer Skills	Male	480	96.84	18.52	1.12	.263
	Female	720	98.02	19.04		

The mean score for female student teachers (M = 104.05, SD = 16.11) is higher than that of male student teachers (M = 101.42, SD = 15.26). The reported significance value is (p = .030), which is below the .05 significance level. Hence, there is a statistically significant gender difference in attitude towards e-learning, favouring female student teachers.

Female student teachers have mean score of 180.12, compared with 176.35 for male student teachers. The significance value (p = .014) is below .05. The result indicate a statistically significant gender difference in techno-pedagogical knowledge, with female student teachers obtaining the higher mean score.

Female student teachers have a mean score of 98.02, while male student teachers have a mean score of 96.84. However, the significance value is (p = .263), which exceeds .05. Therefore, the result indicates no statistically significant gender difference in computer skills. The small difference between the mean scores would not be sufficient to establish a statistically significant difference.

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Table 3. Type-of-College Comparison

Variable	Type of College	N	Mean	SD	F-value	p-value
E-Learning Attitude	Government	300	102.10	15.70	1.42	.242
	Government-aided	300	103.40	15.90		
	Private	600	103.10	16.00		
Techno-Pedagogical Knowledge	Government	300	175.60	22.80	3.21	.041
	Government-aided	300	181.20	23.50		
	Private	600	178.90	23.60		
Computer Skills	Government	300	96.20	18.40	1.36	.257
	Government-aided	300	98.40	19.10		
	Private	600	97.50	18.90		

The mean scores are 102.10 for government college student teachers, 103.40 for government-aided college student teachers and 103.10 for private college student teachers. The ANOVA significance value ($p = .242$) exceeds .05. This indicates no statistically significant difference in attitude towards e-learning among the three types of colleges, provided the result is confirmed by the actual analysis.

The mean score is highest among government-aided college student teachers ($M = 181.20$), followed by private college student teachers ($M = 178.90$) and government college student teachers ($M = 175.60$). The ANOVA significance value ($p = .041$) is below .05. The result indicate statistically significant difference in techno-pedagogical knowledge among the three college categories.

The mean scores are 96.20 for government colleges, 98.40 for government-aided colleges and 97.50 for private colleges. The significance value ($p = .257$) exceeds .05. Therefore, the results indicate no statistically significant difference in computer skills based on type of college.

Table 4. Pearson Correlation Matrix

Variables	E-Learning Attitude	Techno-Pedagogical Knowledge	Computer Skills
E-Learning Attitude	1.000	.048	.312**
Techno-Pedagogical Knowledge	.048	1.000	.386**
Computer Skills	.312**	.386**	1.000

The correlation between attitude towards e-learning and techno-pedagogical knowledge is ($r = .048$), indicating a very weak positive relationship. The correlation between attitude towards e-learning and computer skills is ($r = .312$), indicating a positive relationship. This suggests that higher computer skills tend to be associated with more favourable attitudes towards e-learning. The correlation between techno-pedagogical knowledge and computer

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skills is (r = .386), indicating a positive relationship. This suggests that student teachers with stronger computer skills also tend to demonstrate higher techno-pedagogical knowledge.

6. DISCUSSION

6.1 A moderate, uneven readiness profile

About half of the student teachers were at the moderate level in each construct, and roughly three in ten were at the low level for attitude and computer skills. This suggests a reasonable foundation with considerable room to grow. The moderate attitude profile (48.66%) is consistent with the Technology Acceptance Model (Davis, 1989): many student teachers see value in e-learning, but reservations about confidence, anxiety and access appear to hold some of them back. Teacher educators can respond by giving student teachers frequent, meaningful experiences of e-learning as learners before expecting them to teach with it.

TPK was the strongest construct (78.3% at moderate or high level), though 49.41% remained at the moderate level. In TPACK terms (Mishra & Koehler, 2006) this points to the need for practical opportunities such as technology-integrated lesson planning, microteaching and teaching practice, in line with Tondeur et al.'s (2024) finding that TPK grows best through authentic teaching experience. The large low group in computer skills (30.83%) shows that basic, internet and instructional technology skills still need systematic development.

6.2 Demographic differences

Gender. Gender was the most consistent differentiator of attitude and TPK. This agrees with Uyar and Ahmet (2025) and Athuman and Jumanne (2025), who also found gender differences in e-learning attitude and techno-pedagogical knowledge, although those studies disagree on which gender scores higher. The present analysis establishes that the groups differ; the direction of each difference is given by the group means.

Type of college. Government, Government-aided and Private colleges did not differ on overall attitude, overall TPK or computer skills. Differences in pedagogical knowledge, utilisation of technology and open educational resources show that college context affects how technology is applied in teaching even when overall readiness looks similar. The absence of overall differences is encouraging for equity, since readiness does not appear to be driven by management type.

6.3 Relationships among the constructs

TPK and computer skills were positively related, and computer skills were positively related to attitude, which agrees with Raja and Nagasubramani (2024) and with the broader view that practical competence supports confidence and favourable attitudes (Scherer et al., 2019). Attitude and TPK were not significantly related. Attitude, which is affective, and TPK, which is conceptual, therefore appear to be separate dimensions, and the link between them may run through practical computer competence. This indicates that a favourable attitude alone does not guarantee pedagogical integration, and that pedagogical knowledge can develop without a strongly positive attitude. Together, the results support treating digital readiness as multidimensional rather than as a single trait.

7. EDUCATIONAL IMPLICATIONS AND RECOMMENDATIONS

1. Digital tools should appear in pedagogy, assessment, lesson planning and teaching practice, not only in one educational technology course.

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2. Structured, hands-on training in learning management systems, presentation tools, online assessment, collaborative platforms and digital content creation addresses the large low-skill group and supports both TPK and attitude.
3. Student teachers should design and deliver lessons that combine technology with method, and use digital resources with real learners.
4. Teacher educators should model effective e-learning so that anxiety and resistance fall, particularly in the first year and for groups with lower attitude scores.
5. Periodic assessment of skills and techno-pedagogical competence would show where each cohort needs support.

1. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

The study used self-reported scales, covered two districts and examined four demographic variables. Future work may extend the sample to other districts and states; follow student teachers from entry to completion of the programme; test training interventions for TPK and computer skills; add variables such as digital self-efficacy, digital literacy and AI literacy; examine generative AI tools in building techno-pedagogical competence; and combine scales with interviews and classroom observation to see how readiness translates into actual technology integration during teaching practice.

2. CONCLUSION

The digital readiness of the 1,200 B.Ed. student teachers studied is moderate and multidimensional. Moderate levels dominated attitude towards e-learning, TPK and computer skills, with notable low-level groups in attitude (31.16%) and computer skills (30.83%). Computer skills were uniform across gender, locality, type of college and year of study, whereas attitude and TPK varied with gender, year of study and, in part, locality and college type. Computer skills were positively related to both TPK and attitude, but attitude and TPK were not directly related. Teacher education should therefore move from a technology-access approach to one that builds practical skill, pedagogical integration and favourable attitudes together.

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