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Teachers' attitudes toward ICT integration in higher secondary education: evidence from Manipur, India

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ABSTRACT

One of the most basic imperatives in the current education system is the integration of information and communication technology (ICT) in education, and the teachers' attitude is an important component for the successful integration of ICT. The aim of this study is to investigate the attitudes exhibited by the higher secondary school teachers with respect to the integration of ICT in the state of Manipur, India, and to examine the results with selected demographic variables. The study adopted a quantitative approach with a sample size of 1,100 teachers selected through proportionate stratified random sampling from government and private schools in Manipur using the attitude toward ICT (ATICT) scale. The results show the positive existence of affective, cognitive, and behavioral attitudes among teachers towards the integration of ICT, and the results proved to be significantly valid among teachers from government schools, teachers with professional degrees, and mid-career teachers.

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1. INTRODUCTION

Information and communication technology (ICT) have become central in modern education as they have the potential for improving learning, assessment, and information access; at the same time, they have the potential for supporting individualized learning and higher-order thinking. High-quality education must develop students' talents to enable their contribution to society and help them build a just social order. From this perspective, ICT is not only a technical add-on, but it is potentially even a lever for improved education and social development [1]. Teachers' attitudes toward ICT are one of the most salient factors that influence how or if technology gets used in the classroom: positive attitude, perceived usefulness, and self-efficacy strongly predict the likelihood of ICT integration into pedagogies, while negative attitude or low confidence limits the level of adoption. The positive attitudes towards ICT develop intentions and classroom behavior, change instructional choices, and get institutional support in determining ICT effectiveness to improve student outcomes [2], [3]. ICT can enhance the productivity of teachers and expand instructional choices, allowing rapid creation and dissemination of materials, facilitating multimedia and interactive pedagogies, and establishing alternative ways of evaluating learning. Teachers who perceive themselves as highly digitally self-efficient are more likely to adopt constructivist and student-centered practices enabled by technology. At the same time, successful integration of ICT requires an adequate base of infrastructure, training, and supportive institutional environment; and technology itself will not necessarily guarantee better teaching or learning [4]. Understanding the attitude of teachers towards the use of ICT calls for educational management and policymakers to account for resource planning or allocation and to organize professional development for the use of ICT [5].

The integration of ICT at the secondary level of education is generally identified as one of the core factors to improve the effectiveness of learning as well as the flexibility of the learning process within the learning environment of the 21st-century classroom, where teachers lead the process of integration in the classroom. Teachers' attitudes towards ICT are not merely the presence of a positive attitude, but how the attitudes are felt, thought of, and acted on by the teachers, strongly determine the extent of adoption of ICT within the classroom environment [6]. Although the importance of teacher attitude is widely acknowledged, the study considers teacher attitude from the perspective of an individual trait, forgetting that this process occurs with the involvement of broader professional processes. It highlights the significance of systemic facilitators such as infrastructure in schools and the school leadership to ensure that the readiness of attitude is transformed into action using ICT in the classroom. Technical assistance or school support levels are factors determining the transformation of the positive attitude of teachers regarding ICT into visible action [7]. Teachers with formal training in pedagogy would find it easier to progress from familiarity to proficient practice of ICT in their teaching, compared to those with a teaching background and related attitudes, which are subject-oriented in nature [8]. Research on teachers' attitudes towards ICT globally is abundant; however, existing worldwide studies primarily focus on developed education systems with significant resources. This study does not present any new theoretical model, but uses an existing multi-dimensional institutional readiness model in a distant, and thus different, region and environment from where most studies on teacher attitude toward ICT (ATICT). In doing so, the current study provides evidence for regional education planners' use of regional-specific data collected from the study, as well as importing findings from outside the region into a unique educational project.

Regionally, research with links to Manipur and its neighboring states confirms the need for local evidence: a survey of B.Ed. student teachers in Manipur revealed significant variability across attitudes and a substantial percentage expressing ambivalence or uncertainty toward the use of ICT, again pointing to the need for focused pre- and in-service development in the state [9]. In Manipur, where difficult geography and socio-political factors combine, shifts post-pandemic created new digital practices such as wider use of digital platforms and learning materials, but have also uncovered a host of gaps in connectivity and teacher readiness. Mixed outcomes arising from this make the study of teachers' attitudes in Manipur timely: understanding attitudes will inform the design of targeted professional development, school policy, and maximize the educational value of existing investments in ICTs [10]. Most of these influential findings on ICT preparedness tend to emerge from well-funded urban systems; there is relatively little known about how these same processes function in more peripheral, poorly funded areas. The northeast Indian state of Manipur is one such case, which combines a deep policy-level commitment to using ICT in education with a continued variability of infrastructure as well as varying school administrative conditions. To address these gaps, this paper focuses on the attitudes of higher secondary teachers in Manipur, India, towards integrating ICT, which are measured in terms of their affective, cognitive, and behavioral components. It also investigates if there are differences in attitudes based on gender, type of school administration, teachers' experience, and qualification.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Teacher attitudes regarding the integration of ICT have continued to be among the critical factors that define its success in teaching and learning processes. The construct of teacher attitudes on ICT has incorporated a broader scope of elements that seem to cover the affective, cognitive, and behavioral aspects of it. These, consequently, comprise emotional-feelings, beliefs, or perceptions of usefulness or intention to use of ICT elements, respectively. Conversely, however, it has recently been shown that teachers' favorable perceptions of these aspects do define an enhanced commitment level regarding effective ICT-based teaching methodology integration by teachers, and that, despite teachers having a favorable perception of this technology, some organizational issues do restrict their efficiency at present for effective implementation or application. The technology acceptance model examines the impact that a perception of the use value and simplicity of use of ICT may have on teachers' attitudes and behavior regarding ICT use [11]. More current research indicates that attitudes to ICT use should not merely be regarded as psychological states, but as outcomes of professional training or situational factors [12]. This perspective underscores the need to examine attitudes within broader systemic and organizational contexts.

2.1. Factors influencing attitudes toward ICT

Institutional factors have an important role in influencing the teacher's attitudes and behaviors with respect to ICT. Recent studies show that the school administration, infrastructure, and policy-driven activities have an important positive effect on the teacher confidence level with respect to ICT [13]. Teachers working in such institutional settings develop an appropriate cognitive and behavioral trait with respect to ICT,

independent of their boundaries with respect to gender, age, and other categories [14]. While novice teachers tend to be considered more technology-oriented, new observations suggest that mid-career teachers tend to display stronger cognitive knowledge and behavioral commitment to ICT because of their increased levels of pedagogical self-confidence, class autonomy, and staff development opportunities [12]. These inconclusive results indicate that the dynamics of career stages are more informative than the mere passage of time with regard to the engagement of teachers with ICTs [15]. It is therefore vital from a practical perspective to research the role of teaching experience as a contextual variable. One area that has shown itself to be a very reliable predictor for the adoption of ICT is professional teacher education. Trained teachers always positively and successfully integrate ICT into their classrooms [16], which provides developmentally appropriate opportunities that help integrate knowledge of subjects as well as teaching strategies with technological tools that help teachers move beyond the surface-level application of technology.

In the teaching and learning process, ICT in the classroom turns traditional approaches into student-centered approaches whereby students are center-stage, while teachers play the role of mentors or facilitators. This approach substituted group exercises, discussions, and activities for lectures [17]. Digital technologies in education increase opportunities for active learning; their impact depends on pedagogical design and teacher readiness [18]. Teacher educators with greater technological competency are valued more than those with lower levels of technological competency [19]. The subject-culture collision had a major effect on the teachers' attitudes, beliefs, and self-efficacy toward technology and mobile-based training [20]. However, teachers developed a negative ATICT integration in teaching due to limited access to computers and the internet [21]. Another study revealed that the availability of ICT infrastructure, teacher expertise, and technical support also impacts how well ICT is integrated into teaching and learning in schools [22]. Persistent use and scaffolded pedagogical training are stronger predictors of classroom integration than one-off exposure [18]. Moreover, the frequency of utilizing computer applications or programs, teachers' characteristics, and the availability of facilities are positively correlated with attitude and self-efficacy, which suggests that respondents who frequently use computer applications or programs are more likely to report better scores in attitude and self-efficacy regarding use of ICT which eventually leads to use of technology [23], [24]. Teachers with favorable attitudes towards the use of technology in teaching are absolutely associated with successful integration of technology, while negative attitudes and low confidence may work against policy implementation [25].

Based on the theories of acceptance of technology and the recent studies on the integration of ICTs in contemporary settings, the current study attempts to define the attitude of teachers toward the adoption of ICTs as an institutionally and professionally nuanced outcome of context-based constructs such as management of institutions, work experience in the classroom, qualification of teachers in education, and gender. Despite teacher attitudes towards ICT being a consistent finding in international research, there is scant evidence of large-scale evaluative studies from geographically remote and infrastructurally challenged regions such as Northeast India. Through an extensive evaluation of ICT attitudes, the current research adds to and augments current research efforts in relation to ICT adoption in geographically peripheral and variable resource contexts via a large-scale, multi-dimensional ICT attitude assessment. Using a scale to evaluate the three components of attitude (affective, cognitive, and behavioral) along with institutional and professional components, identifies the intersection of attitudes and the contextual conditions that exist within schools or other institutions regarding technology acceptance.

Educational evaluators can use the study to develop a system-level diagnostic framework for assessing technology acceptance at the teacher level and institutional level. Policymakers can utilize these findings to inform contextually relevant implementation strategies within regional educational systems. Guided by this evaluative and contextual direction, the study seeks to answer these research questions:

- What is the overall level of teachers' affective, cognitive, and behavioral attitudes toward ICT use?
- Do teachers' ICT attitudes differ significantly by gender and school management type?
- Are there significant differences in ICT attitudes across teaching experience levels?
- Do educational qualifications influence the affective, cognitive, and behavioral attitudes toward ICT?

3. METHOD

The study conducted a quantitative cross-sectional design to measure teachers' attitudes toward the use of ICT among higher secondary teachers in Manipur. Primary data was gathered using a questionnaire. There were two sections to the survey. The first section is teachers' demographic information. In this section, gender, school type, teaching experience, and degree of education of the respondents were all gathered by the researcher. The second section was the standardized ICT attitude scale developed by Albirini [26], consisting of 20 items provided on a Likert-type scale, ranging from strongly disagree to strongly agree. The ATICT scale was developed for Syrian English as a foreign language (EFL) teacher; however, the present study was conducted among Manipur, India's higher secondary school teachers. Although the ATICT scale was

designed for the Syrian EFL context, its constructs (affective, cognitive, and behavioral) can be considered as general dimensions of ATICT. To be context-specific, the instrument was subject to expert validation, linguistic modification and cultural adaptation. The relevance of content and equivalence of constructs were reviewed by five experts in the field of education and social science. Items were checked for semantic clarity, context suitability, and consistency. This procedure promotes functional equivalence rather than a strict or literal translation of the instrument, and at the same time maintains the theoretical framework behind the instrument and ensures contextual validation. Based on their suggestions, the scale item numbers 1, 2, 8, 9, and 13 were modified. Utilizing statistical package for social science (SPSS) version 23, Cronbach's alpha was computed from the pilot study data. All negative statements on the Likert scale were reverse-coded to maintain consistency. The Cronbach's α reliability coefficient for the scale was 0.80 (ATICT), which is regarded as satisfactory by Bland and Altman [27].

Although the ATICT scale offers a valid and theoretically supported tool for measuring pedagogical technology attitude among teachers, the current study is based solely on self-reporting, which may be influenced by social desirability bias, perceived professional expectations, and respondents' subjective interpretations of their own instructional practice. Teachers whose administrations attempt to encourage the use of technology in their schools tend to have positive attitudes towards implementing technology, even though their implementation may not be represented effectively in their actual teaching. As such, the results of this research must be interpreted only as indicators of the research subjects' perceived readiness and ATICT using technology, rather than an indication of how they use technology for instruction.

The population comprised 1,977 higher secondary teachers (private school teachers: 1,281; government: 696) from Manipur. A proportionate stratified random sampling procedure was conducted with management (private vs. government) as the strata. Proportions were calculated from the population: private=1,281/1,977=0.648 and government=696/1,977=0.352. An initial target sample of 1,100 was drawn proportionally (private: 713; government: 387). After data collection and cleaning, which included removing non-responses, incomplete questionnaires, and ineligible cases, 1,000 usable responses remained and were retained for analysis (private: 646; government: 354). Utilizing the SPSS version 23, the data gathered from research participants through the ATICT scale were analyzed and assessed. All 20 statements regarding teachers' attitudes toward ICT use were asked, and the measures of the affective, cognitive, and behavioral aspects of ICT attitude were intended to be obtained from the items. Since the data were not normally distributed, non-parametric tests were done for group comparisons. The data collected were analyzed using the Mann-Whitney U test and the Kruskal-Wallis test to measure the variables.

4. RESULTS

The teachers' ATICT uses in Manipur, India, was found to be high. Only a very small percentage of the teachers strongly disagreed or disagreed with the statements that relate to the use of ICT, while nearly half of the respondents strongly agreed and agreed. A moderate proportion remained neutral, which would suggest that only a small minority of teachers are uncertain about the integration of ICT. About 49.3% of the respondents were in strong agreement, and 31.4% agreed on positive statements related to the use of ICT in education, while a very small number of participants expressed disagreement (5.4%) or strong disagreement (2.6%). A neutral response was received from 11.2% of the teachers. The high value of the overall mean (M=4.28, SD=0.60) indicates that higher secondary teachers have a very optimistic attitude in using ICT for teaching–learning. The result revealed that most of the teachers have a positive ATICT, implying that teachers hold a consistent and homogeneous positive ATICT use in teaching and learning.

The analysis revealed significant gender-based differences in two out of three attitude domains toward ICT use. According to their higher mean ranks, male teachers demonstrated significantly more positive affective attitudes and cognitive attitudes than female teachers, as shown in Table 1. These findings suggest that male teachers tend to emotionally appreciate ICT more and cognitively view it as useful and relevant in teaching. In contrast, no statistically significant difference between genders emerged with respect to the behavioral domain. Institutional support for their employees has a greater impact than demographic characteristics. Policies focused on developing the entire institution will have more positive outcomes than developing only the targeted group of employees. This suggests that while males and females may differ in their attitude about, and what they think of ICT, male and female teachers use ICT in practice to roughly the same degree. From here, one may infer that behavioral ICT-use is determined by institutional requirements or the availability of ICT facilities rather than by gender-specific predispositions.

The results indicated significant differences in the attitudes of teachers toward ICT use across all three domains when comparing government and private school teachers. Government school teachers reported significantly higher affective, cognitive, and behavioral attitudes, as reflected in their significantly higher mean ranks, as shown in Table 2. This could be consistently reflective of better access to government

ICT initiatives, higher exposures to professional development programs, and the institutional emphasis placed on digital tool integration in government schools. Access to and the use of technology will be limited for teachers who work in private schools. For that reason, investment in private schools is necessary to address issues with technology in schools, and these issues can only be addressed through targeted capacity-building opportunities. Capacity-building will allow the use of technology to become consistent across all school systems. There is an important management-based gap in the preparedness for ICT use amongst the teachers of Manipur.

The findings showed varying patterns of differences across teaching experience groups in teachers' attitudes toward ICT use, as shown in Table 3. There were no significant differences in the affective domain across years of teaching experience; however, statistically significant differences were observed in the cognitive and behavioral domains. The cognitive and behavioral attitude of teachers towards ICT among mid-career teachers is significantly greater than that of either early-career or late-career teachers, suggesting that successful integration of ICT into the classroom depends on the convergence of pedagogical maturity and ongoing professional development. Given the lower levels of engagement found among early- and late-career teachers, it can be surmised that they have differentiated needs for support. From a policy perspective, it could be said that induction-stage teachers require mentoring through structured programs, while experienced teachers would likely benefit more from targeted digital skills development initiatives. As a result, this suggests that professional development strategies should be based upon a systematized career stage approach rather than a uniform delivery strategy. This implies that mid-career teachers may become more adaptable, more exposed to training oriented toward ICT, and confident in the use of digital tools than their less-experienced or highly senior counterparts.

Table 1. Mann-Whitney U test ranks and statistics for gender

Variable	Gender	N	Mean rank	Mann-Whitney U	Z	p
Affective domain	Male	430	524.55	112210.500	-2.311	0.021
	Female	570	482.36			
Cognitive domain	Male	430	524.03	112433.500	-2.245	0.025
	Female	570	482.75			
Behavioral domain	Male	430	503.05	121454.000	-0.248	0.804
	Female	570	498.58			

Table 2. Mann-Whitney U test ranks and statistics for school management

Variable	School management	N	Mean rank	Mann-Whitney U	Z	p
Affective domain	Government	354	591.58	82098.500	-7.461	<0.001
	Private	646	450.59			
Cognitive domain	Government	354	573.92	88350.000	-5.970	<0.001
	Private	646	460.26			
Behavioral domain	Government	354	590.23	82579.000	-7.452	<0.001

Table 3. Kruskal-Wallis test ranks and statistics across teaching experience

Attitude	Experience	N	Mean rank	Chi-Square	p
Affective domain	Up to 5 years	253	473.11	9.226	0.056
	6–10 years	277	496.19		
	11–15 years	215	539.33		
	16–20 years	134	528.41		
	21+ years	121	467.72		
Cognitive domain	Up to 5 years	253	477.39	16.080	0.003
	6–10 years	277	485.22		
	11–15 years	215	542.83		
	16–20 years	134	555.66		
	21+ years	121	447.50		
Behavioral domain	Up to 5 years	253	440.85	20.903	<0.001
	6–10 years	277	508.10		
	11–15 years	215	545.97		
	16–20 years	134	543.38		
	21+ years	121	479.54		

The result showed a significant difference across the educational qualification groups of teachers in all three attitude domains, as shown in Table 4. The greatest differences were seen based on levels of qualification, with professional teachers (B.Ed. or M.Ed.) showing differences compared to teachers without professional qualifications. This includes the affective domain, where M.Ed.-qualified teachers were most emotionally positive toward ICT use, followed by B.Ed. or postgraduates with B.Ed. degree holders, and the least affective attitudes were shared by postgraduates or Ph.D. holders without professional teacher training.

Table 4. Kruskal-Wallis test ranks and statistics across educational qualifications

Attitude	Qualifications	N	Mean rank	Chi-square	p
Affective	Graduate	60	478.86	30.957	<0.001
	B.Ed.	139	533.55		
	Postgraduate	275	445.59		
	Postgraduate with B.Ed.	377	522.99		
	M.Ed.	59	636.12		
	Ph.D.	90	448.55		
Cognition	Graduate	60	459.94	14.802	0.011
	B.Ed.	139	488.33		
	Postgraduate	275	473.65		
	Postgraduate with B.Ed.	377	519.24		
	M.Ed.	59	611.54		
	Ph.D.	90	477.07		
Behavior	Graduate	60	475.07	60.751	<0.001
	B.Ed.	139	607.94		
	Postgraduate	275	431.44		
	Postgraduate with B.Ed.	377	499.94		
	M.Ed.	59	669.18		
	Ph.D.	90	454.30		

The cognitive domain is significantly different, where M.Ed. and postgraduate with B.Ed. degree holders reported stronger cognitive appreciation for the usefulness and pedagogical relevance of ICT. The most pronounced differences within the behavioral domain are where M.Ed. qualified teachers show the highest level of behavioral engagement in using ICT, followed by B.Ed. qualified teachers, while postgraduates without pedagogical training reported the lowest scores for behavioral traits. These findings confirm the very important place that professional teacher education, particularly the B.Ed. and M.Ed., has in forming teachers' affective, cognitive, and behavioral orientations to integrate ICT into classrooms.

Generally, teachers with an M.Ed. degree have significantly higher affective, cognitive, and behavioral scores than those with other qualifications, suggesting that a professional teacher degree or courses build cognitive skills that advance training and behavioral performance. Thus, it appears that when ICT components are included in a structured way within the context of teacher education, there is a significant benefit to improving a teacher's ability to utilize ICT in a classroom setting. In terms of the evaluation of education, this reinforces our earlier statement that traditional pre-service teacher education is one of the highest leverage opportunities for improving the overall system of education's capability to effectively utilize ICT in education. As a result, to enhance the capacity of school systems to harness the power of ICT in education, we recommend that the incorporation of techno-pedagogy within the initial certification component of teacher preparation programs would have more impact than simply relying on in-service workshops to provide this training.

5. DISCUSSION

The key contribution of this research is not only confirming that teachers in Manipur have positive attitudes towards ICT, but also showing how the positive attitudes were generated by the institutional and professional conditions. It has been shown that, consistent with technology acceptance theory [11], there are stronger positive affective and cognitive perceptions associated with stronger behavioral dispositions toward ICT use. Studies showed that while attitudes are important in influencing an implementation process, these are required in combination with critical enabling components toward effectual outcomes [6]. The results of this study provide further evidence of this shift in theory by showing that variations in ICT attitudes are more closely aligned with professional variables than with other demographic variables, and therefore, the attitude of the teacher should be viewed as an indicator of institutional readiness for ICT and not simply as an individual psychological variable. While slight affective and cognitive differences may exist, the lack of behavioral differences suggests that gender has little or no impact on the actual use of ICT when structural conditions are comparable, as noted by Vanegas *et al.* [14], where an individual demographic predictor for ICT use to be overridden by the institutional factors in determination the pattern and extent of ICT use. This finding highlights that systematic capacity-building may have a greater impact than demographic-based interventions. However, differences across school management types were more evaluatively significant than were differences found between schools within a particular management type. The higher attitudes of teachers in government schools as compared to private schools aligned with the previous literature asserting the role of infrastructure provision, policy-based initiatives; and structured professional development in increasing teachers' technology readiness [13]. Therefore, regional planners should make sure that both government and private institutions have equitable access to technology resources and organized opportunities for professional growth.

On the other hand, teachers from the mid-career group showed the most cognitive and behavioral engagement as they may have benefited from joining teaching efficacy, autonomy, and continuous exposure to professional development that enables them to use their competence in ICT more effectively than novice and late-career teachers. The differences in teachers' attitudes across teaching experience show that there is a necessity for using different methods of professional development. Late-career teachers could gain from programs specifically aimed at developing their skills in digital technologies to achieve adaptive instructional change, whereas early-career teachers may require more structured mentoring support regarding the implementation of ICT in their classrooms. The significance of teachers' professional qualifications adds weight to the argument regarding the role of institutional context. Teachers who have formal pedagogical qualifications such as B.Ed. or M.Ed. exhibited higher levels of multi-dimensional readiness; these findings are consistent with previous studies [6], [16], which indicated that integrating techno-pedagogical training positively affects teachers' confidence and ability to use technology in the classroom. The significance of incorporating techno-pedagogical training into pre-service teacher education programs is shown by the considerable correlation found between professional qualification and multi-dimensional ICT readiness. Instead of depending only on brief in-service seminars, incorporating ICT pedagogy into B.Ed. and M.Ed. programs, and regular hands-on training on ICT may provide a more viable route for long-term digital transformation.

The post-COVID-19 situation provides a larger context in which these results must be understood. While the pandemic has hastened teachers' awareness of technology tools and then encouraged their attitudes towards ICTs, it has also revealed and exacerbated institutional inequalities. Hence, the results shown here indicate that there are positive attitudes together with non-homogeneous implementation levels that are mostly predetermined by technological infrastructural attributes. Also consistent with current academic observations. In alignment with this pattern, recent research has indicated the enhancement of technology acceptance as well as prevalent disparities in its implementation based on related constraints [28], [29]. From the viewpoint of an educational assessment, the results provide evidence that ICT attitude functions as a readiness factor and not only as a psychological state. The overall positive attitudes toward the integration of ICT and the differences between institutions indicate that teacher unwillingness is not the primary barrier to ICT integration. The alignment of teacher readiness with respect to technology, infrastructure, and policy support is, therefore, a critical opportunity for advancing the effective use of technology in the classroom. Educational evaluation frameworks should assess both the attitudes and readiness of institutions as they pertain to digital educational reform to measure the successful implementation of technology.

6. CONCLUSION

The study assessed the attitudes of teachers in higher secondary schools of Manipur in the cognitive, affective, and behavioral aspects of ICT integration. The findings show that the teachers generally have a positive ATICT work, thus confirming the global observations about the increased awareness of teachers about the teaching efficacy of ICTs. A positive attitude is thus not general but deeply determined by the organizational conditions in which teachers work. The two most important determining variables are the type of school management and the teachers' qualifications. Teachers in government schools and those holding professional degrees, especially M.Ed., show more active engagement in all aspects of the attitude. Gender variations were confined to the affective and cognitive parts, indicating that the class implementation aspects were not influenced, and the primary dominance of the institutional construct over the gender construct has been emphasized. Based on the analysis, the attitudes of teachers towards ICT are presented not within the context of an individual construct but within the context of an output construct that encompasses the system readiness, preparation, and institutional construct.

Despite the contributions of this research, there are limitations as well. This research is based on self-reporting scales related to the attitude of teachers towards the ICT tool. Although such scales are widely used and validated, self-reported responses are, per se, susceptible to a measurement bias, including social desirability bias, acquiescence effects, and respondents' tendency to overstate positive attitudes toward ICT in contexts where the use of technology is institutionally encouraged or socially valued.

As a result, the reported attitudes might reflect perceived readiness rather than what takes place in the classroom. Future assessment research should corroborate survey results with observations in the classroom, with records of digital use, and with indicators based on performance. This would provide a more valid and practice-based understanding of ICT attitudes and their possible translation into classroom behavior, enhancing and providing stronger evidence for the relationship between attitudes and actual ICT integration. Future research could also adopt a mixed-method approach in exploring how concrete training models and school-level supports relate to ICT integration.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

The Ethical Clearance Certificate was collected from the corresponding university before the data collection.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [NG], upon reasonable request.

REFERENCES

[1] A. B. Goldhaber, H. Khuan, and R. Allysa, "Impact of ICT integration on quality of education among secondary schools in USA," *Journal of Education*, vol. 4, no. 6, pp. 53–61, Oct. 2021, doi: 10.53819/81018102t5015.
[2] B. N. Cvetković, Z. Arsić, and D. Cenić, "Attitudes of teachers to using information and communication technology in teaching–advantages and obstacles," *International Journal of Cognitive Research in Science, Engineering and Education*, vol. 10, no. 2, pp. 69–76, Aug. 2022, doi: 10.23947/2334-8496-2022-10-2-69-76.
[3] L. Kittinger and V. Law, "A systematic review of the UTAUT and UTAUT2 among K-12 educators," *Journal of Information Technology Education: Research*, vol. 23, pp. 1–21, 2024, doi: 10.28945/5246.
[4] M. Moazam, M. Zamaniyan, and F. Sadighi, "Teachers' attitudes towards the use of instructional technology and its impact on their self-efficacy," *Critical Literary Studies*, vol. 4, no. 2, pp. 195–210, 2021, doi: 10.34785/J0142022.579.
[5] Z. Ayar, "Investigation of university EFL teachers' perceptions and attitudes to resort to ICT: post-local-crisis context," *Moderna Språk*, vol. 119, no. 3, pp. 60–77, Dec. 2025, doi: 10.58221/mosp.v119i3.54913.
[6] L. Márquez-Baldó, N. Orellana, G. Almerich, and S. R. Jesús, "Attitude toward ICT integration for teachers. Validation of a multidimensional scale," *Computers in Human Behavior Reports*, vol. 20, p. 100786, Dec. 2025, doi: 10.1016/j.chbr.2025.100786.
[7] M. M. Msambwa, K. Daniel, and C. Lianyu, "Integration of information and communication technology in secondary education for better learning: a systematic literature review," *Social Sciences and Humanities Open*, vol. 10, p. 101203, 2024, doi: 10.1016/j.ssaho.2024.101203.
[8] A. Pathiranage and T. Karunaratne, "Teachers' agency in technology for education in pre- and post-COVID-19 periods: a systematic literature review," *Education Sciences*, vol. 13, no. 9, p. 917, Sep. 2023, doi: 10.3390/educsci13090917.
[9] R. L. Anal and A. R. Naraginti, "Attitude of B.Ed. student teachers towards ICT in the teacher education programme in Manipur," *SSRN Electronic Journal*, pp. 1–11, 2022, doi: 10.2139/ssrn.4064518.
[10] P. Khundrakpam, K. D. Singh, and E. N. Singh, "Factors influencing the adoption of e-learning technologies: an Indian perspective," *International Journal of Information and Education Technology*, vol. 12, no. 8, pp. 816–820, 2022, doi: 10.18178/ijiet.2022.12.8.1689.
[11] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly*, vol. 13, no. 3, pp. 319–339, Sep. 1989, doi: 10.2307/249008.
[12] K. D. Caratiquit and B. S. Javier, "Teachers' ICT competence, techno-efficacy, school support, and attitude towards digital use in teaching: a mediation and moderation study," *Participatory Educational Research*, vol. 12, no. 3, pp. 1–21, May 2025, doi: 10.17275/per.25.31.12.3.

[13] S. G. Kebede, M. M. Gebremeskel, and S. T. Nigatu, "Antecedents of ICT utilization in teaching and learning: a study of public secondary schools in Amhara, Ethiopia," *Discover Education*, vol. 4, no. 1, p. 440, Oct. 2025, doi: 10.1007/s44217-025-00901-z.
[14] H. D. O. Vanegas, Y. de M. S. Cifuentes, and A. S. Morrás, "Educational technology in teacher training: a systematic review of competencies, skills, models, and methods," *Education Sciences*, vol. 15, no. 8, p. 1036, Aug. 2025, doi: 10.3390/educsci15081036.
[15] M. T. Tran, N. T. Pham, and T. B. H. Dinh, "Teachers' attitudes towards the use of information and communication technology in teaching English: impacts of teachers' characteristics," *AsiaCALL Online Journal*, vol. 14, no. 1, pp. 61–84, Mar. 2023, doi: 10.54855/acoj.231415.
[16] J. E. Otom, E. D. Peteros, K. M. M. Opingo, H. O. Revalde, L. C. Pinili, and R. C. Espina, "Pre-service teachers' attitudes toward ICT, TPACK acquisition, and readiness in fostering education for sustainable development," *International Journal of Learning, Teaching and Educational Research*, vol. 24, no. 5, pp. 605–622, May 2025, doi: 10.26803/ijlter.24.5.31.
[17] A. E. E. Sobaih, I. A. Palla, and A. Baquee, "Social media use in e-learning amid COVID 19 pandemic: Indian students' perspective," *International Journal of Environmental Research and Public Health*, vol. 19, no. 9, p. 5380, Apr. 2022, doi: 10.3390/ijerph19095380.
[18] B. Dey, S. Saha, and R. Das, "Integrating information and communication technology in teacher education: its role and impact," *International Journal For Multidisciplinary Research*, vol. 7, no. 1, pp. 1–8, Feb. 2025, doi: 10.36948/ijfmr.2025.v07i01.36803.
[19] D. Herro, R. Visser, and M. Qian, "Teacher educators' perspectives and practices towards the technology education technology competencies (TETCs)," *Technology, Pedagogy and Education*, vol. 30, no. 5, pp. 623–641, Oct. 2021, doi: 10.1080/1475939X.2021.1970620.
[20] S. Xu and S. Zhu, "Factors influencing K-12 teachers' intention to adopt mobile devices in teaching," *Computers in the Schools*, vol. 37, no. 4, pp. 292–309, Oct. 2020, doi: 10.1080/07380569.2020.1830257.
[21] A. M. Kule, M. Wilson, K. H. Ampeire, and V. Turiabe, "Teacher characteristics and the use of ICT in rural secondary schools of Bwera Sub County, Kasese District, Uganda," *Interdisciplinary Journal of Rural and Community Studies*, vol. 3, no. 2, pp. 30–40, Aug. 2021, doi: 10.51986/ijrcs-2021.vol3.02.04.
[22] R. Asianoa, F. Kuupille, S. K. Segbefia, and J. A. Asenso, "Examining the integration of ICT into teaching and learning: a study of colleges of education in the Volta Region," *Integrated Journal for Research in Arts and Humanities*, vol. 2, no. 6, pp. 15–24, Nov. 2022, doi: 10.55544/ijrah.2.6.3.
[23] M. Ikhlas and E. D. D. Rosa, "Profile and predictors of high school teachers' attitude and self-efficacy in utilizing ICT: an investigation from Indonesia," *SN Social Sciences*, vol. 3, no. 4, p. 71, Apr. 2023, doi: 10.1007/s43545-023-00654-2.
[24] T. O. Oyunge, "Exploring secondary school teachers' pedagogical beliefs and the integration of ICT in the context of a developing country: a technology acceptance model perspective," *European Journal of Education Studies*, vol. 8, no. 3, pp. 206–237, 2021, doi: 10.46827/ejes.v8i3.3639.
[25] E. Alieto, B. Abequibel-Encarnacion, E. Estigoy, K. Balasa, A. Eijansantos, and A. Torres-Toukoumidis, "Teaching inside a digital classroom: a quantitative analysis of attitude, technological competence and access among teachers across subject disciplines," *Heliyon*, vol. 10, no. 2, p. e24282, Jan. 2024, doi: 10.1016/j.heliyon.2024.e24282.
[26] A. Albirini, "Teachers' attitudes toward information and communication technologies: the case of Syrian EFL teachers," *Computers & Education*, vol. 47, no. 4, pp. 373–398, Dec. 2006, doi: 10.1016/j.compedu.2004.10.013.
[27] J. M. Bland and D. G. Altman, "Statistics notes: Cronbach's alpha," *BMJ*, vol. 314, no. 7080, p. 572, 1997, doi: 10.1136/bmj.314.7080.572.
[28] D. Adhya and S. Panda, "Teacher educators' attitude towards technology-enabled learning and its incorporation into teaching-learning during and post-pandemic," *Educational Media International*, vol. 59, no. 2, pp. 131–149, Apr. 2022, doi: 10.1080/09523987.2022.2101204.
[29] D. Georgiou, A. Trikoili, and L. Kester, "Rethinking determinants of primary school teachers' technology acceptance during the COVID-19 pandemic," *Computers and Education Open*, vol. 4, p. 100145, Dec. 2023, doi: 10.1016/j.caeo.2023.100145.

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