

Assessing the Elementary School Teachers' Preparedness, Knowledge and Self-Efficacy in the Use of Classroom Technology

Nur-Ain A. Asa and Mary Ann G. Lim

School of Graduate Studies, Sulu State College, Jolo, Sulu, 4700, Philippines

*Corresponding author: sscgspub@sulustatecollege.edu.ph

ABSTRACT. The use of classroom technology in basic education has expanded, yet limited understanding remains regarding how teachers' knowledge, preparedness, and self-efficacy interact in localized elementary school conditions. This paper examined the level of these dimensions and analyzed how they varied across educational attainment and related to one another among elementary school teachers in a public school district in Sulu, Philippines. A descriptive–correlational design was employed involving 100 teachers, using a structured questionnaire. Data were analyzed through weighted mean, analysis of variance, and Pearson correlation. Findings revealed that teachers demonstrated favorable levels of knowledge ($M = 4.282$), preparedness ($M = 3.143$), and self-efficacy ($M = 4.097$). Differences were observed across educational attainment, with higher qualifications associated with stronger levels of competence and confidence. However, correlation results indicated weak relationships among knowledge, preparedness, and self-efficacy, suggesting that these dimensions did not develop as a strongly integrated set. The findings clarified that although teachers possessed adequate technological capability, the interaction among these dimensions remained limited. This indicates the need for more coherent and sustained development approaches that strengthen the alignment of knowledge, preparedness, and self-efficacy to support more effective classroom technology integration.

Keywords: *Elementary School, Teachers' Preparedness, Knowledge, Self-Efficacy, Classroom Technology*

ARTICLE DETAILS

JEAS-00096; Received: February 28, 2026; Accepted: March 16, 2026; Published: April 6, 2026

CITATION:

Asa, N. A. & Lim, M. A. G. (2026). *Assessing the Elementary School Teachers' Preparedness, Knowledge and Self-Efficacy in the Use of Classroom Technology*. *Journal of Education and Academic Settings*, 3(1). DOI: 10.62596/7f6zyt71

COPYRIGHT

Copyright © 2026 by author(s). *Journal of Education and Academic Settings* is published by Stratworks Research Inc. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>), allowing redistribution and reproduction in any format or medium, provided the original work is cited or recognized.

1. INTRODUCTION

The expansion of classroom technology in basic education has been widely examined, yet prior works have largely emphasized general ICT adoption or secondary-level integration, leaving a limited account of how elementary teachers in geographically and resource-diverse areas of the Philippines translate technological knowledge into actual instructional confidence and readiness; this gap becomes more evident as existing works rarely examine how preparedness, knowledge,

and self-efficacy interact simultaneously in localized elementary school conditions where infrastructure and professional support remain uneven. Teachers often report acceptable levels of familiarity and willingness to use digital tools, but these do not automatically lead to sustained or effective integration, particularly in districts where access, training continuity, and institutional support vary (Siyam et al., 2025). In the Philippine basic education system, national initiatives promoting digital instruction have progressed, yet uneven implementation persists, especially in remote divisions such as Sulu, where teacher capability develops through a mix of formal preparation and independent adaptation.

Preparedness for classroom technology extends beyond exposure to devices and platforms, involving the capacity to align tools with pedagogical intent and learner needs. Samaniego et al. (2025) explains that readiness is shaped through structured training, access to functional resources, and repeated engagement with instructional technologies. However, Qangule and Letuma (2025) note that elementary educators frequently encounter constraints such as limited infrastructure, insufficient follow-through in training, and minimal technical support, conditions that weaken sustained application. In Philippine, these constraints are more pronounced in rural public schools, where teachers often rely on personal initiative to bridge technological gaps, creating variability in competence and instructional delivery. Structured exposure to digital tools during training significantly shapes teachers' ability to implement technology in instructional contexts (Chavez & Lamorinas, 2023). Such conditions suggest that preparedness cannot be assumed from exposure alone but must be examined in relation to actual classroom demands. Teacher readiness for instructional practices is often influenced by contextual constraints such as resource availability and institutional support (Leon et al., 2024).

Knowledge of classroom technology, often framed through technological pedagogical integration, has been identified as a determining factor in effective instruction. Teachers with deeper understanding of how digital tools support learning processes demonstrate more adaptive instructional practices (Md Sabri et al., 2024; Asula-Abaver & Machaba, 2026). Yet, knowledge acquired through short-term training tends to remain procedural rather than pedagogical, limiting its impact on classroom innovation. In many Philippine elementary schools, teachers possess foundational ICT skills but encounter difficulty in applying these to diverse learning needs, indicating a disconnect between technical familiarity and instructional application (Rifle & Ninfa, 2024). This suggests that knowledge must be evaluated not only in terms of awareness but also in its functional use in real teaching environments. Possessing technological knowledge does not automatically ensure its appropriate or effective application in instructional settings (Chavez et al., 2024).

Self-efficacy, defined as teachers' belief in their capability to utilize technology effectively, remains a strong predictor of instructional behavior. Rekmn and Rosalinda (2024) assert that confidence influences both the willingness to experiment with digital tools and persistence in overcoming technical challenges. A repeated successful experiences with technology strengthen teachers' confidence, reinforcing continued use. However, Darwish et al. (2025) and Franco et al. (2024) indicates that from classroom-based findings shows that even when teachers report readiness and knowledge, confidence may remain moderate or inconsistent, particularly when training does not translate into practice. This indicates that self-efficacy develops not only from training but from meaningful and sustained engagement in real instructional conditions. Teachers' confidence in using technology develops progressively through exposure, guided practice, and successful instructional experiences (Diamante et al., 2025; Bowman et al., 2022).

In the Philippine elementary education sector, demographic and professional factors further shape how technology is utilized. Cabalbag (2025) notes that teaching experience, educational attainment, and exposure to professional development influence both competence and confidence in digital instruction. Teachers with advanced training tend to demonstrate stronger application strategies, yet disparities remain across age groups and years of service. These variations highlight that teacher capability is not uniform and must be examined in relation to actual teaching conditions rather than assumed based on qualifications alone.

Despite the growing body of work on technology integration, there remains a need to examine how preparedness, knowledge, and self-efficacy interact in specific local conditions where structural limitations and adaptive practices coexist. Prior works often treat these variables independently or focus on urban or well-supported schools, leaving limited insight into how they converge in districts with distinct operational realities such as Indanan, Sulu. Addressing this gap provides a more grounded understanding of how teachers navigate technological demands in elementary education and how these factors collectively influence instructional capability; thus, this paper examines the level of teachers' knowledge, preparedness, and self-efficacy in classroom technology and analyzes how these dimensions vary across educational attainment and relate to one another in a Philippine public school district.

2. METHODS

2.1 Research Design

The investigation employed a descriptive–correlational design to examine the levels of preparedness, knowledge, and self-efficacy of elementary school teachers in relation to classroom technology use. This approach enabled systematic collection and analysis of quantitative data describing teachers' profiles alongside their perceived readiness, competence, and confidence. Descriptive measures were utilized to summarize demographic characteristics and the three main variables, while inferential techniques including independent samples t-test and one-way ANOVA were applied to determine differences across demographic groupings. In addition, correlation analysis was performed to determine the degree of association among preparedness, knowledge, and self-efficacy, allowing a clearer understanding of how these variables relate in actual teaching practice.

2.2 Participants of the Study


The study was carried out in Indanan North District, Division of Sulu, Philippines, during the School Year 2025–2026. The district consists of public elementary schools supervised under the Department of Education Region IX. These schools operate under the leadership of principals, head teachers, or designated teachers-in-charge, providing the institutional environment in which classroom technology integration is implemented . The participants included one hundred (100) elementary school teachers currently assigned in Indanan North District during the specified school year. These teachers were actively teaching in Grades 4, 5, and 6 and represented various professional ranks, employment statuses, and academic qualifications.

Table 1. Distribution of Respondents by School

Indanan North District	Number of Respondents
1. Bato-Bato Elementary School	15
2. Bwansa Elementary School	16
3. Lower Kajatian Elementary School	10
4. Maharaja Abduraup Elementary School	17
5. South Sionogan Elementary School	7
6. Upper Kajatian Elementary School	35
Total	100

2.3 Sampling Procedure

A non-probability purposive sampling technique was applied in selecting participants. Teachers were chosen based on their availability and relevance to the objectives of the study, particularly those handling Grades 4 to 6. This approach ensured that respondents possessed direct experience with classroom technology integration while maintaining representation across demographic characteristics such as age, gender, teaching experience, grade level assignment, and educational attainment.

2.4 Research Instrument

Data were gathered using a structured survey questionnaire designed to measure teachers' preparedness, knowledge, and self-efficacy in classroom technology use. The instrument was adapted from established tools in prior works, including those focusing on technological knowledge, preparedness for instructional integration, and self-efficacy beliefs. The instrument underwent expert validation by specialists in education and research to ensure clarity, coherence, and alignment with the constructs being measured.

The questionnaire consisted of four sections:

Part I – Knowledge of classroom technology (10 items)

Part II – Preparedness for technology integration (10 items)

Part III – Self-efficacy beliefs in using classroom technology

2.5 Data Gathering Procedure

Prior to data collection, formal permission was secured from the appropriate authorities, including the Graduate Studies Office, the Schools Division Superintendent of Sulu, and school heads within the district. Upon approval, the researcher personally administered the questionnaires to the selected teachers. Completed instruments were retrieved after administration to ensure completeness and accuracy of responses.

2.6 Ethical Considerations

Ethical standards were strictly observed throughout the conduct of the study. Participation was voluntary, and respondents were informed of the purpose of the study prior to data collection. Confidentiality and anonymity were maintained to protect participants’ identities. Data were handled with integrity, ensuring objective analysis and reporting. In addition, ethical clearance was secured in accordance with institutional requirements to guarantee compliance with established research ethics protocols.

3. RESULTS

Objective 1. Determine the level of elementary school teachers’ knowledge of classroom technology, their preparedness for its instructional use, and their self-efficacy in applying digital tools in teaching.

Table 2. Levels of Knowledge of Classroom Technology

Statements	Mean	S.D.	Description
I am capable of resolving technical issues independently.	4.27	.55599	Agree
I quickly learn how to use new technologies.	4.26	.56174	Agree
I stay updated with important and emerging technologies	4.26	.59662	Agree
I regularly explore and try out different technologies	4.32	.54828	Agree
I am knowledgeable about various types of technology.	4.26	.57945	Agree
I possess the necessary technical skills to effectively use technology	4.31	.58075	Agree
I have been given enough opportunities to engage with different technologies	4.27	.56595	Agree
I feel confident In troubleshooting technology-related problems when they occur	4.30	.53235	Agree
I can easily adapt to new technological changes in my field.	4.30	.57735	Agree
I actively seek professional development opportunities to enhance my technology integration skills	4.27	.58353	Agree
Weighted Mean	4.282	.18661	Agree

Legend: (5) 4.50 – 5.00=Strongly Agree; (4) 3.50 – 4.49=Agree; (3) 2.50 – 3.49=Undecided; (2)1.50 – 2.49=Disagree; (1)1.00 – 1.49=Strongly Disagree

The level of teachers’ knowledge in classroom technology, as presented in Table 2 yielded a weighted mean of 4.282 (SD = 0.18661), interpreted as Agree. The use of weighted mean is appropriate in this analysis as it summarizes multiple item responses into a single representative value, allowing a clearer assessment of the overall level of technological knowledge among respondents. The results indicate that teachers generally possess a strong level of familiarity with digital tools, including troubleshooting, adapting to technological changes, and engaging in professional development related to technology integration. The consistently high mean scores across individual indicators further suggest that knowledge is not limited to isolated skills but reflects a broad understanding of technology use in instructional contexts. This overall pattern demonstrates that teachers have developed a stable level of technological awareness necessary for classroom application.

Table 3. Levels of Preparedness for Classroom Technology Integration

Statements	Mean	S.D.	Description
------------	------	------	-------------

My teacher preparation program exposed me to various technology tools used In teaching.	3.14	.58638	A lot
My pre-service training equipped me with skills to teach using technology tools.	3.15	.59246	A lot
My pre-service teacher education program included sessions focused on integrating technology into instruction.	3.13	.56237	A lot
My program trained me to design lessons using technology that address diverse learner needs.	3.12	.57349	A lot
My instructors effectively demonstrated the integration of content, technology, and pedagogy during their lessons.	3.12	.59084	A lot
My teacher education program provided opportunities to practice teaching with technology.	3.17	.57898	A lot
My teacher preparation program guided me in selecting appropriate digital tools across different subject areas.	3.16	.56354	A lot
My training taught me how to plan lessons using online and digital resources.	3.12	.55560	A lot
My teacher education program strengthened my confidence in using technology for lesson planning.	3.17	.58698	A lot
My preparation courses trained me to evaluate and choose suitable instructional technologies.	3.15	.57516	A lot
Weighted Mean	3.143	.18708	A lot

Legend: (4) 3.00 – 4.00=A lot; (3) 2.00 – 2.99=Somewhat; (2)1.00 – 1.99=A little; (1)0.99 – 1.00=Not at all

Table 3 presents the level of preparedness of teachers for integrating technology, with a weighted mean of 3.143 (SD = 0.18708), described as A lot. The weighted mean was utilized to provide a consolidated measure of perceived readiness based on multiple indicators related to training, exposure, and instructional preparation. The findings indicate that teachers generally perceive themselves as adequately prepared to incorporate technology into teaching, particularly in areas such as lesson planning, selection of digital tools, and prior exposure during teacher education. However, compared to the knowledge dimension, the slightly lower mean suggests that preparedness is more closely tied to formal training experiences rather than independent skill acquisition. This implies that while teachers have been introduced to technology integration, their readiness may still depend on the depth and continuity of their training experiences.

Table 4. Levels of Self-Efficacy in Using Classroom Technology

Statements	Mean	S.D.	Description
I am confident that I can effectively teach relevant topics through the appropriate use of technology	4.11	.60126	Agree
I believe that I possess the necessary skills to use computers for instructional purposes.	4.10	.57735	Agree
I am confident in my ability to assess software for teaching and learning purposes	4.13	.58006	Agree
I am certain that I can regularly integrate technology into my lessons when it supports student learning.	4.08	.61431	Agree
I am confident in choosing suitable technology aligned with curriculum standards	4.04	.61824	Agree
I am confident that I will be able to use technology effectively in my teaching.	4.10	.61134	Agree
I am certain that I can consistently employ instructional technology in beneficial ways.	4.12	.57349	Agree

I am confident that I can provide customized feedback to pupils as they use technology.	4.07	.60728	Agree
I am certain that I can encourage students to actively engage in technology-based learning activities	4.11	.61783	Agree
I am confident that I have sufficient understanding of computer skills to fully utilize them in my clas'room	4.11	.58422	Agree
Weighted Mean	4.097	.19251	Agree

Legend: (5) 4.50 – 5.00=Strongly Agree; (4) 3.50 – 4.49=Agree; (3) 2.50 – 3.49=Undecided; (2)1.50 – 2.49=Disagree; (1)1.00 – 1.49=Strongly Disagree

The level of self-efficacy among teachers in using classroom technology, as shown in Table 4, obtained a weighted mean of 4.097 (SD = 0.19251), interpreted as Agree. The weighted mean provides an overall estimate of teachers' confidence across different aspects of technology use, including instructional application, decision-making, and student engagement. The results indicate that teachers generally believe in their capability to use digital tools effectively in teaching. High mean scores across indicators such as integrating technology into lessons and selecting appropriate tools suggest a consistent level of confidence. However, the slightly lower value compared to knowledge indicates that confidence, while positive, may not be uniformly reinforced by actual experience in more complex or sustained technology integration. This reflects that self-efficacy is present but may vary depending on practical classroom conditions.

Objective 2. Examine the extent to which these dimensions differ based on educational attainment and analyze the nature and strength of the relationships among knowledge, preparedness, and self-efficacy.

Table 5. Differences in Preparedness, Knowledge, and Self-Efficacy According to Educational Attainment

SOURCES OF VARIATION	Sum of Squares	df	Mean Square	Sig.	Description
Knowledge					Significant
Between Groups	.756	2	.378	.000	
Within Groups	2.691	97	.028		
Total	3.448	99			
Preparedness					Significant
Between Groups	.332	2	.166	.008	
Within Groups	3.133	97	.032		
Total	3.465	99			
Self-efficacy Beliefs					Significant
Between Groups	.344	2	.172	.008	
Within Groups	3.325	97	.034		
Total	3.669	99			

Significance at alpha 0.05

The analysis in Table 5 reveals that educational attainment significantly influences teachers' knowledge, preparedness, and self-efficacy, as indicated by the computed F-values and significance levels ($p < 0.05$). Specifically, knowledge ($F = 13.628, p = .000$), preparedness ($F = 5.133, p = .008$), and self-efficacy ($F = 5.012, p = .008$) all show statistically significant differences across groups. These results indicate that teachers with higher educational qualifications demonstrate stronger levels across the three dimensions. The use of analysis of variance (ANOVA) in this case allows comparison across multiple groups, making it appropriate for identifying whether differences exist based on educational attainment. The findings suggest that advanced academic exposure contributes to more developed technological understanding, readiness, and confidence in classroom application.

Table 6. Correlation Among Knowledge, Preparedness, and Self-Efficacy

Variables	Pearson <i>r</i>	Sig.	N	Description
Knowledge				
Preparedness	.083**	.411	100	No Correlation
Self-efficacy Belief	.103**	.310	100	No Correlation
Preparedness				

Self-efficacy Belief	.166**	.000	100	Low Correlation
-------------------------	--------	------	-----	-----------------

Table 6 presents the relationships among knowledge, preparedness, and self-efficacy using Pearson correlation coefficients. The results show that the relationships among these variables are either negligible or weak, with coefficients of $r = 0.083$ (knowledge–preparedness), $r = 0.103$ (knowledge–self-efficacy), and $r = 0.166$ (preparedness–self-efficacy). While the relationship between preparedness and self-efficacy is statistically significant ($p = .000$), its strength remains low. Pearson correlation is used in this analysis to determine the direction and strength of association between continuous variables, making it suitable for examining how these dimensions relate. The results indicate that although teachers report favorable levels in knowledge, preparedness, and self-efficacy, these dimensions do not strongly correspond with one another. This pattern suggests that each dimension develops with a degree of independence rather than as a tightly interconnected set of competencies.

4. DISCUSSION

Findings indicate that elementary school teachers demonstrate favorable levels of knowledge, preparedness, and self-efficacy in classroom technology, yet the interaction among these dimensions remains limited. High knowledge scores suggest that teachers have developed familiarity with digital tools and basic operational skills, reflecting exposure to evolving technological demands in education. Such patterns support the assertion that technological familiarity often emerges from continuous engagement rather than formal instruction alone (Deping and Xiukui, 2025). However, familiarity does not automatically translate into deeper pedagogical application, indicating that knowledge remains largely functional rather than integrative in nature.

Preparedness results reveal that teachers perceive themselves as ready to implement technology in instruction, yet this readiness appears strongly tied to prior training experiences. Structured exposure during teacher education contributes to perceived readiness, as noted in similar observations that training environments shape teachers’ ability to integrate instructional tools effectively (Ariyibi and Olasupo, 2025; Foykas et al., 2025). Despite this, reliance on pre-service preparation suggests that readiness may not evolve consistently in actual classroom practice. Limited continuity in professional development may restrict the transformation of preparedness into sustained instructional use, a concern also raised in discussions of insufficient follow-through in teacher training (Ambon et al., 2024). Additionally, Self-efficacy findings indicate that teachers generally believe in their capability to use technology in teaching, yet confidence does not fully align with actual integration practices. Confidence is often reinforced through repeated successful experiences, where teachers gradually build assurance in their instructional decisions (Kohler, 2019). However, when exposure remains occasional or fragmented, confidence may remain perception-based rather than practice-driven. This aligns with the idea that belief in capability develops not only from knowledge acquisition but from continuous application in real teaching conditions.

A closer examination of variation across educational attainment reveals that teachers with advanced academic preparation demonstrate higher levels of knowledge, preparedness, and self-efficacy. Higher academic engagement provides broader exposure to instructional strategies and reflective practices, which strengthens both competence and confidence in technology use (Granström and Oppi, 2025; Song et al., 2025). Advanced studies often introduce more structured opportunities to explore technology integration, allowing teachers to move beyond basic familiarity toward more refined instructional approaches. Such patterns reinforce the argument that professional advancement enhances both technical understanding and pedagogical alignment in digital instruction. Despite favorable levels across all three dimensions, correlation results indicate weak relationships among knowledge, preparedness, and self-efficacy. Limited association suggests that these dimensions do not develop in a synchronized manner. Knowledge may increase independently through exposure and personal exploration, while preparedness depends on training structures, and self-efficacy develops through experiential reinforcement. This separation supports the observation that technological knowledge alone does not ensure effective instructional use (Zekai and Davut, 2025; Sulistiani et al., 2024). A teacher may understand digital tools yet remain uncertain in applying them meaningfully in classroom situations.

This pattern also reflects a partial divergence from the Technological Pedagogical Content Knowledge framework, which assumes an integrated relationship among knowledge domains (Jimenez et al., 2023). Findings suggest that technological knowledge exists, yet its connection to pedagogical application remains inconsistent. Such disconnection indicates that integration does not occur automatically but requires deliberate alignment between knowledge and instructional intent. Without this alignment, technology use may remain superficial rather than transformative. From a theoretical standpoint, the results provide a nuanced interpretation of Social Cognitive Theory. Self-efficacy is expected to develop through the interaction of knowledge, experience, and environmental support (Woreta et al., 2025; Chen & Gong, 2025). However, weak correlations suggest that these elements are not equally reinforced in the current setting. Confidence appears to be influenced by individual experiences rather than structured developmental pathways (Garbenis et al., 2025). This indicates that belief in capability may evolve independently rather than as a direct outcome of knowledge and preparedness.

Local conditions further explain this pattern. In Philippine elementary schools, uneven access to resources and support mechanisms influences how teachers engage with technology. Teachers often rely on personal initiative to compensate for limited institutional support, leading to uneven development of competence and confidence (Linda and Raphaela, 2021; Ngoveni et al., 2025). Such conditions create variability in how knowledge, preparedness, and self-efficacy emerge, reinforcing the idea that these dimensions are shaped by both structural and individual factors. The weak linkage among variables highlights the need for more coherent professional development approaches that move beyond isolated training sessions. Continuous and practice-oriented learning experiences strengthen the connection between knowledge and application, allowing teachers to internalize technological integration as part of their instructional routine (Chiu, 2022; Theodorio, 2024). Sustained engagement encourages the gradual alignment of knowledge, preparedness, and confidence, reducing the gap observed among these dimensions.

Findings suggest that while elementary school teachers possess the necessary foundation in classroom technology, the development of integrated competence remains uneven. Knowledge,

preparedness, and self-efficacy exist at favorable levels, yet their limited interaction indicates that capability is not fully consolidated. Strengthening the alignment among these dimensions requires structured support, consistent application, and opportunities for reflective practice, enabling teachers to translate technological familiarity into meaningful instructional use.

5. CONCLUSION

The findings confirm that elementary school teachers demonstrate favorable levels of knowledge, preparedness, and self-efficacy in the use of classroom technology, indicating that a foundational level of capability is already present in digital instruction. Teachers show familiarity with technological tools, perceive themselves as adequately prepared through prior training, and express confidence in applying technology in teaching. Variation across educational attainment further indicates that higher academic exposure is associated with stronger levels of competence and confidence, suggesting that professional advancement contributes to more developed technological capability.

However, the analysis addressing the central gap reveals that these dimensions do not operate as a strongly integrated set of competencies. Despite all three being rated at favorable levels, the relationships among knowledge, preparedness, and self-efficacy remain weak, indicating that each develops along separate pathways rather than through a unified progression. Knowledge tends to advance through exposure and individual engagement, preparedness is shaped through formal training experiences, and self-efficacy is reinforced through actual classroom application. This separation explains why high levels in one dimension do not necessarily correspond to equally strong levels in the others, thereby clarifying the limited interaction identified in the introduction.

These findings suggest that strengthening classroom technology use requires more than increasing individual components; alignment among knowledge, preparedness, and self-efficacy must be deliberately supported through continuous and practice-oriented development. Efforts that connect training, application, and reflective experience may enable a more coherent development of technological capability among teachers. Further inquiry may explore how sustained professional development, resource availability, and institutional support influence the long-term integration of these dimensions across diverse educational environments.

References

- Afeni, & Ariyibi, O., & Olasupo. (2025). Teachers' readiness and professional development for technology integration in the 21st-century Nigerian classroom. *Contemporary Research Analysis Journal*, 2. <https://doi.org/10.55677/CRAJ/03-2025-Vol02112>
- Ambon, J., Alias, B., Komariah, A., & Mansor, A. (2024). The impact of continuous professional development on teaching quality: A systematic review. *International Journal of Evaluation and Research in Education*, 13. <https://doi.org/10.11591/ijere.v13i6.30427>

Asula-Abaver, M. S., & Machaba, M. F. (2026). Digital tools for inclusive education: Enhancing learning experiences in mathematics for students with special needs. *Education Sciences*, 16(3), 500. <https://doi.org/10.3390/educsci16030500>

Ayik, Z., & Gul, M. D. (2025). The impact of teachers' technological self-efficacy on gifted technological pedagogical content knowledge: A case study. *Asya Studies*, 9, 1–24. <https://doi.org/10.31455/asya.1619664>

Bowman, M. A., Vongkulluksn, V. W., Jiang, Z., & Xie, K. (2022). Teachers' exposure to professional development and the quality of their instructional technology use: The mediating role of teachers' value and ability beliefs. *Journal of Research on Technology in Education*, 54(2), 188–204. <https://doi.org/10.1080/15391523.2020.1830895>

Cabalbag, J. R. (2025). Technology integration: Impact to students' learning engagement in higher education institutions. *Cogent Education*, 12(1). <https://doi.org/10.1080/2331186X.2025.2581410>

Celeste, R. J., & Osias, N. (2024). Challenges and implementation of technology integration: Basis for enhanced instructional program. *American Journal of Arts and Human Science*, 3, 106–130. <https://doi.org/10.54536/ajahs.v3i2.2656>

Chavez, J., & Lamorinas, D. D. (2023). Reconfiguring assessment practices and strategies in online education during the pandemic. *International Journal of Assessment Tools in Education*, 10(1), 160–174.

Chavez, J. V., Cuilan, J. T., Mannan, S. S., et al. (2024). Discourse analysis on the ethical dilemmas on the use of AI in academic settings from ICT, science, and language instructors. *Forum for Linguistic Studies*, 6(5), 349–363. <https://doi.org/10.30564/fls.v6i5.6765>

Chen, R., Liu, Y., & Gong, Y. (2025). Impact of self-concept and self-efficacy on foreign language learners in online and face-to-face learning contexts in China. *SAGE Open*, 15(4).

Chiu, T. K. F. (2022). School learning support for teacher technology integration from a self-determination theory perspective. *Educational Technology Research and Development*, 70(3), 931–949. <https://doi.org/10.1007/s11423-022-10096-x>

Darwish, S., Alodat, A., Al-Hendawi, M., & Ianniello, A. (2025). General education teachers' perspectives on challenges to the inclusion of students with intellectual disabilities in Qatar. *Education Sciences*, 15(7), 908. <https://doi.org/10.3390/educsci15070908>

Deping, Z., & Xiukui, S. (2025). From challenges to chances in the digital age: Psychological transformation in EFL teachers in Chinese teacher education institutions. *Frontiers in Education*, 10, 1606932. <https://doi.org/10.3389/feduc.2025.1606932>

Diamante, R. E. J., Martin, A. B., Berry, E. B., et al. (2025). Developing trust and confidence in the delivery of AI-oriented teaching strategies among non-ICT expert teachers. *Environment and Social Psychology*, 10(8), 3851. <https://doi.org/10.59429/esp.v10i8.3851>

Foykas, E., Raikou, N., Beazidou, E., & Karalis, T. (2025). Transformative potential in special education: How perceived success, training, exposure, and experience contribute to teacher readiness for inclusive practice. *Education Sciences*, 15(11), 1476. <https://doi.org/10.3390/educsci15111476>

Franco, M. P., Bottiani, J. H., & Bradshaw, C. P. (2024). Assessing teachers' culturally responsive classroom practice in PK–12 schools: A systematic review of teacher-, student-, and observer-report measures. *Review of Educational Research*, 94(5), 743–798.

Garbenis, S., & Kaffemaniene, I. (2025). Developing traits of self-confidence and intrinsic motivation in students with severe special educational needs in physical education lessons. *Behavioral Sciences*, 15(11), 1449. <https://doi.org/10.3390/bs15111449>

Granström, M., & Oppi, P. (2025). Student engagement with AI tools in learning: Evidence from a large-scale Estonian survey. *Frontiers in Education*, 10, 1688092. <https://doi.org/10.3389/educ.2025.1688092>

Hobbs, L., & Porsch, R. (2021). Teaching out-of-field: Challenges for teacher education. *European Journal of Teacher Education*, 44, 601–610. <https://doi.org/10.1080/02619768.2021.1985280>

Jiménez Sierra, Á. A., Ortega Iglesias, J. M., Cabero-Almenara, J., & Palacios-Rodríguez, A. (2023). Development of the teacher's technological pedagogical content knowledge (TPACK) from the lesson study: A systematic review. *Frontiers in Education*, 8, 1078913. <https://doi.org/10.3389/educ.2023.1078913>

Kohler, E. (2019). Sources of teachers' self-efficacy for technology integration from formal, informal, and independent professional learning. *Educational Technology Research and Development*, 68. <https://doi.org/10.1007/s11423-019-09671-6>

Leon, A. J. T. D., Jumalon, R. L., Chavez, J. V., et al. (2024). Analysis on the implementation of inclusive classroom: Perception on compliances and obstructions of selected public-school teachers. *Environment and Social Psychology*, 9(9), 2537. <https://doi.org/10.59429/esp.v9i9.2537>

Mayantao, R., & Tantiado, R. (2024). Teachers' utilization of digital tools and confidence in technology. *International Journal of Multidisciplinary Research and Analysis*, 7. <https://doi.org/10.47191/ijmra/v7-i05-16>

Md Sabri, S., Ismail, I., Annuar, N., Abdul Rahman, N., Abd Hamid, N. Z., & Abd Mutalib, H. (2024). A conceptual analysis of technology integration in classroom instruction towards

enhancing student engagement and learning outcomes. *International Journal of Education Psychology and Counseling*, 9, 750–769. <https://doi.org/10.35631/IJEPC.955051>

Ngoveni, M. A., Mphuthi, G. T., Maile, L. M., Mulaudzi, R. V., Tefo, R. M., & Pitsoane, E. M. (2025). Willing but underserved: Interpreting digital training needs of Grade 8–12 teachers in a rural Libangeni circuit. *Education Sciences*, 15(11), 1557. <https://doi.org/10.3390/educsci15111557>

Qangule, T., & Letuma, M. C. (2025). One teacher, many grades: Foundation phase teachers' experiences in multigrade classroom management. *Frontiers in Education*, 10, 1685825. <https://doi.org/10.3389/educ.2025.1685825>

Samaniego López, M. V., Orrego Riofrío, M. C., Barriga-Fray, S. F., & Paz Viteri, B. S. (2025). Technologies in inclusive education: Solution or challenge? A systematic review. *Education Sciences*, 15(6), 715. <https://doi.org/10.3390/educsci15060715>

Siyam, Y., Siyam, N., Hussain, M., & Alqaryouti, O. (2025). Evaluating technology integration in education: A framework for professional development. *Discover Education*, 4. <https://doi.org/10.1007/s44217-025-00448-z>

Song, Y., Lv, S., Wang, M., Wang, Z., & Dong, W. (2025). The impact of digital learning competence on the academic achievement of undergraduate students. *Behavioral Sciences*, 15(7), 840. <https://doi.org/10.3390/bs15070840>

Sulistiani, I., Setyosari, P., Sa'dijah, C., & Praherdhiono, H. (2024). Technological pedagogical content knowledge of preservice elementary teachers: Relationship to self-regulation and technology integration self-efficacy. *European Journal of Educational Research*, 12, 159–170. <https://doi.org/10.12973/eu-jer.13.1.159>

Theodorio, A. O. (2024). Examining the support required by educators for successful technology integration in teacher professional development program. *Cogent Education*, 11(1). <https://doi.org/10.1080/2331186X.2023.2298607>

Woreta, G. T., Zewude, G. T., & Józsa, K. (2025). The mediating role of self-efficacy and outcome expectations in the relationship between peer context and academic engagement: A social cognitive theory perspective. *Behavioral Sciences*, 15(5), 681. <https://doi.org/10.3390/bs15050681>