IJIMR
INTERNATIONAL JOURNAL OF INNOVATIVE AND MULTIDISCIPLINARY RESEARCH

ISSN: 3116-5990 online / 3116-5982 print
Volume 1 Issue No. 4
Copyright © EduHeart Knowledge Network and Publishing Inc. Phils.
DOI: https://doi.org/10.66206/eduheart.ijimr.54

Influence of Technology-Integrated Applications in Mathematics and Technological Competence on the Engagement and Achievement of Public Junior High School Learners

Sheila Mae N. Borja[1*]
[1]*Graduate School, Northwest Samar State University, Calbayog City, Samar, Philippines*
Corresponding Author: Sheila Mae N. Borja, Northwest Samar State University

ARTICLE INFO

Date Received: September 15, 2026

Date Reviewed: September 30, 2026

Date Accepted: October 30, 2026

Date Published:
November 20, 2026

KEYWORDS

constructionism; cognitive load theory; authentic learning; technological competence; engagement; mathematics achievement

ABSTRACT

Learning theories predict that technology improves mathematics learning when it lets learners construct, explore, and apply ideas rather than only watch them presented. Guided by constructionism, Cognitive Load Theory, and authentic learning, this descriptive-correlational study examined the influence of technology-integrated applications in mathematics and teachers' technological competence on the engagement and achievement of public junior high school learners in the Trinidad 1 and Trinidad 2 Districts, DepEd Schools Division of Bohol, in School Year 2025–2026. Data from 42 mathematics teachers and 323 learners were gathered with pilot-tested scales (α = .82 to .87) and analyzed using weighted means, chi-square, and Pearson correlation. Technology was used mainly for content delivery (*M* = 3.22), while learner-centered uses such as digital tools (*M* = 2.20), technology-based engagement (*M* = 2.23), and digital assessment (*M* = 2.05) were limited. Teachers were Competent across 30 skills, strongest in general productivity and weakest in creating interactive modules (2.90) and troubleshooting (2.90). Learners were Highly Engaged in motivation (*M* = 3.34) and rated their concept understanding highest (*M* = 3.28) and real-world application lower (*M* = 2.92). Teachers' education, position, experience, and training, and learners' home resources were related to the variables. Utilization correlated positively with teachers' competence (*r* = .412), learners' engagement (*r* = .385), and achievement (*r* = .362). The results are consistent with the theories but indicate that presentational use leaves much of technology's potential unrealized. A Learning Action Cell emphasizing learner-constructed, authentic, and well-structured digital tasks is proposed.

Introduction

Educational technology can be used to make mathematics either more passive or more active. A projected slide can replace the chalkboard without changing what learners do, while a simulation, a data-modeling task, or a collaborative digital problem can turn learners into investigators. Theories of learning predict that only the second kind of use will substantially affect engagement and achievement, and research supports this distinction: technology improves outcomes most when it redesigns tasks rather than substitutes for traditional tools (Abildinova et al., 2024; Arslan & Aksu, 2022; Bozkus, 2021).

Teachers' technological competence is the hinge on which this distinction turns. Teachers need technical skill, pedagogical judgment, and confidence to move beyond presentation (Gumiero & Pazuch, 2024; Tondeur et al., 2017), and many lack the training and support to do so,

particularly in schools with limited resources (Musasa et al., 2025; Hodges & Prater, 2014). Philippine junior high schools in rural districts face both constraints at once: modest teacher preparation in technology and learners with limited devices and connectivity.

Grounded in constructionism, Cognitive Load Theory, and authentic learning, this study examined the influence of technology-integrated applications in mathematics and teachers' technological competence on the engagement and achievement of public junior high school learners in the Trinidad 1 and Trinidad 2 Districts, DepEd Schools Division of Bohol, during School Year 2025–2026. It described the extent of utilization of technology-enhanced applications, teachers' competence at the level of specific skills, and learners' engagement and self-assessed achievement; tested the relationships of teachers' and learners' profiles with these variables; and tested whether utilization is significantly related to competence, engagement, and achievement. Influence is examined in the sense of significant association, consistent with the correlational design. The results informed a district-based Learning Action Cell (LAC).

Literature Review

Three Theoretical Lenses

Constructionism. Constructionism extends constructivism by proposing that learners build understanding most effectively when they make artifacts, such as models, programs, or simulations, that embody their ideas. Digital environments are natural settings for such making, and constructionist approaches support computational thinking in mathematics (Yunianto, 2024). From this perspective, technology that learners only watch contributes far less than technology they use to create.

Cognitive Load Theory. Cognitive Load Theory holds that working memory is limited, so instruction must minimize extraneous load and support the germane processing that builds schemas. Technology can either reduce load, for example by visualizing relationships or offloading calculation, or increase it through cluttered interfaces and distractions (Asma, 2020). Immediate feedback and well-designed tools can support germane load by prompting reflection (Chin & Ming, 2024).

Authentic learning and Realistic Mathematics Education. Authentic learning holds that knowledge is acquired best through complex, meaningful tasks resembling those outside school, and Realistic Mathematics Education describes how learners progressively mathematize real situations through guided reinvention (Da, 2023; Wijaya, 2023). Technology supports these approaches through dynamic software and real data (Forgasz & Forster, 2021; Wardana, 2024).

Integration models. The SAMR model describes how far technology transforms tasks, from substitution through augmentation and modification to redefinition (Gillespie, 2022; Blundell, 2022). TPACK describes the integrated knowledge teachers need, and its assessment is challenging (You et al., 2019). Teachers' pedagogical beliefs mediate both (Tondeur et al., 2017).

ISSN: 3116-5990 online / 3116-5982 print
Copyright @ EduHeart Knowledge Network and Publishing Inc. Phils.
DOI: https://doi.org/10.66206/eduheart.ijimr.54

Evidence on Outcomes

Technology-enhanced learning environments improve conceptual understanding, engagement, and problem-solving (Srilatha & Sen, 2024), graphing software deepens understanding of functions (Yang et al., 2021), and web-based instruction has positive effects on achievement (Akın, 2022). Effects are mediated by interest (Bright, 2024; Wong & Wong, 2019) and depend on infrastructure and professional support (Boadu, 2024). Technology also supports collaborative reasoning (Webb et al., 2019) and, through AI, personalized learning (Awang et al., 2025).

Conditions for Integration

Teachers' confidence and knowledge shape their use of digital tools (Gumiero & Pazuch, 2024), skill gaps feed resistance (Bećirović, 2023), and sustained, content-specific professional development is needed to build competence (Darling-Hammond, 2020; Hodges & Prater, 2024). Infrastructure, technical support, and curricular alignment determine whether competence can be applied (Herro et al., 2021; Graham et al., 2020; Zulu, 2020).

Methodology

Design. The study used a descriptive-correlational design (Creswell & Creswell, 2018), which has been applied in comparable Philippine research on teachers' digital competence and learner engagement (Caberos & Dioso, 2025).

Participants. All 42 mathematics teachers of six public secondary schools in the Trinidad 1 and Trinidad 2 Districts were included through complete enumeration, and 323 learners from Grades 7 to 10 were selected through stratified random sampling.

Instruments. Four Likert-type scales were used: extent of utilization of technology-enhanced applications in content delivery, problem-solving, digital tools, classroom engagement, and assessment (Haris, 2022); teachers' technological competence in six domains (Gumiero & Pazuch, 2024); learners' engagement in participation, motivation, collaboration, and attention (Jacinto, 2023); and learners' mathematical achievement in concept understanding, procedural fluency, problem-solving, real-world application, and formula memorization (Kirabo et al., 2024). Achievement items asked learners to judge their own competence when learning with technology. Means were interpreted as high (3.26–4.00), moderate (2.51–3.25), or low (1.76–2.50). Pilot testing with 15 teachers and 15 learners in San Miguel District gave alphas of .84, .82, .85, and .87 for the four scales.

Procedure and analysis. Following approval and endorsements from the Graduate School, District Supervisors, and school heads, the researchers oriented teachers, administered the questionnaires outside class time, and retrieved them personally. Frequencies, percentages, weighted means, chi-square, and Pearson's r were used at $\alpha = .05$.

Ethics. Informed consent and parental consent were obtained, participation was voluntary, and data were coded and secured in accordance with the Data Privacy Act of 2012.

Results and Discussion

Respondents

The teachers were mainly 31 to 50 years old (64.28%) and female (61.90%), with a bachelor's degree as the most common highest qualification (54.76%), followed by master's units (28.57%), a master's degree (11.90%), and a doctorate (4.76%). Most were Teacher I (42.86%) or Teacher III (35.71%), and training exposure was modest, with 7.14% reporting none. The learners were mostly 13 and 14 years old (63.47%), slightly more male (51.08%), and largely from low-income households: 76.77% earned ₱20,000 or less a month. Only 18.58% had a laptop and 7.74% a desktop computer at home, and 27.25% had no internet.

How Technology Is Used

Utilization was moderate in content delivery (M = 3.22) and problem-solving (M = 2.62) and low in the use of digital tools (M = 2.20), classroom engagement (M = 2.23), and assessment practices (M = 2.05). Presenting concepts clearly with technology (3.50) and using interactive software to explain topics (3.30) were Highly Utilized. In contrast, learners rarely used data collection and analysis tools (2.00), digital whiteboards or tablets (2.10), gamified platforms (2.10), or digital portfolios (1.90).

Through the constructionist lens, this profile shows that technology is used mainly for teachers' demonstration rather than learners' construction. The practices that would let learners build and test mathematical ideas, such as simulations (2.50), data analysis (2.00), and digital collaboration (2.20), are among the least used (Yunianto, 2024). Through the authentic-learning lens, real-world problems presented through technology (3.10) and challenging online problems (2.40) are moderate to low, which limits learners' opportunities to mathematize real situations (Da, 2023; Wijaya, 2023). In SAMR terms, integration is concentrated at substitution and augmentation (Gillespie, 2022; Arslan & Aksu, 2022).

Teachers' Technological Competence

Table 1

Teachers' Technological Competence per Indicator (n = 42)

Domain and Indicator	Mean	Level
Basic computer operations	**3.18**	**Competent**
Operates a computer confidently	3.40	Highly Competent
Installs and uses basic applications	3.30	Highly Competent
Manages files and folders effectively	3.20	Competent
Navigates operating systems easily	3.10	Competent
Troubleshoots simple computer issues	2.90	Competent
Setup, maintenance, and troubleshooting	**3.05**	**Competent**
Sets up hardware and software independently	3.15	Competent
Manages classroom technology resources	3.10	Competent
Maintains devices for classroom use	3.05	Competent
Updates and configures software	3.00	Competent
Troubleshoots technical problems effectively	2.95	Competent
Word processing, spreadsheets, and presentation	**3.25**	**Competent**

ISSN: 3116-5990 online / 3116-5982 print
Copyright @ EduHeart Knowledge Network and Publishing Inc. Phils.
DOI: https://doi.org/10.66206/eduheart.ijimr.54

Domain and Indicator	Mean	Level
Creates documents using word processors	3.35	Highly Competent
Prepares presentations with multimedia	3.30	Highly Competent
Uses productivity tools effectively	3.25	Competent
Uses spreadsheets for data analysis	3.20	Competent
Integrates charts and graphs in lessons	3.15	Competent
Web resources use and management	**3.10**	**Competent**
Searches for reliable online resources	3.20	Competent
Evaluates the credibility of web content	3.15	Competent
Integrates web resources into lessons	3.10	Competent
Manages online teaching platforms	3.05	Competent
Guides learners in safe web use	3.00	Competent
Communication media skills	**3.15**	**Competent**
Uses email for academic communication	3.25	Competent
Facilitates discussions using online platforms	3.20	Competent
Uses messaging apps for instruction	3.15	Competent
Manages video conferencing tools	3.10	Competent
Integrates multimedia in communication	3.05	Competent
Content development and management	**2.98**	**Competent**
Designs digital learning materials	3.05	Competent
Manages online content repositories	3.00	Competent
Evaluates and updates digital content	3.00	Competent
Adapts digital content for diverse learners	2.95	Competent
Creates interactive learning modules	2.90	Competent

Note. 3.26–4.00 = Highly Competent; 2.51–3.25 = Competent; 1.76–2.50 = Less Competent.

Teachers were Competent in all six domains (Table 1). Word processing, spreadsheets, and presentation was highest (M = 3.25), and content development and management lowest (M = 2.98). Only three of 30 indicators were Highly Competent, all general skills: operating a computer confidently (3.40), creating documents (3.35), and installing applications (3.30). The weakest indicators were troubleshooting simple issues (2.90), creating interactive learning modules (2.90), adapting digital content for diverse learners (2.95), and troubleshooting technical problems (2.95).

The competence profile parallels the utilization profile. Teachers are most confident with the tools they use to prepare and present lessons and least confident with the skills needed to design interactive, adaptive materials and to keep equipment running. In TPACK terms, their technological knowledge is stronger than their technological pedagogical knowledge (You et al., 2019). This matters for each theoretical lens: constructionist tasks require teachers who can design them, cognitive load management requires teachers who can select and structure tools, and authentic tasks require teachers who can adapt digital content to local contexts (Yunianto, 2024; Asma, 2020; Wijaya, 2023). The weak troubleshooting skills also make integration fragile, since a teacher who cannot fix a problem quickly may abandon a technology-based lesson (Zulu, 2020). A similar gap between routine and specialized competencies was found in a skills mapping of basic education teachers on Samar Island (Panela, 2025d).

Table 2

Chi-Square Tests Between Teachers' Profile and Utilization and Competence

Teacher Profile Variable	Utilization χ^2 (p)	Competence χ^2 (p)
Age	3.84 (.147)	3.12 (.210)
Sex	1.92 (.165)	1.78 (.182)
Civil status	2.10 (.238)	2.36 (.306)
Highest educational attainment	9.65 (.021)*	11.42 (.010)*
Position	8.12 (.041)*	9.08 (.028)*
Years in teaching	10.24 (.018)*	10.95 (.012)*
School	6.45 (.072)	5.84 (.066)
Relevant trainings and seminars	12.36 (.009)*	13.57 (.004)*

Note. *$p < .05$.

Teachers' educational attainment, position, years in teaching, and trainings were significantly related to both utilization and competence, while age, sex, civil status, and school were not (Table 2). Trainings had the largest values ($\chi^2 = 12.36$ and 13.57), followed by years in teaching and educational attainment. Professional learning, not demographics, therefore tracks teachers' technology use and skill, which supports continuing, content-specific professional development (Darling-Hammond, 2020; Hodges & Prater, 2024; Bozkus, 2021). That sex was not related to either variable is consistent with the view that technology competence depends on opportunity rather than gender, although confirming that the scale works equivalently for male and female teachers, as done in a Rasch-based gender analysis of a teacher empowerment scale, would strengthen this conclusion (Panela, 2025a).

ISSN: 3116-5990 online / 3116-5982 print
Copyright @ EduHeart Knowledge Network and Publishing Inc. Phils.
DOI: https://doi.org/10.66206/eduheart.ijimr.54

Learners' Engagement and Achievement

Table 3

Learners' Engagement and Self-Assessed Achievement: Means and Extreme Indicators

Dimension	Mean	Level	Highest Indicator	Lowest Indicator
Engagement				
Participation	3.28	Highly Engaged	Engages in group work using technology (3.35)	Asks questions during technology-enhanced activities (3.20)
Motivation	3.34	Highly Engaged	Technology makes mathematics more interesting (3.40)	Technology boosts confidence in learning math (3.25)
Collaboration	3.20	Engaged	Shares ideas through digital platforms (3.25)	Technology strengthens peer relationships (3.15)
Attention and focus	3.16	Engaged	Interactive tools sustain attention (3.22)	Technology reduces distractions in learning (3.05)
Achievement				
Concept understanding	3.28	Highly Competent	Technology improves comprehension of lessons (3.35)	Can explain concepts using technology (3.20)
Procedural fluency	3.18	Competent	Technology helps in practicing procedures (3.25)	Improves speed in solving problems with technology (3.10)
Problem-solving skills	3.04	Competent	Applies strategies effectively with technology (3.10)	Solves real-world problems better with technology (2.95)
Application to real-world contexts	2.92	Competent	Applies math concepts to real-world problems using technology (3.00)	Technology supports authentic problem contexts (2.85)
Formula memorization	2.84	Competent	Practices formula application through technology (2.90)	Technology supports retention of formulas (2.75)

Note. 3.26–4.00 = Highly Engaged/Highly Competent; 2.51–3.25 = Engaged/Competent.

Learners were Highly Engaged in motivation (M = 3.34) and participation (M = 3.28) and Engaged in collaboration (M = 3.20) and attention (M = 3.16) (Table 3). They rated themselves Highly Competent in concept understanding (M = 3.28) and Competent in the other four achievement areas, with formula memorization lowest (M = 2.84).

Cognitive Load Theory helps explain the engagement results. Technology raised learners' interest (3.40) and enjoyment (3.38), but it reduced distraction less (3.05) and sustained attention only moderately. When tools are introduced without careful structuring, novelty attracts attention without necessarily focusing it on the mathematics (Asma, 2020). The achievement pattern fits authentic learning theory: learners feel that technology helps them understand concepts but are less confident applying mathematics to real situations (2.92), which reflects the limited use of authentic, data-rich tasks (Da, 2023; Forgasz & Forster, 2021). The positive motivational response agrees with evidence that technology raises interest in mathematics (Bright, 2024; Suarez & Dela Cruz, 2025). Learners' readiness to engage may also reflect their post-pandemic circumstances, as Filipino students' well-being and learning were affected during that period (Panela, 2025b).

Learners' school, parents' education, family income, gadgets, and internet access were significantly related to their engagement and achievement, with internet access strongest (χ^2 =

15.36 and 14.88), while age, sex, and parents' occupation were not. Teachers' education, position, experience, and training were also related to learners' engagement and achievement. From a constructionist view, devices and connectivity are the materials of digital making, and learners without them have fewer chances to construct and practice outside class (Yunianto, 2024; Zulu, 2020).

Influence of Utilization on Competence, Engagement, and Achievement

Utilization was significantly and positively related to teachers' competence ($r = .412$, $p = .001$), learners' engagement ($r = .385$, $p = .003$), and learners' achievement ($r = .362$, $p = .005$). Where technology-enhanced applications were used more, teachers were more competent and learners more engaged and more confident in their mathematics.

These associations are consistent with the theoretical expectations. Constructionism and authentic learning predict that greater use of interactive, real-world applications will engage learners and deepen understanding, and the positive coefficients agree (Yunianto, 2024; Wijaya, 2023; Srilatha & Sen, 2024). The moderate size of the coefficients, however, is also consistent with Cognitive Load Theory and SAMR: since most use remains presentational, the potential of technology to influence outcomes is only partly realized (Asma, 2020; Blundell, 2022). The relationship between utilization and competence suggests a reciprocal process in which competence enables use and use builds competence (Gumiero & Pazuch, 2024).

Limitations

Several limitations qualify the claim of influence. The design is correlational and cross-sectional. Achievement was measured through learners' self-assessment of their competence with technology rather than tests or grades, so it may partly reflect engagement and attitudes. Only the three correlations involving utilization were reported; relationships between competence and learner outcomes, and between engagement and achievement, were not tested. Several chi-square tests related one group's profile to the other group's outcomes without describing how teachers and learners were linked. Finally, the pilot reliability table lists 20 competence items, whereas the results report 30.

Implications for the Learning Action Cell

The proposed ten-month, ₱500,000 LAC targets low technological competence, limited access to tools, insufficient mentoring, weak curriculum alignment, and inadequate monitoring. The theoretical reading of the results suggests three priorities. Workshops should teach teachers to design learner-constructed tasks, such as simulations, data modeling, and digital products, rather than presentations. Training should include principles of cognitive load management and troubleshooting so that lessons run smoothly. Lesson planning should anchor technology in local, real-world contexts aligned with the MATATAG curriculum. Mentoring will be essential, as teachers who built research capacity during the pandemic needed sustained collegial support to overcome barriers (Panela, 2025e). Teachers' well-being should also be protected as their responsibilities expand; one study found that university teachers used an AI companion device to manage workplace stress (Panela, 2026).

ISSN: 3116-5990 online / 3116-5982 print
Copyright @ EduHeart Knowledge Network and Publishing Inc. Phils.
DOI: https://doi.org/10.66206/eduheart.ijimr.54

Conclusion

Technology in the mathematics classrooms of the Trinidad Districts is used mainly for presentation, with little use for learner construction, digital collaboration, or assessment. Teachers are competent in general technology skills but weaker in designing interactive content and troubleshooting. Learners are strongly motivated by technology and confident in their conceptual understanding, though less so in applying mathematics to real situations. Professional development and educational attainment among teachers, and home resources among learners, are related to the study variables. Utilization is significantly and positively related to teachers' competence and to learners' engagement and achievement, consistent with constructionist and authentic-learning theories, though the moderate relationships indicate that much of technology's potential remains untapped.

The division should implement a Learning Action Cell that builds teachers' capacity to design learner-centered, authentic, and well-structured technology tasks, supported by mentoring and technical training. Schools should improve access to devices and connectivity and engage parents. Researchers should use tested achievement measures and examine all relationships among the four variables. Attention to learners' continuing recovery from the pandemic is also warranted (Panela, 2025c).

References

Abildinova, G., et al. (2024). Effective use of digital pedagogy in mathematics education and student achievement. *Mathematics Education Research Journal*, *30*(2), 171–202.

Akın, A. (2022). The effectiveness of web-based mathematics instruction: A meta-analysis. *Journal of Educational Technology & Society*, *25*(1), 45–62.

Arslan, Ö., & Aksu, M. (2022). The impact of the SAMR model on student creativity and collaboration in mathematics education. *Journal of Educational Technology & Society*, *25*(2), 115–128.

Asma, H. (2020). Cognitive load theory and its relation to instructional design. *World Journal of Education*, *10*(3), 60–67.

Awang, M., et al. (2025). Artificial intelligence in mathematics education: Potential and challenges. *International Journal of Educational Research*, *124*, 101894.

Bećirović, S. (2023). Teacher beliefs and resistance to technology integration in classrooms. *Education and Information Technologies*, *28*(5), 5679–5698.

Blundell, C. N. (2022). A scoping review of the application of the SAMR model in education. *Computers & Education Open*, *3*, 100078.

Boadu, S. K. (2024). Enhancing students' achievement in mathematics education in the 21st century through technology. *International Journal of Educational Technology*, *12*(1), 33–49.

Bozkus, F. (2021). Teacher digital pedagogy and its impact on students' academic performance in mathematics. *International Journal of Educational Technology*, *18*(1), 35–48.

Bright, A. (2024). The effect of using technology in teaching and learning mathematics on students' mathematics performance. *International Journal of Education and Research, 12*(3), 34–50.

Caberos, M. M., & Dioso, E. D. (2025). Teachers' digital competence and learner engagement: A descriptive-correlational study. *International Journal of Multidisciplinary and Current Educational Research, 7*(2), 112–125.

Chin, Y., & Ming, L. (2024). Automated feedback tools in mathematics education: Enhancing learning and assessment. *Journal of Educational Computing Research, 62*(3), 430–452.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.

Da, N. T. (2023). Realistic mathematics education and authentic learning: A combination of teaching mathematics in high school. *European Journal of Science and Mathematics Education*, *11*(6), 120–135.

Darling-Hammond, L. (2020). Supporting effective technology integration: Professional development and policy. *Educational Researcher*, *49*(3), 193–200.

Forgasz, H., & Forster, P. (2021). The role of technology in integrating real-world applications into mathematics curriculum. *International Journal of Novel Research in Education and Learning*, *11*(6), 106–112.

Gillespie, R. (2022). SAMR: The power of a useful technology integration model. In R. M. Lawless (Ed.), *Technology integration in education* (pp. 45–64). Ontario Tech University Press.

Graham, R., Dilworth, M., & O'Leary, J. (2020). Curriculum and technology integration: Aligning goals and practices. *Journal of Curriculum Studies*, *52*(7), 965–982.

Gumiero, R., & Pazuch, V. (2024). Teacher professional knowledge and confidence in digital technology integration. *International Journal of Instruction*, *17*(2), 45–62. https://doi.org/10.29333/iji.2024.1723a

Haris, A. (2022). Practical technology integration into mathematics education: Approaches, benefits, and challenges. *Remittances Review*, *11*(1), 32–45.

Herro, D., et al. (2021). Barriers to technology integration in mathematics teaching: Insights for educators. *Journal of Mathematics Education*, *14*(2), 32–48.

Hodges, C. B., & Prater, M. (2014). Challenges in technology integration for mathematics classrooms. *Computers in the Schools*, *31*(3), 219–234.

Hodges, C. B., & Prater, M. (2024). Teacher preparedness for technology integration: Revisiting professional development strategies. *Journal of Digital Learning in Teacher Education*, *40*(2), 101–113.

Jacinto, H. (2023). Technology-based clubs and student collaboration in mathematics problem solving. *Journal of Mathematics Education Research, 12*(3), 215–229.

ISSN: 3116-5990 online / 3116-5982 print
Copyright @ EduHeart Knowledge Network and Publishing Inc. Phils.
DOI: https://doi.org/10.66206/eduheart.ijimr.54

Kirabo, J., Batiibwe, M., Mbulankende, R., & Lie, J. (2024). Technology-supported problem-based learning and pre-service teachers' design of authentic tasks. *Education and Information Technologies*, *29*(5), 6123–6142.

Musasa, M., Chikasha, J., & Dube, T. (2025). Barriers to effective technology integration in mathematics education. *African Journal of Educational Technology*, *14*(1), 33–49.

Panela, T. L. V. (2025a). Gender-based analysis of Teacher Empowerment Scale: Examining factor structure and Rasch model fit in higher education. *Environment and Social Psychology*, *10*(11), 3570. https://doi.org/10.59429/esp.v10i11.3570

Panela, T. L. V. (2025b). Assessing Ways through Research and Augmentation (AWRA): Impact of COVID-19 pandemic on the mental health of college students in the Philippines Phase 1. *Innovations*, *80*, 462–475. https://journal-innovations.com/assets/uploads/doc/346b3-462-475.16805.pdf

Panela, T. L. V. (2025c). Assessing Ways through Research and Augmentation (AWRA): Impact of COVID-19 pandemic on the mental health of college students in the Philippines Phase 2. *Innovations*, *80*, 476–489. https://journal-innovations.com/assets/uploads/doc/886c9-476-489.16806.pdf

Panela, T. L. V. (2025d). Mapping the research landscape: Evaluating skills and competencies of basic education teachers in Samar Island, Philippines. *Innovations*, *80*, 490–506. https://journal-innovations.com/assets/uploads/doc/1b29b-490-506.16830.pdf

Panela, T. L. V. (2025e). Navigating barriers and building capacity: A phenomenological study of teachers' action research experiences in Samar Island during the COVID-19 pandemic. *Innovations*, *80*, 507–530. https://journal-innovations.com/assets/uploads/doc/6f255-507-530.16831.pdf

Panela, T. L. V. (2026). Finding comfort in digital companions: University teachers' lived experiences using the Xiaopa AI companion toy for workplace stress management. *International Journal of Biosciences (IJB)*, *28*(5), 186–194. https://doi.org/10.12692/ijb/28.5.186-194

Srilatha, P., & Sen, R. (2024). Technology-enhanced learning in mathematics: Conceptual understanding, engagement, and problem-solving. *Journal of Digital Pedagogy*, *6*(2), 101–118.

Suarez, M., & Dela Cruz, J. (2025). Gamification and digital resources in mathematics education: Impacts on student interest and achievement. *Philippine Journal of Educational Technology*, *15*(1), 77–93.

Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: A systematic review of qualitative evidence. *Educational Technology Research and Development*, *65*(3), 555–575. https://doi.org/10.1007/s11423-016-9481-2

Wardana, R. (2024). Real-world applications of mathematics through digital tools: A classroom study. *Asian Journal of Mathematics Education*, *12*(4), 321–338.

Webb, N. M., et al. (2019). Collaborative mathematical reasoning supported by digital tools. *Educational Technology Research and Development*, *67*(4), 765–785.

Wijaya, A. (2023). Integration of technology and authentic mathematical tasks: Effects on engagement and achievement. *Mathematics Education Review*, *35*(1), 47–65.

Wong, P., & Wong, C. (2019). The effect of mathematics interest on middle school student achievement. *Journal of Mathematics Education*, *12*(3), 78–93.

Yang, J., et al. (2021). Using graphing software to enhance functions understanding in secondary mathematics. *Journal of Educational Computing Research*, *59*(5), 876–895.

You, M., et al. (2019). Challenges in assessing TPACK: Teacher perspectives and institutional barriers. *Journal of Technology and Teacher Education*, *27*(4), 423–445.

Yunianto, W. (2024). A constructionist approach in learning computational thinking in mathematics. *Journal of Instructional Technology*, *23*(4), 83–102.

Zulu, R. (2020). Barriers to technology integration in disadvantaged schools. *Journal of Information Technology Education*, *19*, 1–14.