

ENHANCING THE LEVEL OF INTEGRATION AND ACCEPTABILITY OF ICT IN SCIENCE MICRO-TEACHING USING TECHNOLOGY-MEDIATED INSTRUCTION

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ABSTRACT

This research aimed to determine the effect of technology-mediated instruction in enhancing the level of technology integration and acceptability among second-year pre-service elementary teachers at President Ramon Magsaysay State University, Botolan Campus, in Zambales. This action research employed a pre-test–post-test design using survey questionnaires to measure the respondents' level of technology integration and acceptability before and after the intervention, which consisted of implementing technology-mediated instruction during science micro-teaching sessions. Findings revealed that prior to the intervention, the pre-service teachers only sometimes integrated technology into their teaching, though they already found it acceptable as a teaching tool. After the intervention, however, they reported often integrating technology and continued to find it acceptable in their teaching. Statistical analysis further indicates a significant difference in both technology integration and acceptability before and after the intervention. The study concludes that technology-mediated instruction enhances technology integration and acceptability among pre-service teachers in science micro-teaching. It recommends training and workshops for pre-service teachers, as well as mentorship and the inclusion of technology-mediated instruction in education courses.

Keywords: action research, level of technology integration and acceptability, technology-mediated instruction

INTRODUCTION

In the past five decades, technology has shifted from being a distinct concept to becoming an indispensable part of daily life, shaping communication, healthcare, transportation, and education. Across the world, education systems are confronted with the challenge of meaningfully integrating technology into teaching and learning. Although research affirms that technology enhances teaching quality, supports knowledge acquisition, develops skills, and increases learner motivation (Akram et al., 2021; Chen et al., 2018), many institutions continue to struggle with how to embed digital tools effectively into classroom practice. This continuing challenge highlights the urgent need to prepare teachers who can navigate and maximize technology for 21st-century education.

Different countries have taken active steps in response. Singapore has consistently incorporated digital technologies into its curriculum design, teaching strategies, and assessment processes to ensure that students are future-ready (Tan et al., 2017). Pakistan has also emphasized the role of ICT in its national education policies to align with international standards (Pakistan Ministry of Education, 2018). In the Philippines, the Enhanced Basic Education Act or Republic Act 10533 mandates the use of information and communication technologies to promote high-quality and globally competitive learning (Smiths, 2021). The Commission on Higher Education (CHED), through Memorandum Order No. 74 series of 2017, further strengthens this by requiring science teaching courses in the Bachelor of Elementary Education curriculum. These courses aim to develop pre-service teachers' pedagogical content knowledge, inquiry-based science instruction, instructional material development, and assessment strategies, all of which include the use of technology to accelerate teaching and learning. Despite these policy directions, many teachers still lack confidence and adequate preparation in integrating ICT effectively into their practice. Within teacher education institutions, this gap becomes evident in the preparation of pre-service teachers. Micro-teaching, a widely used training method, provides future educators with opportunities to refine their instructional skills in a controlled setting.

However, the integration of technology into micro-teaching remains limited. Studies have shown that incorporating ICT in science teaching enhances engagement, collaboration, and deeper understanding of concepts (zhogchuk, 2019; Yang & Baldwin, 2020). Technology-Mediated Instruction (TMI), as defined by the California State University Academic Senate, leverages digital platforms to enrich teaching and inspire both teachers and learners to adapt to technological innovations. Research has consistently confirmed that TMI improves academic performance, motivation, and self-directed learning but also underscores the need for adequate training and institutional support (Su & Cheng, 2015; Renapure et al., 2023).

This study is expected to help pre-service elementary teachers by enhancing their skills in integrating technology into science micro-teaching. School administrators, teachers, and facilitators may also use the findings as a guide or baseline for implementing and improving technology-mediated instruction. Furthermore, the results can provide valuable reference for academic researchers seeking to advance future studies on technology integration in teacher education; thus, this study is conducted.

STATEMENT OF THE PROBLEM

This study aimed to test the effect of Technology-Mediated Instruction in enhancing the integration and acceptability on ICT in science micro-teaching of pre-service elementary teachers of President Ramon Magsaysay State University - Botolan Campus.

Specifically, the study sought to answer the following questions:

1. What is the profile of the pre-service elementary teachers in terms of:
 - 1.1 age;
 - 1.2 sex; and,
 - 1.3 monthly family income?
2. What is the level of technology integration of the respondents before the implementation of the technology mediated instruction in terms of:
 - 2.1 replacement;
 - 2.2 amplification; and,
 - 2.3 transformation?
3. What is the extent of acceptability on technology integration in science micro-teaching among pre-service elementary teachers before the implementation of the technology mediated instruction in terms of:
 - 3.1 instructional methods;
 - 3.2 student learning processes; and,
 - 3.3 curriculum goals?
4. What is the level of technology integration of the respondents after the implementation of the technology mediated instruction in terms of:

- 4.1 replacement;
 - 4.2 amplification; and,
 - 4.3 transformation?
5. What is the extent of acceptability on technology integration in science micro-teaching among pre-service elementary teachers after the implementation of the technology-mediated instruction in terms of;
- 5.1 instructional methods;
 - 5.2 student learning processes; and,
 - 5.3 curriculum goals?
6. Is there a significant difference between the level of technology integration in science micro teaching of pre-service elementary teachers before and after the implementation of the technology-mediated instruction?
7. Is there a significant difference on the extent of acceptability on integration of ICT in science micro teaching of pre-service elementary teachers before and after the implementation of the technology-mediated instruction?
8. How do the respondents described the effectiveness of the instruction?

METHODOLOGY

Research Design

This study is action research using a within-group pretest-posttest design with a qualitative component, allowing teachers to identify problems, implement strategies, and evaluate outcomes in a cyclical process (f, 2014). It helps educators develop effective classroom practices while gaining specialized knowledge and skills to foster positive change in schools and communities (Galarion, 2018).

Population of the Study

The study was conducted at President Ramon Magsaysay State University, Botolan Campus, in Botolan, Zambales. The respondents of the study were the 23 BEEed II students enrolled in the second semester of the 2023-2024 school year. These students were purposefully selected because they are currently taking the Teaching Science in Intermediate Grades (ESC 11) subject and have previously taken the Teaching

Science in Primary Grades (ESC 8) subject. As a result, they already have experience in integrating technology during science micro-teaching.

Research Instruments and Intervention and Strategies

This study used a self-made survey-questionnaire based on the Replacement, Amplification, and Transformation (RAT) Model by Hughes et al. (2006) to assess digital technology's role and the acceptability of ICT. The questionnaire included three parts: demographic information, pre-implementation levels of technology integration rated from 1 (Never) to 4 (Always), and the acceptability of ICT in instructional methods, student learning, and curriculum goals rated from 1 (Unacceptable) to 4 (Acceptable). The same instrument was administered after the intervention to evaluate changes in integration and acceptability. The intervention involved weekly sessions to enhance pre-service teachers' ICT integration skills: Week 1 focused on creating online assessments using Quizizz, Lumi, Gimkits, and Nearpod; Week 2 on using software like Bioman, Chemagic, and Stellarium to teach science concepts; Week 3 on creating and downloading educational videos; and Week 4 on developing interactive simulations using Labster, NASA's Eye, and PhET.

Data Collection Method

The researchers first obtained permission from the campus director and BEEEd program chairperson and explained the study's purpose to participants, ensuring confidentiality. The study was conducted in three phases: pre-assessment, experiment, and post-assessment, beginning with a pre-test to evaluate ICT integration and acceptability. During the experiment phase, technology-mediated instruction was implemented, followed by a post-test to measure its effectiveness in enhancing ICT integration and acceptability in science micro-teaching.

Data Analysis

The respondents' level of technology integration before and after the technology-mediated instruction was interpreted using weighted means, with scales ranging from 1.00 to 4.00 for both integration and acceptability of ICT, each assigned specific verbal interpretations. A paired-sample t-test was conducted to determine significant differences between pre-test and post-test results. Additionally, content analysis was employed to examine students' reflective journals, identifying patterns, themes, and meaningful insights regarding the effectiveness of the technology-mediated instruction.

RESULTS AND DISCUSSION

Part I. Respondents' Profile

Table 1. Frequency and Percentage Distribution of the Pre-service teachers-Respondents as to Age, Sex, and Monthly Family Income

Age		
Category	Frequency	Percentage
19–21	15	65%
22–24	8	35%
Sex		
Category	Frequency	Percentage
Female	21	91%
Male	2	9%
Monthly Family Income		
Category	Frequency	Percentage
10,957 and below	16	64%
10,957 – 21,914	7	28%
21,914 – 43,828	0	0%
43,828 – 76,669	2	8%
76,699 – 131,484	0	0%
131,484 – 219,140	0	0%

The respondents were mostly young adults, with 15 (65%) aged 19–21 and 8 (35%) aged 22–24. Younger pre-service teachers are known to exhibit more positive attitudes toward research and innovation and hold favorable perceptions of aging (Manu & Owusu-Ansah, 2019). A significant majority of respondents were female (21, 91%), while only 2 (9%) were male. Gender can influence teaching preferences and professional orientation, with females more likely to pursue education-related fields and males reporting higher digital literacy (Taylor & Francis, 2024). Most pre-service teachers (64%) come from families earning P10,957 and below, while 28% fall between P10,957–P21,914, and only 8% between P43,828–P76,669. This indicates that the respondents largely belong to lower-income households. Prior studies note that socioeconomic status affects access to and use of technology (Huseynpur et al., 2015), and students from low-income backgrounds often have limited exposure, making technology integration in teaching more challenging (Garba, 2020).

Part II. Respondents' level of technology integration in science micro-teaching before and after implementing the technology-mediated instruction.

Table 2. Respondents' Level of Technology Integration in terms of Replacement Level before and after Implementing Technology-Mediated Instruction.

Replacement	Weighted Mean (Before)	Verbal Interpretation (Before)	Weighted Mean (After)	Verbal Interpretation (After)
1. I utilize slide presentations in my discussion.	3.39	Always	3.78	Always
2. I incorporate video clips in presenting science concepts.	2.74	Often	3.52	Always
3. I utilize television in presenting the lesson.	1.48	Sometimes	2.48	Often
4. I use laptop and projector in teaching.	3.65	Always	4.00	Always
5. I make use of MS Word and MS PowerPoint in designing my assessment tasks.	3.57	Always	3.83	Always
OVERALL WEIGHTED MEAN	2.97	Often	3.52	Always

The results show that before implementing Technology-Mediated Instruction, pre-service teachers frequently used technology primarily as a replacement for traditional teaching methods. They consistently utilized slide presentations, laptops and projectors, and MS Word/PowerPoint for designing assessments. They often incorporated video clips in presenting concepts but rarely used televhavigation. In terms of amplification, their use of technology was limited. While interactive slide presentations were used often and Quizizz, Quizlet, and Kahoot were used sometimes, other educational applications such as Padlet, Lumi, offline game-based apps, and tools like Cells Alive and Gimkits were rarely or never used. After the implementation, technology integration improved in both replacement and amplification dimensions. Replacement activities such as using slide presentations, laptops and projectors, and productivity tools were consistently applied, reflecting a stronger habitual use of technology in lesson delivery and assessment design. At the same time, amplification activities significantly increased: interactive slides and online quiz platforms were always used, and other applications were integrated more frequently than before.

Table 3. Respondents' Level of Technology Integration in terms of Amplification Level before and after Implementing Technology-Mediated Instruction.

Amplification	Weighted Mean (Before)	Verbal Interpretation (Before)	Weighted Mean (After)	Verbal Interpretation (After)
1. I utilize interactive slide presentations in my discussions.	3.00	Often	3.70	Always
2. I introduce educational applications like Padlet and Lumi in my teaching sessions.	1.48	Never	2.91	Often
3. I use offline game-based apps such as WordSearch, Memory Games, and Jeopardy.	1.83	Sometimes	2.91	Often
4. I utilize Cells Alive and Gimkits in my teaching.	1.30	Never	2.57	Often
5. I utilize Quizizz, Quizlet, and Kahoot in creating student assessment tasks.	2.00	Often	3.43	Always
OVERALL WEIGHTED MEAN	1.92	Sometimes	3.10	Often

The results show that before implementing Technology-Mediated Instruction, pre-service teachers frequently used technology as a replacement for traditional teaching methods, consistently utilizing slide presentations, laptops and projectors, and MS Word/PowerPoint for assessments, often using video clips, but never using television. Their use of technology to amplify learning, however, was limited, with interactive slide presentations used often, Quizizz, Quizlet, and Kahoot sometimes, and other educational applications like Padlet, Lumi, offline game-based apps, and tools like Cells Alive and Gimkits rarely or never used. After implementation, technology integration improved in both areas: replacement activities were consistently used, and amplification activities increased, with interactive slides and Quizizz/Quizlet/Kahoot always used and other applications often used. This indicates that Technology-Mediated Instruction enabled pre-service teachers to effectively substitute and amplify conventional teaching methods, enhancing discussions, instructional activities, and assessments (Farjon et al., 2019; Ghavifekr & Rosdy, 2015; Kent & Giles, 2017).

Table 4. Respondents' Level of Technology Integration in terms of Transformation Level before and after Implementing Technology-Mediated Instruction.

Transformation	Weighted Mean (Before)	Verbal Interpretation (Before)	Weighted Mean (After)	Verbal Interpretation (After)
1. I use CheMagic in teaching concepts about matter.	1.00	Never	2.09	Sometimes
2. I use Bioman in teaching concepts about living things.	1.00	Never	2.17	Sometimes
3. I utilize digital tools such as Labster and PhET for experiments.	1.00	Never	2.57	Often
4. I employ digital planetariums like Stellarium and NASA's eye in teaching Astronomy.	1.00	Never	2.39	Sometimes
5. I utilize digital tools such as Nearpod in creating assessments.	1.04	Never	3.22	Often
OVERALL WEIGHTED MEAN	1.01	Never	2.49	Sometimes

The results showed that before the implementation of Technology-Mediated Instruction, pre-service teachers rarely used technology for transformative purposes. Tools such as CheMagic, Bioman, Labster, PhET, Stellarium, NASA's Eye, and Nearpod were mostly never used, resulting in an overall weighted mean of 1.01, interpreted as never. This indicates that technology was not applied to supplement teaching concepts, conduct virtual experiments, or create assessments, consistent with chenn and Ngwako (2017a) and tendeu, Kim, and McIntyre (2016), who noted that pre-service teachers often lacked practical application despite positive attitudes and technological competencies. After the implementation, usage improved, with Labster and PhET and Nearpod used often, and other tools used sometimes, leading to an overall weighted mean of 2.49, interpreted as sometimes. This shows that pre-service teachers began to apply technology more regularly to enhance instruction, experiments, and assessments.

Table 5. Summary of the Respondents’ Level of Technology Integration Before and after Implementing the Technology-Mediated Instruction.

Level of Technology Integration	Weighted Mean (Before)	Verbal Interpretation (Before)	Weighted Mean (After)	Verbal Interpretation (After)
A. Replacement	2.97	Often	3.52	Always
B. Amplification	1.92	Sometimes	3.10	Often
C. Transformation	1.01	Never	2.49	Often
OVERALL MEAN	1.97	Sometimes	3.04	Often

The results showed that before implementing Technology-Mediated Instruction, pre-service elementary teachers frequently used technology only at the Replacement level (WM = 2.97, Often), while Amplification (WM = 1.92, Sometimes) and Transformation (WM = 1.01, Never) were limited, with an overall weighted mean of 1.97, interpreted as sometimes. This indicates that technology use was mostly rudimentary, focused on basic tasks, and aligned with traditional teaching practices, consistent with Batane and Ngwako (2017b), De Santis and Rotigel (2014), and Tondeur et al. (2016), who noted that pre-service teachers often feel unprepared to integrate technology effectively. After implementation, all levels improved: Replacement was always used (WM = 3.52), Amplification often used (WM = 3.10), and Transformation sometimes used (WM = 2.49), leading to an overall weighted mean of 3.04, interpreted as often. This demonstrates that Technology-Mediated Instruction enabled pre-service teachers to effectively replace, amplify, and transform traditional teaching and learning practices.

PART III. Respondents’ extent of acceptability on the technology integration in science micro-teaching after implementing the technology-mediated instruction.

Table 6. Respondents’ Extent of Acceptability on Technology Integration in Science Micro-teaching in terms of Instructional Methods before and after Implementing Technology Mediated Instruction.

Instructional Methods	Weighted Mean (Before)	Verbal Interpretation (Before)	Weighted Mean (After)	Verbal Interpretation (After)
1. The use of technology enhances the teaching of content and helps students to learn.	3.91	Acceptable	3.91	Acceptable
2. Technology enhances student interaction with each other during learning and	3.74	Acceptable	3.96	Acceptable

instructional activities.				
3. Technology changes assessment practices (e.g., grading, instructor feedback, peer feedback, reporting, assessment materials), by either the teacher and/or the students.	3.61	Acceptable	3.91	Acceptable
4. Technology changes the way(s) the instructor prepares for instruction (e.g., lesson planning, developing/refreshing knowledge of a topic or concept, activity development etc.).	3.65	Acceptable	3.96	Acceptable
5. Technology transforms traditional classrooms into interactive learning environments, engaging students through multimedia content and collaborative tools.	3.70	Acceptable	3.96	Acceptable
OVERALL WEIGHTED MEAN	3.72	Acceptable	3.94	Acceptable

The results showed that pre-service teachers positively accepted the integration of technology in science micro-teaching both before and after implementing Technology-Mediated Instruction. Before implementation, all indicators were interpreted as acceptable, with weighted means ranging from 3.60 to 3.88 and an overall mean of 3.70, indicating that teachers recognized technology as beneficial for enhancing teaching, promoting student interaction, improving assessment practices, simplifying instructional preparation, and transforming classrooms into interactive learning environments. After implementation, the weighted means improved slightly, ranging from 3.91 to 3.96, with an overall mean of 3.94, still interpreted as acceptable. This demonstrates that Technology-Mediated Instruction strengthened pre-service teachers' positive perception of using technology in instructional methods, aligning with bandbatane et al. (2022), who found that pre-service teachers believe technology enhances teaching and learning.

Table 7. Respondents' Extent of Acceptability on Technology Integration in Science Micro-teaching in terms of Student Learning Process before and after Implementing Technology Mediated Instruction.

Student Learning Process	Weighted Mean (Before)	Verbal Interpretation (Before)	Weighted Mean (After)	Verbal Interpretation (After)
1. The use of technology impacts the nature of the learning activity or task(s) in which students engaged.	3.35	Acceptable	3.91	Acceptable
2. Technology impacts how students mentally processed information to be learned.	3.39	Acceptable	3.87	Acceptable
3. Technology plays a role in student groupings for task activities.	3.22	Acceptable	3.91	Acceptable
4. Technology impacts students' intrinsic motivation to learn.	3.35	Acceptable	3.87	Acceptable
5. Technology impacts students' attitudes toward the content, the teacher, or the task(s).	3.30	Acceptable	3.83	Acceptable
OVERALL WEIGHTED MEAN	3.32	Acceptable	3.88	Acceptable

The results showed that pre-service teachers found technology integration in science micro-teaching to be generally acceptable in terms of its impact on student learning processes both before and after implementing Technology-Mediated Instruction. Before implementation, all indicators were interpreted as acceptable, with weighted means ranging from 3.24 to 3.44 and an overall mean of 3.36, suggesting that technology positively influenced learning activities, information processing, groupings, motivation, and attitudes, consistent with Iles and Gorin (2017), who noted that integrating technology makes student learning more dynamic and engaging. After implementation, weighted means improved slightly, ranging from 3.83 to 3.91, with an overall mean of 3.88, still interpreted as acceptable, indicating that Technology-Mediated Instruction further strengthened the positive impact of technology on student learning.

Table 8. Respondents' Extent of Acceptability on Technology Integration in Science Micro-teaching in terms of Curriculum Goals before and after Implementing Technology Mediated Instruction.

Curriculum Goals	Weighted Mean (Before)	Verbal Interpretation (Before)	Weighted Mean (After)	Verbal Interpretation (After)
1. Technology enhances students' engagement in achieving curriculum goals.	3.43	Acceptable	3.74	Acceptable
2. Technology integration positively impacts students' understanding of complex concepts in the curriculum.	3.26	Acceptable	3.87	Acceptable
3. Technology contributes to fostering critical thinking skills aligned with curriculum goals.	3.26	Acceptable	3.87	Acceptable
4. Technology broadens the "curricular knowledge" to be gained, learned, or applied.	3.30	Acceptable	3.91	Acceptable
5. Technology impacts the "curricular knowledge" in scientific concepts that the teacher intended to be gained, learned, or applied by the students.	3.35	Acceptable	3.96	Acceptable
OVERALL WEIGHTED MEAN	3.32	Acceptable	3.87	Acceptable

The results showed that pre-service teachers generally accepted the integration of technology in science micro-teaching in terms of achieving curriculum goals both before and after implementing Technology-Mediated Instruction. Before implementation, all indicators were interpreted as acceptable, with weighted means ranging from 3.28 to 3.44 and an overall mean of 3.35, indicating that technology positively influenced student engagement, understanding of complex concepts, critical thinking, and curricular knowledge, consistent with Instefjord and Munthe (2016), who emphasized the importance of pedagogical compatibility in achieving curriculum goals. After implementation, weighted means improved, ranging from 3.74 to 3.96, with an overall mean of 3.87, still interpreted as acceptable, showing that Technology-Mediated Instruction further strengthened the positive impact of technology on curriculum goals.

Table 9. Summary of the Respondents' Extent of Acceptability on Technology Integration in Science Micro-teaching before Implementing Technology-Mediated Instruction.

Level of Technology Integration	Weighted Mean (Before)	Verbal Interpretation (Before)	Weighted Mean (After)	Verbal Interpretation (After)
A. Instructional Methods	3.72	Acceptable	3.94	Acceptable
B. Student Learning Process	3.32	Acceptable	3.88	Acceptable
C. Curriculum Goals	3.32	Acceptable	3.87	Acceptable
OVERALL MEAN	3.45	Acceptable	3.90	Acceptable

The results showed that pre-service elementary teachers generally accepted the integration of technology in science micro-teaching both before and after implementing Technology-Mediated Instruction. Before implementation, Instructional Methods, Student Learning Process, and Curriculum Goals obtained weighted means of 3.72, 3.32, and 3.32, respectively, with an overall mean of 3.45, interpreted as acceptable. This indicates that teachers perceived technology as enhancing instructional methods, learning processes, and curriculum goals, consistent with Teo (2014), who noted that computer self-efficacy and perceived usefulness influence pre-service teachers' willingness to adopt technology. After implementation, weighted means improved across all areas—3.94 for Instructional Methods, 3.88 for Student Learning Process, and 3.87 for Curriculum Goals—with an overall mean of 3.90, also interpreted as acceptable, showing a strengthened positive perception of technology integration.

Part III. Test of significant difference between the level of technology integration in science micro-teaching of pre-service elementary teachers before and after implementing technology-mediated instruction.

Table 10. Test of significant difference between the level of technology integration in science micro-teaching of pre-service elementary teachers before and after implementing technology-mediated instruction.

Level of Technology Integration	Pre-test Mean	Post-test Mean	Gain Score	t-value	p-value	Remarks
A. Replacement	2.966	3.522	0.556	-3.908	0.017	Significant
B. Amplification	1.922	3.104	-1.182	-8.650	0.001	Significant
C. Transformation	1.008	2.488	-1.48	-7.620	0.002	Significant

U-test for paired samples was used to compare the mean difference of the pre-test and post-test to a single group. Results show that in Replacement level, the pre-test and post-test means are 2.966 and 3.522 respectively with a gain score of 0.556, t-value of -3.908 and a p-value of 0.017. These indicate that there is a significant difference between the pre-test and post-test mean scores in replacement level after conducting the technology-mediated instruction. Also, in the amplification level, the pre-test and post-test means are 1.922 and 3.104 respectively with a gain score of -1.182, t-value of -8.650, and a p-value of 0.0001. These results show that there is a significant difference between the pre-test and post-test mean scores in the amplification level after the implementation of technology-mediated instruction. Lastly, in transformation level, the pre-test and post-test means are 1.008 and 2.488 respectively with a gain score of -1.48, t-value of -7.620, and a p-value of 0.002. These results indicate that there is a significant difference between the pre-test and post-test mean scores in transformation level when the technology-mediated instruction was conducted. Thus, the null hypothesis is rejected. It can be said that technology-mediated instructions are effective in enhancing the level of technology integration of pre-service elementary teachers. This is in line with the study of Zhong et al. (2022), which found that integrating technology into instruction significantly improves students' academic achievement and learning outcomes.

Table 11. Test of significant difference between the level of acceptability on technology integration in science micro-teaching of pre-service elementary teachers before and after implementing technology-mediated instruction.

Level of Acceptability	Pre-test Mean	Post-test Mean	Gain Score	t-value	p-value	Remarks
A. Instructional Methods	3.722	3.944	-0.222	-3.828	0.019	Significant
B. Student Learning Process	3.322	3.878	-0.556	-15.504	0.000	Significant
C. Curriculum Goals	3.320	3.870	-0.550	-9.167	0.001	Significant

T-test for paired samples was used to compare the mean difference of the pre-test and post-test to a single group. Results show that in instructional methods, the pre-test and post-test means are 3.722 and 3.944 respectively with a gain score of -0.222, t-value of -3.828 and a p-value of 0.019. These indicate that there is a significant difference between the pre-test and post-test mean scores in instructional methods after conducting the technology-mediated instruction. Also, in the student learning process, the pre-test and post-test means are 3.322 and 3.878 respectively with a gain score of -0.556, t-value of -15.504 and a p-value of 0.00. These results show that there is a significant difference between the pre-

test and post-test mean scores in the student learning process after the implementation of the technology-mediated instruction. Lastly, in curriculum goals, the pre-test and post-test means are 3.320 and 3.870 respectively with a gain score of -0.550, t-value of -9.167 and a p-value of 0.001. These results indicate that there is a significant difference between the pre-test and post-test mean scores in curriculum goals when the technology-mediated instruction was implemented. Thus, the null hypothesis is rejected. It can be said that the technology-mediated instructions are effective in enhancing the acceptability on technology of pre-service elementary teachers. On the study of Zengulaaru et al. (2022), he found that the usefulness in ICT is consistent with the technology acceptance paradigm. As pre-service teachers utilize technology in teaching sessions, in this case, the perceived utility is a factor in students' acceptance of technology.

Part IV. Description of the effectiveness of the technology-mediated instruction.

Table 12. Description of the effectiveness of the technology-mediated instruction.

Theme	Written Response	Frequency
Enhanced teaching methodologies	The use of ICT tools in teaching help us to create and innovate new teaching methodologies which in turn can also improve the instructional delivery and assessment.	10
Increased student engagement	Integrating ICT in teaching improves engagement among the students, as they actively participate in the learning process.	9
Interactive teaching	ICT integration helps me to easily interact with my students through incorporating interactive elements such as games and simulations where my students actively participate.	4

The researcher likewise checked the students' journal entries of 23 students to determine the effectiveness of the technology-mediated instruction. A total of 3 journal entries were accomplished by the students. The entries were content analyzed and themes and the corresponding significant statements were crystallized. Table 22 shows the descriptions of the effectiveness of the technology-mediated instruction in integration of technology given by the pre-service teachers using multiple responses. As seen from the table, technology-mediated instruction is effective in enhancing the technology integration and acceptability of the pre-service elementary teachers since their teaching methodologies were enhanced and the student engagement was increased. Further, the instruction helped them to transform their teaching into interactive ones. ro and Molwele (2022) concluded that technology integration is

essential for developing the 21st century skills and competencies in teaching and learning of Life Sciences. Technology-mediated instruction may be used by pre-service elementary teachers to enhance their micro-teaching experiences, and eventually, to develop the 21st century skills and competencies.

CONCLUSIONS RECOMMENDATIONS

The study concluded that the pre-service elementary teachers were mostly 19–21 years old, predominantly female, and from lower-income families with a monthly income of ₱10,957 or below. Their level of technology integration before the implementation of technology-mediated instruction was interpreted as Sometimes, while their extent of acceptability was Acceptable. After the implementation, their level of technology integration improved to Often, and their acceptability remained Acceptable, indicating a high acceptance of technology use. The technology-mediated instruction significantly enhanced both their technology integration and their acceptability of ICT in teaching. Moreover, it improved their teaching methodologies, increased student engagement, and made their micro-teaching sessions more interactive.

RECOMMENDATIONS

The study recommended that pre-service teachers should actively participate in technology integration training sessions and workshops provided by their teacher education program. Teachers are encouraged to mentor pre-service teachers on effectively using technology in their science micro-teaching sessions. College deans may require faculty members to incorporate technology-mediated instruction in teaching education courses to strengthen its application. Future researchers are advised to include in-service teachers in examining the level of integration and acceptability of ICT. Comparing pre-service and in-service teachers could highlight significant differences and guide more comprehensive strategies for supporting technology integration across teaching careers.

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