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Effects of Technology -Based Instruction Among Teachers in Basic Education

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ABSTRACT

This study aimed to determine the effects of technology-based instruction among teachers in Basic Education at Tomas Claudio Colleges during the School Year 2025–2026. Specifically, it examined the effects of technology-based instruction in terms of achievement of learning objectives, learners' engagement, and learning outcomes assessment, as well as the challenges encountered by teachers in its implementation. The study employed a descriptive survey research design involving the total population of 90 basic education teachers. A researcher-made questionnaire checklist served as the primary instrument for data gathering. The respondents were described according to age, sex, civil status, educational attainment, position title, length of service, and in-service trainings attended. The findings revealed that the respondents were predominantly 31 years old and above, female, and married. Most were pursuing graduate studies, held the position of Teacher I, had more than five years of teaching experience, and had attended in-service trainings at various levels. Technology-based instruction was found to have a high effect on the achievement of learning objectives, learners' engagement, and learning outcomes assessment. Furthermore, no significant differences were found in teachers' perceptions when grouped according to sex, civil status, and position title. However, significant differences existed when grouped according to age, educational attainment, length of service, and in-service trainings attended. Teachers also often encountered challenges in implementing technology-based instruction, with heavy workload identified as the leading concern. The study concluded that teachers' perceptions of technology-based instruction varied according to selected demographic and professional characteristics. It recommended that school administrators strengthen technology-based instructional practices through school-based training, massive open online courses, face-to-face professional development, and adequate instructional resources. The proposed action plan was likewise recommended for implementation to enhance teachers' competencies and improve instructional delivery..

Keywords: *Technology-Based Instruction, Basic Education Teachers, Learning Objectives, Learners' Engagement, Learning Outcomes Assessment, Instructional Challenges*

1. INTRODUCTION

1.1. Background and Context of the Study

The rapid advancement of information and communication technology (ICT) has significantly transformed the educational landscape, influencing how teachers deliver instruction, facilitate classroom interaction, and assess learners' performance. Technology-based instruction has become an increasingly important component of contemporary education as schools adopt digital platforms, multimedia presentations, online learning management systems, interactive applications, and other technological resources to support teaching and learning. According to UNESCO (2023), technology offers opportunities to improve access to educational resources, facilitate communication, and provide engaging learning experiences. However, its effectiveness depends on appropriate implementation, teacher preparedness, accessibility, and alignment with educational objectives. Similarly, the Organisation for Economic Co-operation and Development (OECD, 2023) emphasized that teachers must possess both general digital skills and teaching-specific digital competencies to maximize the educational value of technology.

In the context of classroom instruction, technology provides teachers with opportunities to present lessons through varied instructional approaches, accommodate different learning needs, and encourage active learner participation. Digital resources can make abstract concepts more understandable through visual representations, simulations, educational videos, and interactive activities. Msafiri et al. (2023, 2024) highlighted the contributions of ICT integration to curriculum delivery, resource accessibility, personalized learning, and improved teaching and learning processes. Likewise, Akpen et al. (2024) emphasized the relationship between online learning, student engagement, and academic performance. These developments suggest that technology-based instruction can support the achievement of learning objectives when digital resources are purposefully integrated into instructional planning and classroom activities.

Another important consideration is the influence of technology-based instruction on learners' engagement. Through interactive presentations, educational games, collaborative platforms, and digital communication tools, teachers can create opportunities for learners to participate actively in classroom discussions and learning activities. Chen and Chen (2024) explained that technology-supported collaborative inquiry can facilitate learners' participation in different stages of the learning process. Similarly, research on classroom response technologies has demonstrated the potential of digital tools to support immediate classroom interaction and student participation. These approaches highlight the importance of selecting instructional technologies that encourage meaningful engagement rather than merely replacing traditional teaching materials with digital alternatives.

Technology also provides opportunities to improve learning outcomes assessment through online quizzes, electronic examinations, digital rubrics, automated feedback, and learning management systems. These tools enable teachers to monitor learners' progress, identify areas requiring improvement, and provide timely feedback. The OECD (2023) recognized assessment as one of the essential areas in which teachers must develop digital competencies. Furthermore, the integration of technology into assessment requires teachers to exercise appropriate judgment in selecting tools, interpreting results, and ensuring that assessment activities remain aligned with intended learning outcomes. Consequently, technology-based assessment should complement sound pedagogical practices and not become solely dependent on the availability of digital applications.

Despite its potential benefits, technology-based instruction presents challenges that may affect teachers' instructional practices. These include inadequate technological resources, unstable

internet connectivity, insufficient training, limited technical assistance, differences in digital competencies, and the additional time required to prepare technology-supported lessons. The UNESCO (2023) Global Education Monitoring Report emphasized that inadequate infrastructure and unequal access to technological resources remain significant barriers to educational technology integration. In the Philippine setting, the Department of Education's Quality Basic Education Development Plan 2025–2035 identifies digital infrastructure, teacher competencies, digital learning resources, and institutional support as important components of the country's educational digitalization agenda.

Recent Philippine studies further demonstrate the importance of understanding teachers' competencies and experiences in using educational technology. Cabunoc and Ubayubay (2024) examined teachers' ICT competencies and barriers in public schools, while Sunga and Ramos (2024) investigated digital teaching competence among public elementary school teachers. Arellano et al. (2024) explored teachers' experiences and adjustments in integrating technology into classroom instruction. Similarly, Valle et al. (2024) examined the relationship between technological pedagogical content knowledge and other factors associated with teachers' digital practices. These studies emphasize that successful technology integration requires not only access to digital resources but also appropriate knowledge, confidence, training, and institutional support.

Teachers' ability to integrate technology into instruction is also influenced by their professional backgrounds, digital competencies, and opportunities for continuous development. Stringer et al. (2024) emphasized the importance of professional learning and development in strengthening teachers' knowledge and confidence in using digital technologies. Similarly, Stavermann (2025) found that online and blended professional development programs can contribute positively to teachers' competencies and instructional practices. Amemasor et al. (2025) further identified collaborative learning, practical digital training, mentoring, and institutional support as important elements of effective professional development. These findings indicate that teachers' age, educational attainment, length of service, position, and participation in in-service training may be relevant considerations in understanding their perceptions and experiences of technology-based instruction.

In the Philippines, studies have continued to identify the relationship between teachers' digital competencies and their capacity to integrate technology into classroom instruction. Alfeche and Abarquez (2024) examined technology integration challenges and teaching performance, while Celeste and Osias (2023) investigated challenges in technology integration and their implications for instructional programs. Cabunoc and Ubayubay (2024) and Diabo (2024) likewise explored teachers' ICT competencies and classroom integration practices. More recent investigations by Dasal (2025), Magtoltol and Oropa (2025), and Orbigoso and Pontillas (2026) further highlighted the importance of digital literacy, teacher preparedness, available resources, and professional training in strengthening technology-driven instruction.

Moreover, research has established that technology integration is influenced by teachers' attitudes, self-efficacy, digital competence, and the support provided by educational institutions. A study by Althubyani (2024) examined the digital competence of teachers and the factors affecting their competency levels. Similarly, research by Wohlfart and Wagner (2025) emphasized that technology acceptance and integration develop through continuous adaptation, reflection, and professional support. Caratıquıt and Javier (2025) also highlighted the importance of ICT competence, techno-efficacy, and school support in influencing teachers' attitudes toward digital instruction. These findings reinforce the need for schools to establish an

environment that supports teachers in developing their technological and pedagogical capabilities.

At Tomas Claudio Colleges, technology-based instruction is an important consideration in strengthening the delivery of basic education and responding to the changing demands of contemporary teaching and learning. Teachers are expected to utilize appropriate technological resources in achieving learning objectives, promoting learners' engagement, and assessing learning outcomes. However, the extent to which these technologies contribute to instructional effectiveness may vary depending on teachers' competencies, experiences, professional development opportunities, and the challenges they encounter. Understanding these factors is essential in determining how technology-based instruction is perceived and implemented within the institution.

In view of these considerations, the researcher deemed it necessary to investigate the effects of technology-based instruction among teachers in Basic Education at Tomas Claudio Colleges during the School Year 2025–2026. Specifically, the study examined its effects on the achievement of learning objectives, learners' engagement, and learning outcomes assessment, including differences in teachers' perceptions when grouped according to their personal and professional profiles. It also determined the challenges encountered in implementing technology-based instruction. The findings were expected to provide an empirical basis for developing an action plan that would strengthen teachers' technological competencies, improve instructional practices, and promote meaningful technology integration in basic education.

1.2. Research Problem

The study aimed to determine the effects of technology-based instruction among teachers in Basic Education at Tomas Claudio Colleges during the School Year 2025–2026. Specifically, it sought to determine the profile of the respondents in terms of age, sex, civil status, educational attainment, position title, length of service, and in-service trainings attended. It also aimed to assess the extent of the effects of technology-based instruction as perceived by the teachers themselves with respect to the achievement of learning objectives, learners' engagement, and learning outcomes assessment. Furthermore, the study sought to determine whether significant differences existed in the teachers' perceptions of the effects of technology-based instruction across the identified aspects when grouped according to their profile. It also intended to assess the extent of the challenges encountered by teachers in implementing technology-based instruction. Finally, based on the findings of the study, it aimed to propose an action plan to improve technology-based instruction among teachers in Basic Education at Tomas Claudio Colleges.

1.3. Research Gap

Although numerous studies have examined the integration of technology in education, much of the existing literature has focused on digital learning platforms, online instruction, teachers' technological competencies, and students' academic performance. Limited attention has been given to examining the perceived effects of technology-based instruction from the teachers' perspectives, particularly in relation to the achievement of learning objectives, learners' engagement, and learning outcomes assessment within a single institutional context. Moreover, differences in teachers' perceptions according to their demographic and professional profiles, as well as the challenges they encounter in implementing technology-based instruction, require further investigation. In the context of Tomas Claudio Colleges, there is a need for institution-specific empirical evidence to determine how technology-based instruction influences teachers' instructional practices and what areas require improvement. Thus, this study sought to address these gaps by examining the perceived effects of technology-based instruction among basic

education teachers, identifying significant differences based on their profiles, determining the challenges encountered, and proposing an action plan responsive to the institution's instructional needs.

1.4. Purpose and Objectives of the Study

The primary purpose of this study was to determine the effects of technology-based instruction among teachers in Basic Education at Tomas Claudio Colleges during the School Year 2025–2026. Specifically, it aimed to describe the respondents' demographic and professional profiles in terms of age, sex, civil status, educational attainment, position title, length of service, and in-service trainings attended; assess the perceived effects of technology-based instruction on the achievement of learning objectives, learners' engagement, and learning outcomes assessment; and determine whether significant differences existed in their perceptions when grouped according to their respective profiles. Furthermore, the study intended to identify the extent of challenges encountered by teachers in implementing technology-based instruction. Ultimately, the findings served as the basis for developing a proposed action plan that would address identified challenges, strengthen teachers' technological and instructional competencies, and improve the effective integration of technology into basic education teaching practices.

1.5. Significance and Practical Contribution of the Study

This study was significant because it provided empirical information on the perceived effects of technology-based instruction and the challenges encountered by teachers in Basic Education at Tomas Claudio Colleges. The findings may benefit school administrators by providing a basis for institutional decisions concerning technology integration, resource allocation, and professional development initiatives. Teachers may use the findings to recognize effective technology-based instructional practices and identify areas requiring improvement in lesson delivery, learner participation, and assessment strategies. Learners may indirectly benefit from improved instructional approaches that promote meaningful engagement and support the achievement of learning objectives. The institution may also utilize the proposed action plan in designing relevant training programs, strengthening technological resources, and establishing support mechanisms for teachers. Furthermore, future researchers may use the findings as a reference for conducting related investigations on educational technology, instructional effectiveness, and teachers' professional development. Practically, the study contributes an institution-based assessment that can guide the development of responsive and sustainable strategies for improving technology-based instruction.

1.6. Sustainable Development Goals (SDG) Alignment

This study was aligned primarily with Sustainable Development Goal 4 (Quality Education), which promotes inclusive, equitable, and quality education and lifelong learning opportunities for all. By examining the effects of technology-based instruction on the achievement of learning objectives, learners' engagement, and learning outcomes assessment, the study supports efforts to improve the quality and effectiveness of basic education. It also contributes to SDG 9 (Industry, Innovation and Infrastructure) by recognizing the role of technological resources and digital innovation in strengthening educational delivery, and SDG 10 (Reduced Inequalities) by highlighting the importance of addressing differences in teachers' access to technology, competencies, and professional development opportunities. Furthermore, its emphasis on in-service training and the proposed action plan supports SDG 8 (Decent Work and Economic Growth) through continuous professional development and the enhancement of teachers' workplace competencies. Overall, the study reinforces the importance of responsible technology integration, institutional support, and sustained capacity-building in creating a more responsive, accessible, and effective educational environment.

2. METHODOLOGY

2.1. Research Design

The study employed a descriptive survey research design to determine the effects of technology-based instruction among teachers in Basic Education at Tomas Claudio Colleges during the School Year 2025–2026. This design was appropriate because it enabled the researcher to gather, describe, and analyze information regarding the respondents' profiles, their perceptions of the effects of technology-based instruction, and the challenges they encountered in its implementation. Through a structured questionnaire, the study obtained quantitative data concerning the achievement of learning objectives, learners' engagement, and learning outcomes assessment. The descriptive survey research design also facilitated the comparison of teachers' perceptions when grouped according to their demographic and professional characteristics. Furthermore, the findings provided the basis for developing a proposed action plan to improve technology-based instructional practices.

2.2. Research Locale

The study was conducted at Tomas Claudio Colleges, located in Morong, Rizal, Philippines. The institution provides educational programs that include basic education and serves as an academic setting where teachers utilize various instructional approaches and technological resources to facilitate teaching and learning. The institution was selected as the research locale because it provided an appropriate setting for examining the implementation of technology-based instruction among basic education teachers. Specifically, the study focused on teachers in the Basic Education Department, whose instructional experiences and perceptions served as the primary sources of data. The research locale was considered suitable for determining the effects of technology-based instruction on the achievement of learning objectives, learners' engagement, and learning outcomes assessment, as well as identifying the challenges encountered by teachers in its implementation.

2.3. Sampling Technique

The study employed total population sampling, a non-probability sampling technique in which all members of the identified population were included as respondents. This technique was appropriate because the study involved a relatively manageable population consisting of 90 teachers from the Basic Education Department of Tomas Claudio Colleges. Rather than selecting only a portion of the population, the researcher included all 90 teachers to obtain a comprehensive representation of their perceptions and experiences concerning technology-based instruction. The respondents were described according to age, sex, civil status, educational attainment, position title, length of service, and in-service trainings attended. Through this sampling technique, the researcher sought to gather sufficient information from the entire identified population to address the objectives of the study.

2.4. Data Gathering Procedure

Before conducting the study, the researcher secured permission from the appropriate authorities of Tomas Claudio Colleges to administer the research instrument among the teachers in the Basic Education Department. Upon approval, the researcher finalized and prepared the researcher-made questionnaire checklist based on the objectives and specific variables of the study. The questionnaire was then distributed to the 90 teacher-respondents, accompanied by an explanation of the purpose of the research and the instructions for answering each item. The respondents were given sufficient time to accomplish the instrument voluntarily and honestly. After the retrieval of the questionnaires, the researcher examined the accomplished forms for completeness, consistency, and accuracy. The collected responses were subsequently organized, coded, tabulated, and prepared for statistical treatment and

interpretation. The resulting data were analyzed to determine the respondents' profiles, the perceived effects of technology-based instruction, the significant differences in their perceptions, and the challenges encountered. The findings were then utilized as the basis for formulating the proposed action plan.

2.5. Data Analysis

The data gathered in the study were organized, tabulated, and analyzed using appropriate descriptive and inferential statistical techniques. Frequency and percentage were utilized to describe the respondents' profiles in terms of age, sex, civil status, educational attainment, position title, length of service, and in-service trainings attended. Weighted mean was employed to determine the extent of the effects of technology-based instruction with respect to the achievement of learning objectives, learners' engagement, and learning outcomes assessment, as well as the extent of challenges encountered by teachers. To determine whether significant differences existed in teachers' perceptions when grouped according to their demographic and professional profiles, an appropriate inferential statistical test was applied based on the number of comparison groups and the characteristics of the data. Specifically, the independent samples t-test and one-way analysis of variance (ANOVA) were considered for comparing group means, subject to the assumptions of the tests. All statistical tests were interpreted using a 0.05 level of significance. The results served as the basis for drawing conclusions and developing the proposed action plan

2.6. Ethical Considerations

The researcher observed appropriate ethical standards throughout the conduct of the study to protect the rights, privacy, and welfare of the respondents. Prior to data collection, permission was obtained from the authorized officials of Tomas Claudio Colleges. The purpose, scope, and nature of the research were explained to the teacher-respondents to ensure that their participation was based on informed consent. Participation was entirely voluntary, and respondents were informed of their right to decline participation or withdraw without experiencing any form of penalty or disadvantage. Confidentiality and anonymity were maintained by ensuring that personal information and individual responses were not disclosed or used for purposes other than the study. The collected questionnaires and research data were handled responsibly and accessed only by authorized individuals involved in the research. The researcher also ensured that the presentation and interpretation of findings were accurate, objective, and free from fabrication, falsification, or misrepresentation. Furthermore, the study respected the institutional policies of Tomas Claudio Colleges and applicable data privacy principles, particularly in the collection, processing, storage, and reporting of information obtained from the respondents.

3. RESULTS AND DISCUSSION

3.1. Profile of the Respondents in Terms of Selected Variables

The findings revealed that the 90 teacher-respondents were predominantly 31–40 years old, comprising 43.3%, female at 70.0%, and married at 57.8%. In terms of educational attainment, the largest group held a Bachelor's degree at 38.9%, followed by those with a Master's degree at 27.8% and those with MA units at 22.2%, indicating that several teachers were pursuing or had completed graduate studies. Regarding position title, most were Teacher I at 47.8%, while 32.2% were Teacher II. In terms of length of service, the majority had been teaching for 5–9 years at 32.2%, followed by those with 10–14 years of experience at 27.8%. As to in-service trainings attended, most had participated in school-level training programs at 44.4%, followed by national-level training programs at 24.5% and regional-level training programs at 20.0%. Overall,

the findings indicate that the respondents represented a predominantly female teaching workforce composed of relatively experienced teachers with varying educational qualifications, professional positions, and exposure to professional development activities.

3.2. Extent of Effects of Technology-Based Instruction Among Teachers in Basic Education as Perceived by Themselves with Respect to the Different Aspects

The findings revealed that technology-based instruction had a high effect on teachers in Basic Education, obtaining a composite weighted mean of 4.30. Among the three aspects, achievement of learning objectives ranked first with a weighted mean of 4.37, followed by learners' engagement with 4.29, while learning outcomes assessment ranked third with 4.23. All aspects received a verbal interpretation of High Effect, indicating that technology-based instruction positively contributes to the teaching-learning process. The results suggest that integrating technology into classroom instruction helps teachers achieve intended learning objectives, encourage learners' active participation, and facilitate the assessment of learning outcomes. Furthermore, the findings highlight the value of technology in providing interactive learning experiences, supporting instructional delivery, and improving assessment practices. Overall, technology-based instruction serves as an effective means of strengthening teaching practices and creating more engaging and responsive learning environments in basic education

3.3. Significant Difference on the Extent of Effects of Technology-Based Instruction Among Teachers in Basic Education as Perceived by Themselves With Respect to the Different Aspects in Terms of Their Profile

The findings revealed that significant differences existed in teachers' perceptions of the effects of technology-based instruction when grouped according to age, educational attainment, length of service, and in-service trainings attended across all three aspects, namely achievement of learning objectives, learners' engagement, and learning outcomes assessment, with all probability values below the 0.05 level of significance. However, no significant differences were found when respondents were grouped according to sex, civil status, and position title, as all probability values exceeded 0.05. These results indicate that teachers' age, educational background, teaching experience, and exposure to professional development activities may influence how they perceive the effects of technology-based instruction. On the other hand, their perceptions remain relatively consistent regardless of sex, civil status, and position title. The findings suggest that professional experience, educational preparation, and participation in relevant training contribute to teachers' understanding and appreciation of technology integration in instruction. This further emphasizes the importance of continuous professional development and appropriate training opportunities to strengthen technology-based teaching practices.

3.4. Extent of the Challenges Encountered by Teachers in Technology-Based Instruction

The findings revealed that teachers often encountered challenges in implementing technology-based instruction, obtaining an overall weighted mean of 3.85. Among the identified challenges, heavy workloads among teachers ranked first with a weighted mean of 4.49, followed by difficulty in keeping learners engaged and focused with 4.17 and technical malfunctions of devices with 4.11. Lack of effective training on the pedagogical use of new technologies also emerged as a concern, obtaining a weighted mean of 4.04. Meanwhile, lack of confidence in technological proficiency ranked last with a weighted mean of 3.28, interpreted as Sometimes. These results indicate that despite the perceived positive effects of technology-based instruction, teachers continue to experience difficulties related to workload demands, classroom management, technical issues, training opportunities, and available technological resources. The findings suggest the need for institutional interventions, particularly the provision of relevant training,

adequate technical support, improved technological infrastructure, and workload management strategies. Addressing these challenges may help teachers maximize the benefits of technology-based instruction and ensure more effective delivery of basic education.

4. CONCLUSIONS AND RECOMMENDATIONS

The study concluded that technology-based instruction has a high effect on the teaching-learning process in Basic Education at Tomas Claudio Colleges, particularly in achieving learning objectives, promoting learners' engagement, and assessing learning outcomes. Teachers' perceptions significantly differed when grouped according to age, educational attainment, length of service, and in-service trainings attended, while no significant differences were observed in terms of sex, civil status, and position title. Despite its perceived benefits, teachers often encountered challenges in implementing technology-based instruction, with heavy workloads, difficulty maintaining learners' engagement, and technical malfunctions identified as the leading concerns. These findings establish that the effective integration of technology in instruction requires not only appropriate digital resources but also teachers' preparedness, institutional support, and continuous professional development.

Based on the findings, it is recommended that school administrators strengthen technology-based instruction through regular school-based training, seminars, workshops, and opportunities for participation in massive open online courses to enhance teachers' technological and pedagogical competencies. The institution may also provide adequate technological resources, reliable infrastructure, technical assistance, and appropriate workload management strategies to address the challenges encountered by teachers. Teachers are encouraged to continuously explore innovative instructional approaches and utilize digital tools that promote active learner participation and effective assessment of learning outcomes. Furthermore, the proposed action plan should be considered for implementation and periodic evaluation to ensure its responsiveness to teachers' needs. Future researchers may conduct similar studies involving other educational institutions, additional variables, and broader respondent groups to further establish the factors influencing the effective implementation of technology-based instruction.

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