

Teachers' Perceptions of Challenges in Educational Technology Integration: A Quantitative Study

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Abstract

The integration of educational technology has become increasingly important in improving teaching and learning practices in modern classrooms. This study examined elementary school teachers' perceptions of the use of educational technology and the challenges encountered in integrating these tools into classroom instruction in Bongao III District, Tawi-Tawi, Philippines. Guided by the Technology Acceptance Model (TAM), the study explored how teachers' perceptions of usefulness and ease of use influence their engagement with educational technologies. A quantitative research design was employed using a modified survey questionnaire consisting of forty-nine items administered to sixty public elementary school teachers. The instrument measured teachers' demographic characteristics, the extent of their use of educational technology tools, and the barriers affecting technology integration. Data were analyzed using descriptive statistics and inferential analysis through the Statistical Package for the Social Sciences (SPSS), including frequency distribution, mean, standard deviation, and t-test analysis. The findings revealed that teachers used educational technology tools at a moderate level, with most respondents indicating that they "sometimes" used digital tools such as word processing applications, email communication, multimedia presentations, and online resources for instructional purposes. The preparation of instructional materials for interactive whiteboards showed the highest level of reported use. The study also identified several barriers affecting technology integration, including insufficient numbers of computers and internet-connected devices, limited access to technological infrastructure, outdated or malfunctioning school computers, inadequate technical and pedagogical support, and the absence of clear institutional goals supporting educational technology use. Furthermore, the analysis showed that there was a weak and statistically insignificant relationship between gender and the use of educational technology in classroom instruction. The study concludes that although educational technology is present in classroom practices, its integration remains inconsistent due to infrastructural and institutional constraints. It recommends strengthening institutional support for technology integration, improving access to ICT resources, and developing ICT literacy programs to enhance teachers' technological competencies. The study aligns with Sustainable Development Goal 4 (Quality Education) by promoting improved teaching practices through technology integration, and with SDG 9 (Industry, Innovation, and Infrastructure) and SDG 10 (Reduced Inequalities) by highlighting the need for improved digital infrastructure and equitable access to educational technologies in rural communities. By addressing barriers to technology integration, the study contributes to educational sustainability and supports efforts to reduce digital inequalities in underserved educational contexts.

Keywords: Educational Technology, ICT Integration, Quantitative Research, Teacher Perceptions, Technology Acceptance Model, Technology Integration Challenges

1. Introduction

The integration of educational technology in modern classrooms has become essential for preparing learners with the competencies required in the 21st century. Technological developments continue to reshape teaching and learning environments, enabling new forms of communication, collaboration, and knowledge construction. However, despite widespread investment in educational technologies, teachers continue to face challenges in integrating these tools effectively in classroom practice. Understanding teachers' perceptions, technological competencies, and contextual barriers is critical for improving educational technology implementation in schools. Educational technologies such as computers, projectors, digital media tools, and online platforms have expanded opportunities for interactive and student-centered learning. Nevertheless, research indicates that technology integration does not automatically improve educational outcomes unless teachers possess the necessary knowledge, support, and pedagogical strategies to use these tools effectively. This study examines the perceptions of elementary school teachers regarding the challenges they encounter when integrating

educational technology into classroom instruction. Conducted among public elementary school teachers in Bongao III District, Tawi-Tawi, the study seeks to identify barriers to technology integration and provide evidence that may guide the development of an ICT literacy program to strengthen teachers' capacity to use educational technology effectively.

1.1 Background of the Study: Integration of Educational Technology in Elementary School Teaching

The rapid growth of digital technology has significantly influenced education systems worldwide. Educational technology encompasses the development, application, and evaluation of tools and systems designed to enhance human learning. From early tools such as the abacus to contemporary digital learning platforms and virtual environments, technological innovations continue to transform educational practices. Despite the increasing availability of educational technologies, debates remain regarding their effectiveness in improving learning outcomes. Concerns have been raised about the high cost of technological investments and the lack of consistent evidence demonstrating improved academic achievement (Software & Information Industry Association, 2000). Bloom (1996) also cautioned educators to approach technological innovations with skepticism, noting that earlier educational reforms such as language laboratories and filmstrip viewers often produced limited educational impact. Similarly, Rukeyser argued that educators and policymakers should adopt a cautious approach to educational technology adoption and emphasize the need for objective research. Government reports have echoed these concerns, suggesting that investments in educational technology must be evaluated alongside other educational improvement initiatives (Trotter, 2005). Nevertheless, educational technology remains a vital component of modern education. Computers began to appear in schools during the 1980s and have since become increasingly important in teaching and learning processes. Up-to-date technologies provide multiple opportunities to enhance classroom instruction, improve communication between teachers and students, and facilitate interactive learning experiences (Ghavifekr et al., 2014; Lefebvre, Deaudelin & Loisele, 2006). Dawes (2001) emphasized that digital technologies have the potential to improve education across subject areas and enable more effective teacher-student communication, although successful implementation may be challenging when teachers face unfavorable conditions. Given the increasing importance of technology in society and education, identifying the barriers that teachers encounter when integrating educational technologies into classrooms is necessary to improve teaching effectiveness and learning outcomes. Balanskat, Blamire, and Kefala (2006) noted that although teachers acknowledge the value of ICT in education, many continue to encounter obstacles that limit their ability to integrate technology into teaching and learning.

1.2 Themes and Insights from Related Literature on Teachers' Use of Educational Technology

Modern educational technology includes a wide range of digital tools that can enhance teaching strategies and student engagement. Digital platforms enable learners to communicate globally, collaborate with peers, and access vast amounts of information instantly (Lambert & Cuper, 2008). These capabilities are increasingly important because digital literacy and technological competence are widely recognized as essential workplace skills in the 21st century. Various technological tools have been introduced to support educational practices. Social networking platforms, for example, can promote collaborative learning and encourage critical thinking when used effectively in educational settings (Boholano, 2017). Similarly, digital tools have enabled innovative instructional approaches such as gamification, which allows learners to engage in educational activities within interactive and motivating environments. Online learning tools can also transform classroom structures by shifting lower-level learning tasks outside the classroom and allowing more time for higher-order learning activities during in-class instruction. Mobile technologies and personal devices also play a growing role in education. Students frequently use mobile phones and other digital tools to access information, communicate with peers, and participate in collaborative learning activities. Research by Thomas and Orthober (2011) found that students are highly motivated to use mobile devices for communication and learning. However, the successful implementation of such initiatives requires careful planning, training, and support (Murphy et al., 2007). Teacher perceptions play a crucial role in determining whether educational technologies are used effectively in classrooms. The Technology Acceptance Model (TAM) proposed by Davis et al. (1989) explains that an individual's intention to use technology depends largely on perceived usefulness and perceived ease of use. These factors influence teachers' attitudes toward technology and their willingness to adopt new tools in teaching. Subsequent research has applied this model to educational contexts, showing that teachers' beliefs about technology significantly influence their classroom practices (Teo et al., 2012). Teachers' expertise and familiarity with technology also affect their perceptions of its usefulness. In technology-rich environments, teachers tend to use digital tools more frequently when they perceive them as beneficial for achieving instructional goals (Badia et al., 2013). Conversely, limited technological expertise may lead teachers to perceive technology integration as challenging or frustrating. Research has also demonstrated that removing technological barriers can improve student engagement, promote higher-order learning, and enhance students' ability to use technology as a learning tool (Lowther et al., 2008).

1.3 Local, National, and Global Context of Educational Technology Integration

Globally, the integration of information and communication technologies (ICT) in education has become a major focus of educational reforms. However, schools across different countries continue to experience challenges related to infrastructure, access to digital resources, and teacher competencies. Studies have identified several barriers to effective ICT integration. Lack of access to technological resources remains a major issue that prevents teachers from using

technology in classroom instruction (Empirica, 2006). Similarly, limited availability of computers, outdated equipment, and insufficient educational software have been reported as barriers to ICT integration in schools (Toprakci, 2006). Pelgrum (2001) also identified several infrastructure-related challenges, including insufficient computer units, limited software availability, and inadequate internet access. Other studies highlight the importance of teacher training and technical support. Research indicates that teachers may avoid using technology in classrooms when they lack the necessary skills or technical assistance (Korte & Hüsing, 2007). Similarly, teachers have reported difficulties accessing computers or scheduling computer laboratories due to shared resources within schools (Sicilia, 2005). Becta (2004) further noted that inadequate technical support and poor maintenance of technological equipment can discourage teachers from integrating technology into classroom instruction. In the Philippine context, particularly in rural areas such as Tawi-Tawi, these challenges may be further compounded by limited infrastructure, geographic isolation, and unequal access to technological resources. Understanding the experiences and perceptions of teachers in such contexts is essential for designing appropriate interventions to support effective technology integration in schools.

1.4 Theoretical or Conceptual Basis: Technology Acceptance Model and Technology Integration

This study is conceptually grounded in the Technology Acceptance Model (TAM) developed by Davis (1989), which explains how individuals decide whether to adopt new technologies. According to this model, perceived usefulness and perceived ease of use influence users' attitudes toward technology and their intention to utilize technological tools. In educational contexts, TAM has been widely used to analyze teachers' acceptance of educational technologies. Research shows that teachers are more likely to adopt digital tools when they perceive them as useful for improving teaching practices and when they find them easy to use (Teo et al., 2012). Conversely, negative perceptions related to technological complexity or lack of competence may hinder technology integration. The conceptual framework of this study assumes that teachers' experiences with technological barriers influence their perceptions and practices related to educational technology use. By identifying the challenges encountered by teachers, the study seeks to provide a foundation for developing an ICT literacy program that supports effective technology integration in classroom instruction.

1.5 Research Gaps and Rationale: Teachers' Perceptions of Barriers to Educational Technology Integration

Although numerous studies have examined the benefits of educational technology, many schools continue to struggle with its effective implementation. Existing research indicates that barriers such as limited technological resources, lack of teacher training, inadequate infrastructure, and insufficient technical support remain significant obstacles to technology integration (Balanskat et al., 2006; Becta, 2004; Pelgrum, 2001). Moreover, teacher perceptions play a critical role in determining whether educational technologies are used effectively in classroom settings. Teachers who perceive technology as beneficial and manageable are more likely to incorporate it into their teaching practices (Badia et al., 2013; Ertmer et al., 2012). However, teachers who encounter persistent challenges may develop negative attitudes toward technology use. Despite growing interest in educational technology integration, limited research has focused specifically on teachers' perceptions of technological barriers in rural or geographically isolated educational settings such as Bongao, Tawi-Tawi. Addressing this gap is important for understanding the unique challenges faced by teachers in these contexts and for developing targeted interventions to improve ICT integration in schools.

1.6 Alignment with Relevant Sustainable Development Goals (SDGs)

This study aligns with several Sustainable Development Goals (SDGs), particularly those related to education, innovation, and inclusive development. SDG 4 – Quality Education is closely related to this research because the effective integration of educational technology can enhance teaching strategies, improve access to learning resources, and promote interactive and student-centered learning environments. Strengthening teachers' technological competencies contributes to improving the overall quality of education. SDG 9 – Industry, Innovation, and Infrastructure is also relevant because educational technology relies on digital infrastructure and technological innovation to support learning processes. Addressing challenges such as insufficient technological resources and limited internet access supports the development of stronger educational infrastructure. SDG 10 – Reduced Inequalities is indirectly addressed through the study's focus on rural schools, where technological resources may be limited. Identifying barriers faced by teachers in these contexts contributes to efforts aimed at reducing digital inequalities in education.

1.7 Importance of the Study to Multidisciplinary Sustainability

The findings of this study contribute to multiple dimensions of sustainability, particularly educational sustainability, socio-economic sustainability, community sustainability, and digital innovation sustainability. From an educational sustainability perspective, strengthening teachers' capacity to integrate educational technology supports long-term improvements in teaching quality and learning outcomes. Teachers who are confident in using digital tools can create more engaging learning environments that prepare students for future academic and professional challenges. The study also contributes to socio-economic sustainability by promoting digital literacy and technological competence among educators and students. These competencies are increasingly essential for participation in modern economies and knowledge-based societies. At the community level, improved integration of educational technology in rural schools can reduce the digital divide and provide learners with greater access to information and educational opportunities. Finally, the development of an ICT literacy

program based on the study's findings supports innovation and digital sustainability within educational institutions by encouraging the responsible and effective use of technology in teaching and learning.

2. Material and methods

2.1 Research Design

The study utilized a quantitative research design to systematically collect and analyze data regarding teachers' perceptions of educational technology integration. A structured survey questionnaire was adopted, modified, and finalized to align with the objectives of the study. The instrument was designed to gather information about teachers' demographic characteristics, their level of technology use in teaching and learning, and the challenges they encounter when integrating educational technology into classroom practices. The quantitative design allowed the researcher to summarize responses using statistical measures and examine patterns among the collected data.

2.2 Locale of the Study

The study was conducted in selected public elementary schools under the Bongao III District in Tawi-Tawi, Philippines. These schools operate under the Ministry of Basic, Higher and Technical Education (MBHTE). The research involved three schools located within the district: Hji. Yunos Jumdain Elementary School, Luuk-Banca Elementary School, and Panglima Annao Elementary School. These institutions are situated in a rural island community in the southern Philippines where access to technological resources and infrastructure may vary. The context of the study is therefore significant in understanding how geographic and institutional conditions influence the integration of educational technology in classroom instruction.

2.3 Respondents of the Study

The respondents consisted of sixty public elementary school teachers from Bongao III District who were actively engaged in classroom instruction. These teachers were responsible for teaching various subjects and were expected to integrate educational technologies into their teaching and learning activities. All respondents had at least three years of teaching experience, ensuring that they possessed sufficient professional exposure to classroom practices and technology use. Their responses provided insights into both the extent of technology integration and the challenges teachers encounter when implementing digital tools in educational settings.

2.4 Sample and Sampling Procedure

The sample for this study included sixty teachers selected from the participating schools in Bongao III District. The researcher distributed the survey questionnaire randomly among teachers who were available and willing to participate in the study. The selection process ensured that respondents represented teachers actively involved in classroom teaching and the use of educational technologies. By including teachers from multiple schools within the district, the study was able to capture a broader perspective on technology integration practices and challenges within the local educational context.

2.5 Research Instrument

Data were collected using a modified adaptive survey questionnaire adapted from Simin et al. The instrument consisted of four sections with a total of forty-nine items designed to measure teachers' demographic characteristics, their use of educational technology tools, and the challenges they face in integrating these technologies into teaching and learning processes. The questionnaire utilized a five-point Likert scale to measure respondents' frequency of technology use. The scale ranged from "always," "often," "sometimes," "rarely," to "never," enabling respondents to indicate how frequently they performed specific technology-related tasks in classroom settings. The instrument included items measuring teachers' use of various educational technology tools such as word processing programs, email communication, digital image editing, online questionnaire editing, file sharing, spreadsheet use, multimedia presentation creation, participation in online discussion forums, software installation, and downloading instructional materials from digital platforms. It also included items examining how teachers guide students in safe and ethical online behavior and how they prepare instructional materials using interactive whiteboards. The survey also assessed the challenges encountered by teachers in integrating educational technology into classroom instruction. These challenges included issues such as insufficient computers, limited internet-connected devices, lack of interactive whiteboards, inadequate numbers of laptops or notebooks, malfunctioning or outdated school computers, insufficient technical and pedagogical support, lack of appropriate teaching materials, difficulties integrating technology into the curriculum, lack of pedagogical models for technology use, limitations related to classroom organization and scheduling, resistance from parents or teachers toward technology use, lack of teacher interest, and absence of institutional goals supporting educational technology integration. In addition to these components, the conceptual framework of the study described the relationship between teachers' experiences with educational technology and the development of an ICT literacy program. The framework proposed that identifying the challenges teachers encounter in integrating educational technology tools in the classroom would guide the development of an ICT literacy program tailored to the needs of the MBHTE-Tawi-Tawi Division. This program is intended to strengthen teachers' competencies and support more effective technology integration in teaching and learning environments.

2.6 Data Gathering Procedure

Prior to data collection, the researcher obtained permission from the school division superintendent through the district supervisors and school principals. After receiving authorization, the researcher distributed the modified survey questionnaire to sixty public elementary school teachers within the Bongao III District. Respondents were given one week to complete the questionnaire. After the allotted time, the completed questionnaires were collected and organized for analysis. The gathered responses were then tabulated, interpreted, and statistically analyzed to identify patterns in teachers' use of educational technology and the challenges they encounter in integrating such tools into classroom instruction. The results were subsequently used as the basis for developing recommendations and proposing an ICT literacy program for the district.

2.7 Data Analysis Techniques

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS). Both descriptive and inferential statistical methods were applied to interpret the results. Descriptive statistics were used to summarize the demographic characteristics of the respondents and to determine the frequency and percentage distribution of responses across the survey items. Measures such as the mean and standard deviation were also calculated to determine the general level of teachers' use of educational technology tools. Inferential statistical analysis was conducted using the t-test to examine relationships between selected variables. In particular, the study analyzed the relationship between gender and the use of educational technology in classroom instruction. The analysis allowed the researcher to determine whether demographic factors influenced teachers' engagement with educational technology in teaching and learning processes.

3. Results and Discussion

3.1 Teachers' Use of Educational Technology in Classroom Instruction

3.1.1 Demographic Profile of the Respondents

The results showed that most of the sixty respondents were between 36 and 45 years old, representing the largest proportion of the participants. Teachers aged 26 to 35 comprised the second-largest group, followed by those aged 46 to 55. Only a small number of teachers were under 25 years old. In terms of gender distribution, female teachers made up the majority of the respondents, while male teachers represented a smaller portion. Regarding teaching experience, most respondents had between five and ten years of teaching experience, followed by those with eleven to twenty years of experience. A few teachers had one to four years of teaching experience, and very few had more than twenty-one years of service or less than one year of experience. These findings indicate that the respondents were generally experienced educators with several years of teaching practice. The predominance of teachers with moderate teaching experience suggests that most respondents have had sufficient exposure to classroom instruction and technology use. Their demographic characteristics provide a meaningful context for understanding how teachers interact with educational technologies and how professional experience may influence technology integration in classroom settings.

3.1.2 Extent of Teachers' Use of Educational Technology Tools

The results showed that teachers used educational technology tools in classroom instruction at a moderate level. Most respondents indicated that they "sometimes" used various digital tools for instructional activities. Teachers reported occasional use of word processing programs for preparing instructional materials and moderate use of email communication for educational purposes. Similarly, many teachers sometimes used digital tools for editing images or multimedia materials, organizing computer files, and creating presentations with animations or audio and video components. Teachers also reported moderate engagement with online communication platforms and occasional participation in online discussion forums. Some respondents indicated that they sometimes downloaded or uploaded curriculum resources from websites or learning platforms for student use. Additionally, many teachers reported that they regularly instructed students on how to behave safely and ethically in online environments. Among the technology-related tasks measured, preparing instructional materials for interactive whiteboards recorded the highest mean level of use, while other technology tasks were used less frequently. These findings suggest that educational technology is present in classroom instruction but is not consistently integrated into daily teaching practices. The moderate level of technology use indicates that teachers are familiar with digital tools but may face limitations that prevent them from maximizing their potential. Such results highlight the importance of strengthening teachers' technological skills and providing support systems that encourage more consistent use of educational technologies in classroom instruction.

3.2 Challenges Affecting the Integration of Educational Technology

The results revealed several barriers that teachers encounter when integrating educational technology into classroom teaching and learning. Many respondents reported that the number of computers available in schools was insufficient for instructional use. Teachers also indicated that access to internet-connected computers was limited, which restricted opportunities for online learning activities and digital resource access. In addition, several respondents noted a shortage of interactive whiteboards and laptops or notebooks, further limiting the availability of digital teaching tools. Another

commonly reported challenge was that school computers were sometimes outdated, malfunctioning, or in need of repair. Teachers also indicated that they occasionally lacked adequate technical and pedagogical support for using educational technology effectively in their teaching practices. Some respondents reported that there were not enough instructional materials available to support technology-based teaching, and others indicated that integrating educational technology into the curriculum could be difficult. In addition, some teachers reported that there were limited pedagogical models available to guide effective technology use in teaching and learning. Organizational factors such as classroom scheduling, classroom space, and furniture arrangements were also identified as occasional barriers to technology integration. The results further showed that while resistance from parents or teachers toward technology use was not a major concern for most respondents, some teachers still perceived limited support for technology integration. In some cases, teachers reported that technology use was not always considered a priority or goal within their schools. Overall, the findings indicate that infrastructure limitations, insufficient technical support, and lack of institutional direction contribute significantly to the challenges teachers face when integrating educational technology into classroom instruction.

3.3 Relationship Between Gender and the Use of Educational Technology

The analysis examined whether a relationship existed between teachers' gender and their use of educational technology to support classroom teaching and learning. The results showed a low correlation between gender and technology use, with a correlation coefficient indicating a weak relationship between the two variables. The statistical significance value was higher than the threshold required to indicate a meaningful relationship, suggesting that gender did not significantly influence the use of educational technology among the teachers in this study. This finding indicates that both male and female teachers used educational technology tools at relatively similar levels. The weak correlation suggests that gender differences were not a determining factor in teachers' adoption or use of educational technology in classroom instruction. Instead, other factors such as access to technological resources, institutional support, teacher training, and infrastructure conditions may play a more significant role in shaping teachers' technology integration practices.

4. Conclusion & Recommendations

The study examined teachers' perceptions of the use of educational technology in classroom teaching and learning among sixty public elementary teachers in Bongao III District. The findings revealed that teachers used educational technology tools at a moderate level, with most responses indicating that these tools were used "sometimes" during instruction. Despite the presence of educational technology in classroom practices, its integration was not yet consistent. The results further showed that major challenges affecting technology integration included the insufficient number of computers, limited internet-connected devices, and the absence of clear school goals supporting the use of educational technology in teaching and learning. These findings indicate that while teachers recognize the value of educational technology, several structural and institutional barriers continue to hinder its effective implementation in classroom instruction.

Based on the findings of the study, it is recommended that school administrators and policymakers strengthen support for educational technology integration in schools by improving access to ICT resources and addressing the technological needs of both teachers and learners. The results of the study may guide educational leaders in developing programs that enhance teachers' technological competencies and improve ICT integration in teaching and learning. The findings may also contribute to the development of initiatives that expand the use of educational technology in schools and provide guidance for future research on strategies and policies that address the barriers teachers encounter in integrating ICT into classroom instruction.

The study was limited to sixty public elementary school teachers in selected schools within Bongao III District, Tawi-Tawi. The findings were based on data collected through a survey questionnaire and analyzed using descriptive and inferential statistical methods. Because the respondents were limited to a specific district and educational context, the results may not fully represent the experiences of teachers in other regions or school systems. The scope of the study was also confined to teachers' perceptions of educational technology use and the challenges they encountered in integrating these tools into teaching and learning.

Compliance with ethical standards

The study followed standard academic research practices for survey-based research involving teachers. Participation was voluntary, and responses were collected through a questionnaire for research purposes while maintaining the confidentiality of participants.

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Conflict of interest statement

The researchers declare that there are no financial, personal, or professional conflicts of interest related to this study.

Statement of ethical approval

The study involved non-invasive, survey-based data collection among teachers and did not involve experimental procedures; therefore, formal ethical approval was not sought or required.

Statement of informed consent

Informed consent was obtained from the participating teachers prior to data collection. Participation was voluntary, and responses were treated confidentially with no personal identifiers reported in the study.

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