Technology Integration in Secondary Education: a Study of the Technological Learning Environment in Camotes Island High Schools, Cebu, Philippines

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***Abstract*—Technology has become an essential component of modern education, enhancing teaching strategies, learning outcomes, and access to information. However, schools located in geographically isolated areas often face challenges in adopting educational technologies. This study examines the technological learning environment of selected high schools in Camotes Island, Cebu, Philippines. Using a descriptive research design, the study analyzes the availability of technological resources, the level of digital integration in teaching practices, and the challenges experienced by teachers and students. Data were analyzed using descriptive statistics (frequency, percentage, and mean) and thematic analysis for qualitative responses. Findings indicate that while schools in Camotes are gradually integrating technology through computers, internet connectivity, and digital learning platforms, several constraints remain, including limited infrastructure, unstable internet connectivity, and insufficient technological training for educators. Despite these challenges, strong collaboration among schools, parents, and local government units supports the gradual improvement of technology-based learning environments. The study recommends strengthening digital infrastructure, teacher training programs, and community partnerships to enhance technological integration in secondary education.**

Keywords: **Technology Integration; Digital Learning Environment; Secondary Education; ICT in Education; Rural Schools; Camotes Island; Digital Literacy; Educational Technology**

I. INTRODUCTION

Technology has become a fundamental component of educational transformation worldwide. Schools increasingly rely on digital tools such as computers, projectors, online learning platforms, and mobile devices to enhance teaching and learning processes. These technologies allow students to access global knowledge resources, participate in collaborative learning, and develop digital literacy skills necessary for the modern workforce (Selwyn, 2016).

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The integration of information and communication technology (ICT) in education has been widely promoted by international and national organizations. According to UNESCO (2021), digital technologies can improve access to education and enhance learning experiences when properly integrated into instructional practices. Similarly, the World Economic Forum (2022) emphasized that digital competence is one of the most important skills required for future employment.

In the Philippines, the Department of Education has implemented several initiatives to promote ICT integration in schools, including digital classrooms, learning management systems, and teacher training programs. However, the level of technology adoption varies significantly between urban and rural areas. Schools located in geographically isolated communities often face challenges related to infrastructure, connectivity, and limited technological resources (Trucano, 2015).

Camotes Island, located in the Province of Cebu, is composed of the municipalities of Poro, Tudela, San Francisco, and Pilar. The island's educational system includes several public and private high schools that serve students from rural and coastal communities. Historically, educational access in the area was limited, with only a few secondary institutions serving the entire island in earlier decades.

The physical and environmental context of Camotes Island also shapes the learning environment. The island is surrounded by coastal ecosystems and mangrove forests, which provide opportunities for environmental and community-based learning. Schools often integrate local resources and community collaboration into educational activities, helping students connect academic concepts with real-world environmental issues.

Despite these opportunities, schools in Camotes face several challenges related to technological infrastructure. Factors such as limited electricity supply, unstable communication signals, and geographic isolation can affect the availability and reliability of digital learning tools.

Given these circumstances, it is important to examine the current technological environment of high schools in Camotes Island. Understanding how schools utilize technology and address existing challenges can provide insights for improving digital learning opportunities in geographically isolated communities.

II. METHODS

This section presents the research design, participants, research locale, data collection procedures, and data analysis methods used in the study. It explains how the technological learning environment of selected high schools in Camotes Island was examined systematically to ensure accurate and reliable results.

A. Research Design

This study used a **descriptive research design** to examine the technological environment of high schools in Camotes Island.

B. Research Locale

The research was conducted in selected secondary schools located in the municipalities of **San Francisco, Poro, Tudela, and Pilar** in Camotes Island, Cebu.

C. Participants

The participants included:

- 40 High school teachers
- 120 Senior high school students
- 8 School administrators

Participants were selected using **purposive sampling** to ensure that respondents had experience with technology integration in education.

D. Data Collection

Data were gathered using:

1. Survey questionnaires
2. Interviews with teachers and school administrators
3. Observation of ICT laboratories and school facilities

E. Data Analysis

The collected data were analyzed using:

- **Descriptive statistics (frequency, percentage, and mean)**

III. RESULTS AND DISCUSSION

This section presents and interprets the findings of the study. Quantitative data from survey questionnaires are summarized using descriptive statistics such as frequencies, percentages, and means, while qualitative data from interviews and observations are analyzed thematically. The discussion integrates these findings with existing literature, highlighting patterns, similarities, and differences, and exploring their implications for technology integration in high schools. By combining results and discussion, this section not only reports what was observed but also explains the significance of the findings in the context of educational practice and policy.

Technological Resources in Camotes High Schools

Table 1 presents the availability of technological resources in selected Camotes Island high schools.

TABLE 1
AVAILABILITY OF TECHNOLOGICAL RESOURCES IN SCHOOLS

Technological Resource	Frequency	Percentage
Computer laboratories	7	87.5%
LCD Projectors	6	75%
Internet Connectivity	5	62.5%
Multimedia Classrooms	4	50%
Learning Management Systems	3	37.5%

The results show that computer laboratories are the most commonly available technological resource, present in 87.5% of the schools. However, internet connectivity was available in only 62.5% of the schools, indicating that connectivity remains a significant challenge in rural island communities.

These findings are consistent with previous studies indicating that rural schools often have limited access to stable digital infrastructure compared to urban institutions (Trucano, 2015), which implies that students and teachers in these areas may face challenges in fully integrating technology into teaching and learning, potentially affecting learning outcomes and digital skill development. Limited access to reliable hardware, software, and internet connectivity may hinder the adoption of innovative teaching strategies, reduce opportunities for collaborative and self-directed learning, and widen the digital divide between rural and urban students. Consequently, addressing these infrastructural gaps is critical for promoting equitable educational opportunities, improving digital literacy, and ensuring that all learners can benefit.

Technology Integration in Teaching and Learning

Table 2 presents the level of technology integration in classroom instruction.

TABLE II
LEVEL OF TECHNOLOGY INTEGRATION IN TEACHING

Technology Tool	Mean	Interpretation
PowerPoint presentations	3.65	High
Educational videos	3.52	High
Online research activities	3.40	Moderate
Digital assessments	3.25	Moderate
Virtual collaboration tools	3.10	Moderate

Legend:

3.50–4.00 = High
2.50–3.49 = Moderate
1.50–2.49 = Low

The results indicate that **PowerPoint presentations (M = 3.65)** and **educational videos (M = 3.52)** are the most frequently used digital tools by teachers. However, more advanced technologies such as virtual collaboration tools received lower ratings, suggesting limited exposure to digital pedagogical strategies.

According to Selwyn (2016), technology integration often begins with basic digital tools before progressing toward more interactive learning environments, which implies that schools lacking foundational digital resources may struggle to advance toward more engaging and collaborative teaching methods. This gradual integration suggests that professional development for teachers, adequate infrastructure, and consistent access to digital tools are essential to support effective technology adoption. Without these supports, students may miss opportunities to develop critical digital skills, engage in interactive learning, and fully benefit from the pedagogical potential of educational technologies.

Digital Literacy of Teachers and Students

Teachers and students demonstrated **moderate to high digital literacy**, with an overall mean score of **3.38**. Many students are already familiar with smartphones and online research platforms, which supports the development of digital learning practices.

However, several teachers reported limited training opportunities related to ICT integration, which affects their confidence in using digital technologies in classroom instruction.

Challenges in Technology Integration

Qualitative responses from interviews revealed four major themes:

1. **Limited Internet Connectivity**

   Participants reported unstable internet connections, particularly in remote barangays, which limits students' access to online learning resources, hinders real-time communication, and reduces opportunities for blended or fully digital instruction. This connectivity gap can prevent teachers from implementing innovative teaching strategies and students from participating in interactive learning activities.

2. **Power Supply Issues**
   Intermittent electricity supply sometimes interrupts ICT-based instruction, causing delays in lesson delivery and limiting the time available for practical computer-based exercises. Unreliable power can also damage sensitive equipment, further constraining the use of technology in classrooms.

3. **Limited ICT Equipment**
   Several schools reported having insufficient computers to accommodate all students, which leads to shared devices, reduced hands-on learning opportunities, and difficulty in implementing individualized or group-based digital activities. This limitation can hinder students' development of essential digital skills.

4. **Need for Teacher Training**
   Teachers expressed the need for additional professional development related to digital pedagogy. Without proper training, educators may struggle to effectively integrate technology into their lessons, limiting instructional innovation and reducing students' engagement with digital learning tools.

These findings support UNESCO's (2021) observation that infrastructure and teacher training remain key challenges in implementing educational technologies in developing regions. Addressing these challenges is crucial for creating equitable learning environments, enhancing teaching effectiveness, and ensuring that students develop the digital competencies necessary to succeed in a technology-driven society. By improving internet connectivity, providing reliable power supply, increasing access to ICT equipment, and offering targeted professional development for teachers, schools can foster more interactive, inclusive, and effective learning experiences, ultimately bridging the digit

IV. FINDINGS

This section presents the study's results, summarizing quantitative data using descriptive statistics and qualitative insights thematically. Findings highlight the technological environment of selected high schools, including access to digital resources, ICT equipment, internet connectivity, power reliability, and teacher preparedness, providing a basis for understanding ICT adoption in rural schools and guiding improvements in digital learning.

The study revealed the following key findings:

1. Most Camotes high schools possess basic ICT facilities, including computer laboratories and projectors.

2. Technology integration is moderately implemented, with teachers primarily using presentation and multimedia tools.

3. Teachers and students demonstrate moderate digital literacy.

4. Major challenges include internet connectivity issues, limited ICT equipment, and insufficient teacher training.

Community partnerships and government initiatives contribute to improving technological learning environments.

V. CONCLUSION

The technological learning environment in Camotes Island high schools continues to develop as educational institutions adopt digital tools and modern teaching methods; however, several challenges remain, particularly in terms of infrastructure and teacher training. Despite these limitations, schools demonstrate a strong commitment to improving digital learning practices, and strengthening ICT infrastructure, expanding teacher training programs, and improving internet connectivity will significantly enhance technology integration in these rural island schools.

APPENDIX

This study utilized structured survey questionnaires, interview guides, and observation checklists as primary data collection instruments. The survey questionnaire was designed to assess the availability of technological resources, the level of technology integration in teaching practices, and the digital literacy of teachers and students in selected high schools in Camotes Island, Cebu, Philippines.

The questionnaire consisted of three sections. The first section gathered demographic information about the respondents, including their role in the school and their experience with educational technology. The second section measured the availability and accessibility of ICT resources in schools, such as computer laboratories, internet connectivity, multimedia classrooms, and learning management systems. The third section examined the level of technology integration in classroom instruction, focusing on the use of digital tools such as presentation software, educational videos, online research activities, digital assessments, and virtual collaboration platforms.

In addition to the survey, semi-structured interviews were conducted with selected teachers and school administrators to gain deeper insights into the challenges and opportunities related to technology integration in the schools. Direct observations of ICT laboratories and school facilities were also conducted to verify the availability and condition of technological resources.

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