# Integrating Technology in Lesson Content and Teaching Strategy: Experiences of Public Secondary Science Teachers

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**DOI: https://doi.org/10.47772/IJRISS.2026.10200375**

**Received: 18 February 2026; Accepted: 24 February 2026; Published: 12 March 2026**

## ABSTRACT

The integration of technology into teaching and learning is a challenge. This phenomenological study explored the experiences of 10 junior and senior high school science teachers in Davao Oriental regarding technology integration in pedagogy and lesson content. Through interviews and focus group discussions, we identified two emerging themes: enhanced pedagogical confidence and inclusive, engaging digital instruction, each with corresponding sub-themes. The mediating effect of these themes on the correlation between technology and pedagogical and lesson content may be pursued. Schools may create an environment that provides opportunities for inclusive technology integration.

**Keywords**: Integrating technology in lesson content and teaching strategy, experiences of public secondary science teachers

## INTRODUCTION

As we explored studies on ICT implementation, we noticed that teachers often struggled with incorporating digital tools effectively into their daily pedagogical practices. Reflecting on this, the poor integration of technology into lesson content and teaching strategies was a persistent concern worldwide (Paran, 2024). From my perspective, even when digital tools were available, we observed classroom practices that often showed inconsistent use of technology, which made us wonder how teachers reconciled these challenges while delivering meaningful lessons (Mthembu, 2024). The literature's observation, particularly that teachers' integration of technology into lesson planning and teaching strategies varied significantly across instructional settings, prompted me to consider the lived experiences behind these numbers (Mthembu, 2024).

As we examined this issue across different countries, we realized that poor integration was not confined to any one region. In South Africa, Brazil, and Indonesia, we found that classroom practices continued to reflect uneven patterns of technology use, with digital tools often not fully aligned with pedagogical objectives (Mthembu, 2024; Florentino et al., 2025; Ongsotto, 2025). When we read these studies, we sensed a common thread: technology integration remained inconsistent across subject areas and levels of schooling, and we reflected on how teachers in these contexts negotiated these challenges in their daily work (Mthembu, 2024; Florentino et al., 2025; Ongsotto, 2025). These patterns led us to consider the broader implications for how educators experienced technology in practice, and we were prompted to explore what might support more consistent and meaningful integration in classrooms globally.

In our observations and reflections on public secondary schools in the Philippines, we noticed that integrating technology into lesson content and teaching strategies remained a persistent challenge. From what we had seen and what was documented in recent research, classroom practices showed varying levels of alignment between technology use, lesson content, and pedagogical approaches (Mthembu, 2024; Ongsotto, 2025). we often found that, though technology was present in classrooms, it was inconsistently embedded in lesson delivery, which led us to question how deeply digital tools were truly integrated into everyday teaching practices. This inconsistency mirrors broader patterns reported in studies, in which technology integration remained fragmented across subject areas, leaving us to wonder how teachers negotiate these challenges in their daily instruction (Mthembu, 2024).

As we reflected further, we became concerned about the consequences of this continued poor integration. we sensed that when technology was not effectively integrated, opportunities for instructional innovation appeared limited. In our views, students' engagement and the development of higher-order thinking skills were constrained, and teachers' professional confidence might also be affected when they could not consistently apply technology to support learning (Mthembu, 2024; Ongsotto, 2025). These reflections led us to conduct the study.

**Significance of the Study**

This study is significant because it explores the integration of technology in lesson content and teaching strategies, a practice essential for enhancing instructional quality and fostering 21st-century skills among learners. By addressing this issue, the research supports Holy Cross of Davao College's mission to provide transformative, holistic education. It aligns with its vision of developing competent, ethical, and innovative graduates who can respond to society's evolving demands. Insights from this study may guide educators and administrators in implementing effective technology-supported teaching practices, thereby advancing the institution's commitment to academic excellence and learner-centered education. Embedded into lesson content and teaching strategies across diverse contexts and disciplines.

**Statement of the Problem**

In this study, we aimed to describe teachers' experiences of effective instruction. Specifically, we sought answers to the following questions:

1. What are the experiences of science teachers in Integrating Technology in Pedagogy?

2. What are the experiences of science teachers in Integrating Technology in Lesson Content?

**Assumption**

This study is guided by the assumption that the purposeful integration of technology into both pedagogical content and lesson content enhances teaching effectiveness and supports inclusive, meaningful learning experiences for diverse learners (Mishra & Koehler, 2006; Schindler et al., 2017).

## THEORETICAL FRAMEWORK

Technological Pedagogical Content Knowledge (TPACK) is a framework describing the knowledge teachers need to effectively integrate technology in education. Developed by Mishra and Koehler (2006), it emphasizes that effective instruction requires understanding how content, pedagogy, and technology interact. Content Knowledge refers to mastery of the subject matter, Pedagogical Knowledge involves strategies for teaching and engaging students, and Technological Knowledge focuses on using digital tools to support learning. Together, these domains guide teachers in combining content, pedagogy, and technology to enhance student learning.

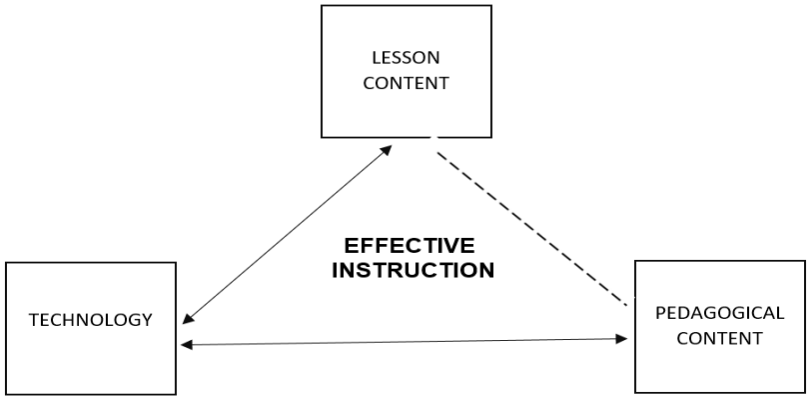


**Figure 1. Conceptual Framework of the study**

# METHOD

we employed a phenomenological research design to explore the experiences of science teachers in integrating technology into pedagogical and lesson content. Phenomenology is suitable because it seeks to understand how teachers make meaning of their practices from their own perspectives. As Creswell and Poth (2018) note, phenomenology describes the common essence of participants' experiences, allowing me to capture in-depth narratives of how teachers navigate digital tools, science concepts, and instructional strategies, and to uncover shared meanings, challenges, and realities in technology integration.

The study was conducted in the selected municipality of Davao Oriental. Davao Oriental was a promising tourism and investment destination located at the easternmost part of Southern Mindanao. The Pacific Ocean bounded it in the east, Davao Province in the west, Agusan del Sur in the north, and Davao Gulf and Celebes Sea in the south. It was considered the easternmost part of the country, with Pusan Point as the easternmost location. The province comprised one city and ten municipalities, with 183 barangays, and was subdivided into two legislative districts.

We used purposive sampling, a nonprobability sampling method that selects participants based on specific characteristics (Foley, 2018). We chose science teachers with at least 3 years of experience, excluding those with fewer years, as they might lack the necessary context. Our target participants were 10 teachers from junior and senior high schools, with 5 participating in in-depth interviews and 5 in a focus-group discussion (FGD).

We developed the interview guide to explore science teachers' experiences in integrating technology into pedagogy and lesson content, aligned with our research objectives. To address pedagogy, we asked questions about how teachers use technology in teaching, the opportunities it provides, and its effects on instructional strategies and student engagement. For lesson content, we asked about integrating digital resources, designing materials, and using technology to clarify concepts and enhance student understanding.

We followed these qualitative steps to gather data: we first requested an endorsement from the Dean of the Graduate School of Holy Cross of Davao with my thesis adviser's consent. With this, we obtained written permission from the Division Superintendent of Davao Oriental and from each School Principal to conduct the study with science teachers. During in-depth interviews, we recorded the sessions to ensure thorough analysis and accurate referencing, storing all recordings securely to maintain participants' confidentiality.

We employed qualitative data analysis to systematically examine the rich data from in-depth interviews on science teachers' integration of technology in lesson content and teaching strategies. We organized, coded, and categorized responses to identify patterns and themes reflecting their lived experiences. Following Creswell and Poth (2018), we transcribed, coded, developed themes, and interpreted the data to capture the essence of participants' experiences. This allowed us to gain insights into how teachers integrate technology, pedagogy, and content in science instruction.

The researcher's data was the cornerstone of research excellence. In this study, Stumpfegger (2017) cited Lincoln and Guba (1985) for creating a set of criteria for trustworthiness in qualitative research: credibility, transferability, dependability, and confirmability, to provide a different set of criteria for assessing the quality of the study.

Credibility. We focused on the richness of the data and analysis, enhanced through triangulation rather than sample size. We encouraged science teachers to respond spontaneously to the guide questions to ensure the findings were factual and credible.

Transferability. We ensured my findings could be applied to other contexts by providing thick descriptions of the research setting. By detailing the fieldwork environment, we enabled readers to assess whether the results could inform studies in different fields or locations, thereby supporting the transferability of our research.

Dependability. We ensured the consistency and reliability of the findings by thoroughly documenting our research procedures, allowing others to follow, audit, and critique my work. By providing detailed methodologies and data-collection processes, we enabled readers to assess the appropriateness of our research design and implementation.

Confirmability. We ensured my results clearly supported my conclusions and could be replicated. Confirmability, like credibility, was necessary for studies informing policy. We documented the steps we took to manage and reflect on my personal biases, which, while present, clarified their influence and still provided valuable insights.

## RESULTS AND FINDINGS

This chapter presents the results of the study on teachers' technology integration in lesson content and teaching strategy, interpreting the modified paradigm and key themes – technology, pedagogical content, and lesson content.

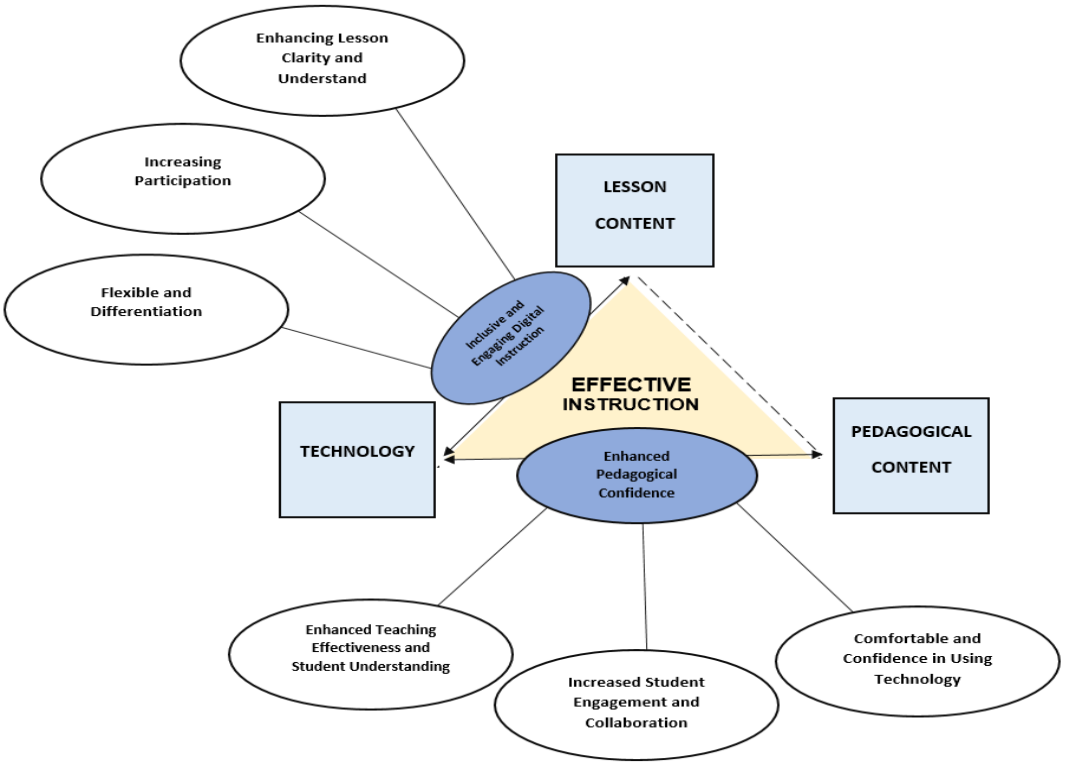


**Figure 2. Modified Paradigm of the Study**

**Enhancing Pedagogical Confidence: Integration of Technology into Pedagogical Content**. While listening to our participants' responses, we recognized the importance of integrating technology into pedagogical content. This integration does not happen automatically or like magic; instead, it involves a process in which meaningful experiences occur along the way. Through this process, a momentous event emerged—the enhancement of pedagogical confidence. This enhanced pedagogical confidence is characterized by greater teaching effectiveness and student understanding, increased student engagement and collaboration, and greater comfort and confidence in using technology.

**Enhanced Teaching Effectiveness and Student Understanding.** Enhanced Teaching Effectiveness and Student Understanding. Enhanced teaching effectiveness actively engages learners and strengthens conceptual understanding through innovative, student-centered approaches such as flipped classrooms and technology supported scaffolding, leading to improved academic performance and deeper comprehension. One participant mentioned, *In integrating technology in the teaching- learning process, kay mas better kay maenhance man yang engagement ng mga iso through interactive content. For example, yang kanak kuan igamit na technology kay yang kahoot na app, which is ma yang, kuan ng iso makainteract silan kay, then maka think gyud silan kung ma answer or unn yang answer sian na question kay awon man timer, so kailangan nilan..FGD; p1; Lines 9-13*

*Integrating technology into the teaching–learning process is better because it can enhance student engagement through interactive content. For example, the technology I used, such as the Kahoot app, allows students to*

*interact with the lesson. They really have to think to answer the questions, especially since there is a timer, which challenges them to respond promptly. FGD; p1; Lines 9-13*

As reflected in the response, we realized that using technology like Kahoot not only makes lessons more engaging but also enhances teaching effectiveness.

*Increased Student Engagement and Collaboration*. Integrating technology fosters student engagement and collaboration by creating interactive, student-centered environments where digital tools support active, joint knowledge construction. According to one participant,

*Yaang using technology laung pa mas mapagaan, mas mapadali, mas mapasayun labis da sang teaching and learning process. Sang yaexperience ko mas interactive yang mga iso like ng laung ni mam jen kagaena. Interactive, collaborative tapos awon fun while learning. And also tama ngawon ni mam badin na mas mapasabtan ng mga iso.. FGD; p1; Lines 24- 27*

*Using technology makes the teaching and learning process easier, faster, and more efficient. Based on my experience, lessons become more interactive, like those taught by Ms. Jen before, collaborative, and fun while learning. It also helps students better understand the lessons, as noted by Ms. Badin. FGD; p1; Lines 24- 27*

As indicated in the response, we realized that using technology in lessons makes learning more interactive, collaborative, and fun. Students participate more actively, work together, and engage deeply with the content, which makes learning memorable and meaningful.

*Comfort and Confidence in Using Technology*. Teachers' comfort and confidence with technology, strengthened through hands-on experience and support, are essential for meaningful integration of digital tools into instruction.

As shared by one participant,

*As for the comfort, I think I'm more comfortable using the ICT, kay my experience in teaching science, especially now that I'm teaching junior high school grade 9 and grade 7, it is essential that during the teaching, the concept and content knowledge is explained well, discussed well, kay kung dili kayo madiscuss ang mga studyante pag-uli sa balay walay nasabtan, walay mastery ng topic.IDI lines. 51-54; P2*

*As for comfort, I feel more comfortable using ICT based on my experience in teaching Science, especially now that I am handling Junior High School Grades 7 and 9. Concepts and content knowledge must be clearly explained and thoroughly discussed during the lesson, or students may leave without understanding or mastering the material. IDI lines. 51-54; P2*

Based on the response, we gained insight that using ICT tools like laptops, screens, and speakers makes the teacher more confident and comfortable in teaching, as they help explain concepts clearly and engage students effectively, ensuring they understand and master the lesson.

**Inclusive and Engaging Digital Instruction: Integration of Technology into Lesson Content**

We recognized the significance of integrating technology into lesson content to create inclusive and engaging digital instruction. This integration does not happen automatically; instead, it involves a deliberate process where meaningful experiences unfold. Through this process, an important outcome emerged—inclusive and engaging digital instruction, enabling teachers to deliver lessons more effectively and support diverse learners. This inclusive and engaging digital instruction is characterized by clearer lessons, greater participation, and flexible, differentiated learning.

**Enhancing Lesson Clarity and Understanding**. Integrating technology clarifies lessons and boosts student understanding. Tools like reflective feedback software engage students metacognitively, making learning goals more accessible. As expressed by one participant,

Based on my experience in teaching Science using technology, *ahh mas madali yang mga iso mas mas makalearn, it's because example kung awon kanak ipakita kanilan na image mas madali silan makasabot compare kung mag imagine. FGD; p1; Lines 19-21 ased on my experience in teaching Science using*

*technology, students learn more easily. This is because, for example, when I show them an image, they understand the lesson more quickly than when I ask them to imagine it. FGD; p1; Lines 19-21*

We realized that using technology to show images and visuals makes the lessons clearer and easier to understand, because students can see concepts directly, which helps them grasp the topic faster and participate more actively.

*Increasing Participation*. Integrating technology boosts student participation by making lessons interactive and student-centered, while tools like response systems enhance engagement and motivation and provide feedback through interactive activities. A specific study participant asserted,

*It helps me make my students more active because using technology in my teaching practices allows me to foster environmental engagement and equip my students with meaningful learning that they can use to become globally competitive in the future. IDI-lines 168-170, P5*

Using technology in science lessons makes learning more interactive, fun, and collaborative, encouraging students to engage with the content rather than imagine it.

*Flexible and Differentiation.* Flexible, technology-enhanced instruction meets diverse learning needs by tailoring materials, paths, and assessments. Tools like apps, interactive videos, and gamified content create personalized, engaging experiences that improve student outcomes. In the words of one participant,

*Well, Kanak, for me through technology gives me the flexibility to adapt my teaching methods, like if there's a student who's struggling to accept or maglisod siya ng concept, through technology can easily provide kaw ng other alternative ways or different learning styles, just like showing pictures or videos na maexplain niya na dali makacater ng kanilan, ah dali makacater sang mga students na gastruggling about ng concept. FGD; p2; Lines 69- 73*

*Technology gives me the flexibility to adapt my teaching methods. For example, if students are struggling to understand a concept, technology allows me to easily provide alternative approaches or different learning styles, such as showing pictures or videos. These help explain the lesson more clearly and better cater to students who are having difficulty understanding the concept. FGD; p2; Lines 69- 73*

Listening to this conversation, we really realized that the teacher is highly adaptive and flexible, finding various ways to meet students' needs.

## DISCUSSION

In this chapter, we discussed the fundamental backbone of our study. With that, we assumed that technology can be integrated into both pedagogical content and lesson content.

With our interest in ascertaining whether technology can be integrated into pedagogical and lesson content, we proved my assumption that it can be incorporated into the latter. Nevertheless, some vehicles facilitate the integration process, namely, enhanced pedagogical confidence and the development of inclusive, engaging digital instruction.

**Confidence helps integrate technology into Pedagogical Content.**

We review the study by Sullivan (2024), which found that the TPACK framework helps teachers align digital tools with instructional goals, leading to more precise explanations, interactive learning experiences, and differentiated instruction. This finding is supported by our study on integrating technology into pedagogical content. We found that teachers successfully use digital tools in pedagogical content and in meaningful ways because they trust and are confident in their instructional choices and feel more capable.

Abedi and Ackah-Jnr (2023) reported that teachers often faced persistent contextual and infrastructural barriers that led to routine, surface-level use of technology. Our finding contradicts this assertion. We found that teachers' confidence helps integrate technology into pedagogical content.

**Integration of Technology in Lesson Content through Inclusive and Engaging Digital Instruction**

Our findings on the integration of technology in lesson content through inclusive and engaging digital instruction affirm the study of Navas Bonilla et al. (2025) about the tools, such as mobile devices and interactive applications, that reduce learning barriers, promote participation, and provide equitable access to content, supporting meaningful engagement for learners with diverse abilities and backgrounds.

Samaniego López et al. (2025) identified barriers such as limited training, inadequate infrastructure, and social inequalities. The result of our study denies this.

**Viewpoint and Standpoint**

Drawing on our participants' experiences, integrating technology into both pedagogical and lesson content is essential for enhancing teaching effectiveness and promoting inclusive learning. For me, technology, when used thoughtfully, not only builds teachers' confidence and flexibility but also actively engages students, clarifies complex concepts, and accommodates diverse learning needs. These experiences suggest that purposeful technology integration transforms lessons into interactive, collaborative, and differentiated learning environments that support meaningful student understanding.

**Future Directions**

Future research could explore the mediating effect of enhanced pedagogical confidence on the correlation between technology and pedagogical content, using the sub-themes as indicators of the variable.

Further study includes the mediating effect of inclusive and engaging digital instruction on the correlation between technology and lesson content, applying the sub-themes as indicators of the variable.

**Implication for Practice**

Based on these findings, schools play a crucial role in supporting teachers' purposeful use of technology. Schools may create an environment that provides opportunities for inclusive technology integration, enabling teachers to confidently experiment with technology and foster inclusive, engaging, and meaningful learning experiences that respond to students' diverse needs.

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