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STATE OF DIGITAL INSTRUCTION OF PRIMARY SCHOOL TEACHERS IN BONTOC DISTRICT

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Abstract

Digital tools are now central to teaching and learning, yet their effect on instruction depends largely on teachers' digital competence. This study examined the state of digital instruction among primary school teachers in the Bontoc District, Philippines, specifically the profile of schools in terms of ICT training and resources, teachers' perceived digital competence, differences in competence between pilot and non-pilot schools, and the perceived impact of digital instruction on pupils' learning. A mixed-methods design was used during the second semester of the 2023–2024 academic year. Primary teachers from the district's 19 schools answered a questionnaire on the availability and use of digital resources, training attended, and a self-assessment adapted from the National ICT Competency Standard (NICS) for Teachers (4-point scale; pilot-tested, Cronbach's $\alpha = 0.998$). Semi-structured interviews with ICT coordinators, teachers, parents, and learners supplied the qualitative data. Data were analyzed using descriptive statistics, the Mann-Whitney U test, and thematic analysis. Teachers had attended between one and five ICT trainings since 2022, most commonly one, and training centered on Open Educational Resources (OER) created with Lumi. All teachers had laptops and smartphones; tablets were found only in pilot schools, and only about half of the schools had internet connectivity. Teachers' overall digital competence was at the Developing level ($M = 2.46$, $SD = 0.47$); it was highest in the social and ethical domain ($M = 2.64$) and lowest in applying technology to assessment ($M = 1.69$, Beginning). Competence did not differ significantly between pilot and non-pilot schools ($U = 544.000$, $p = .860$). Teachers and parents perceived that digital instruction enhanced pupils' engagement, motivation, and differentiated learning, although parents also raised concerns about screen time. The findings point to the need for longer, differentiated, and practice-oriented training, functional ICT resources, and continuous monitoring of digital instruction initiatives.

Keywords: *digital instruction; digital competence; primary school teachers; ICT integration; National ICT Competency Standard; Bontoc District; Philippines*

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INTRODUCTION

Background of the Study

Information and Communication Technologies (ICTs) play a central role in accelerating progress in digital culture and inclusive knowledge, as emphasized in the Sustainable Development Goals advanced by UNESCO (Benali & Mak, 2022). As more governments embrace a digital future, they advocate for its inclusion in education and professional development.

The World Education Forum highlighted the importance of harnessing ICT to strengthen education systems, knowledge dissemination, information access, quality and practical learning, and service provision (UNESCO, 2015). Teachers and administrators have been encouraged to use digital tools in teaching and learning and to incorporate ICT in their classrooms. However, the sudden shift to remote learning during the pandemic revealed how poorly prepared many teachers were in terms of resources and digital skills (Benali & Mak, 2022). Digital tools such as computers, laptops, smartphones, tablets, and Wi-Fi came to dominate the tasks of teachers, administrators, and students.

As digital tools become a crucial part of teaching and learning, teachers' digital competence has become increasingly necessary (Meling, 2022). Teachers need practical digital competence to weave technologies into their instruction (Tondeur et al., 2017). Digital instruction requires digital tools, yet these tools are used effectively only with digital competence; thus, digital tools used appropriately in the classroom, together with the teacher's digital competence, are the foundation of digital instruction. Digital instruction, however, encompasses more than the use of any digital tool. At the teacher's discretion, it requires careful consideration of which digital tools are most appropriate for teaching and learning a particular content, which relates to the teacher's skill in using ICT in pedagogy (Krumsvik, 2008).

Although digital tools were highlighted during the pandemic, when digital instruction also became widespread, most of these tools are not new, owing to the Department of Education (DepEd) mandate to integrate technology through the DepEd Computerization Program (DCP). The program aims to provide public schools with appropriate technologies to enhance the teaching-learning process and meet the challenges of the 21st century. Its initiatives include providing ICT packages to schools, integrating ICT into teaching and learning, and boosting the ICT literacy of students, teachers, and administrators, among others (DepEd, 2010).

The DCP is indeed helpful and continues to supply identified schools; however, despite the distribution of digital tools to schools, many teachers have had to purchase their own gadgets. In the Bontoc District, teachers had to develop modules or activity sheets for asynchronous learning during the suspension of classes, and some sent online assessments to learners who wished to use online platforms. Consequently, teachers rely mainly on digital tools.

DepEd evaluates public school teachers at the end of each school year using the Individual Performance and Commitment Review Form (IPCRF). This tool rates teachers on their annual accomplishments, including their ability to select, develop, organize, and use appropriate teaching and learning resources, including ICT, to achieve learning goals. Teachers' ability to integrate and use ICT in their daily lesson plans and delivery can therefore significantly influence their overall rating.

To empower teachers to provide continuous education to learners during the pandemic, mass ICT-based training was conducted in Bontoc. However, a significant challenge arose: many teachers were not adequately prepared for advanced ICT training, such as sessions on creating audio-visual presentations, because of insufficient proficiency in basic computer use. Moreover, DepEd-Cordillera launched the project Hybrid Learning using Technology with Equity and Quality (HyTEQ) 1, an alternative to the printed modules in the region, and nine

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pilot schools in the Bontoc District received tablets to expedite the use of ICT in today's learning contexts (Division ICT Coordinator, personal communication).

The DCP began more than a decade ago, and multimedia packages including computers, printers, headphones, and projectors were given to recipient schools. At least three personnel from each school (the Property Custodian, the ICT Coordinator, and the School Head) underwent orientations to facilitate the efficient and effective use of the package. However, informal conversations showed that ICT coordinators have yet to undergo any ICT-based training regarding the DCP. Given the training sessions conducted for teachers from 2021 (workshops on utilizing technology, script writing, and AVP production, among others) to 2022, it is essential to determine whether teachers have benefited from them and continue to apply what they learned in their classrooms. The performance of learners, in both pilot and non-pilot classes, likewise needs to be evaluated given their exposure to digital instruction. Therefore, this study investigated the profile of digital instruction of primary school teachers in the Bontoc District, their digital competence, and the overall impact of digital instruction on learners.

Review of Related Literature

Digital Instruction

Digital instruction uses technology and digital tools to deliver educational content, guidance, and learning experiences to students. Put simply, digital instruction uses digital devices and applications (Argawati & Suryani, 2020). Digital devices or tools include smartphones, tablets, LCD projectors, laptops, and computers, whereas digital applications include online dictionaries and various software (Kurniawati et al., 2018).

Digital instruction in the Philippines has become increasingly important in recent years. The COVID-19 pandemic highlighted the need for distance and online learning, prompting educational institutions to adopt digital instruction methods. Virtual learning platforms such as Google Classroom, Microsoft Teams, and Zoom have been widely used to facilitate online classes and ensure educational continuity during class suspensions. However, challenges persist in achieving full implementation and success of digital instruction in the Philippines, including in the Bontoc District. These include the lack of reliable internet access in remote areas, limited access to digital devices among students and teachers, and the need for proper training and support in using digital tools effectively (Baticulon et al., 2021; Maphosa, 2021). These come on top of the more apparent issues of internet speed, cost of materials, and mode of delivery (Rosario, 2023). In Maphosa's (2021) study, a significant challenge to digital instruction was stimulating students' motivation and energy to engage more actively in teaching and learning.

The best way to move forward and address these challenges is to take a step back and design a comprehensive strategy that involves all stakeholders: teachers, students, parents, educational institutions, and the government (Barrot et al., 2021). This strategy should include improving internet connectivity in remote areas, providing digital devices to students and teachers, offering training programs on digital tools and platforms, and creating guidelines and policies that support innovative educational practices. It is also crucial to prioritize equitable access to digital instruction so that marginalized and disadvantaged communities are not left behind (Barrot et al., 2021).

While digital instruction in the Philippines has made significant progress, hurdles remain to widespread and effective implementation. Continued efforts are needed to bridge the digital divide, address infrastructure issues, and provide support and resources to all stakeholders. Overall, digital instruction in the Philippines is progressing but faces significant challenges related to internet access, device access, and training and support (Barrot et al., 2021). Moreover, while government partnerships have worked to expand digital access by deploying computer laboratories and devices to public schools over the past decade, penetration rates alone fail to catalyze adoption (Alsodemani, 2019).

Teachers' Digital Competence

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Teachers are essential in integrating ICT into the classroom, and their ability to use ICT effectively determines the impact of these technologies on students' learning. Digital competence can be defined in various ways, but it essentially refers to the knowledge, skills, and abilities required to navigate the digital world. In this study, digital competence pertains to the "set of ICT knowledge, abilities, and skills applied to the teaching profession that can help teachers to resolve professional and pedagogical challenges" (Cabero-Almenara et al., 2020; European Commission, 2018; Ghomi & Redecker, 2019).

Teachers must be able to integrate digital tools and applications effectively (Argawati & Suryani, 2020; Spiteri & Chang Rundgren, 2020; Ferrari, 2013). Professional development and training programs are essential to hone teachers' digital competence and incorporate ICT into their instructional processes efficiently and effectively (Benali & Mak, 2022). Establishing a positive ICT environment, developing pedagogical strategies, and providing training opportunities are critical to building teachers' digital competence (Yang et al., 2023; Zakaria & Khalid, 2016). A lack of digital competence adversely affects the use of digital tools in the classroom and students' learning outcomes (Spiteri & Chang Rundgren, 2020; Tomaro, 2018). Several studies have also found that teachers' self-rated digital competence does not necessarily translate into practice (He et al., 2022; Kong & Zhao, 2017; Ma et al., 2019; Tang et al., 2019).

For instance, public school teachers in the Philippines possess only basic ICT knowledge and require further advancement (Caluza et al., 2017). Teachers' digital competence is crucial for using ICT to facilitate learning, motivate students, and develop independent learners (Garcia et al., 2023). Equipping teachers with the appropriate tools and competence to integrate ICT into their instructional processes is therefore imperative. The European Framework for the Digital Competence of Educators (DigCompEdu; Redecker, 2017) is a promising framework for determining teachers' digital competence.

DigCompEdu has five areas with self-assessed indicators for assessing digital competence, including information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving (Garcia et al., 2023). The Department of Education and the Commission on Information and Communications Technology in the Philippines have adopted the National ICT Competency Standard (NICS) for Teachers. The NICS comprehensively stipulates indicators for evaluating teachers' knowledge and competence in teaching and learning, including the technological operations and concepts, social and ethical, pedagogical, and professional domains (Commission on Information and Communications Technology, n.d.). The domains of the NICS for the Philippines were adapted in this study to determine the digital competence of the respondents.

Impact of Digital Instruction

Numerous studies have examined the benefits of digital instruction for teachers and students and have highlighted several key points. First, digital instruction offers opportunities for personalized and differentiated learning. Students can access resources and materials at their own pace, allowing individualized learning that caters to their needs and interests (Clark, n.d.). Second, digital instruction promotes active and engaged learning: students can participate actively through interactive online activities, multimedia resources, and collaborative projects (Yang & Ding, 2021; Javier, 2022). Third, digital instruction provides access to vast information and resources, allowing students to explore various perspectives, conduct in-depth research, and access up-to-date information. It also fosters 21st-century skills such as critical thinking, creativity, collaboration, and communication, which are crucial for success in today's digital age and highly valued by employers (Javier, 2022).

Digital instruction has also been associated with improved student motivation and engagement, and it can encourage lifelong learning and help spur positive relationships and interactions (Zakaria & Khalid, 2016). However, teachers need appropriate digital competencies to facilitate their students' learning of technology (ElSayary, 2023). Conversely, when teachers expand their digital competencies, they can positively influence

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their students by using digital technologies to complete tasks innovatively, and they can develop their students' digital competencies as well.

Interestingly, the Organisation for Economic Co-operation and Development (OECD, 2019) found that the use of digital tools by teachers who lack digital skills (and use the tools anyway) affects learning outcomes because of the distraction it brings. Courtney et al. (2022) report similar findings, noting that integrating technology into instruction negatively affected students' learning proficiency, specifically in Mathematics.

Synthesis and Research Gap

In summary, the reviewed literature emphasizes the growing significance of digital instruction in the Philippines, particularly in response to the challenges posed by the COVID-19 pandemic. While digital tools and platforms have been increasingly adopted, obstacles such as unreliable internet access, limited device availability, and insufficient training hinder their effective implementation. The literature also underscores the critical role of teachers' digital competence in successfully integrating ICT into the classroom. However, a notable gap exists between teachers' self-rated digital competence and its practical application, particularly in Philippine public schools, where most teachers possess only basic ICT skills. Although frameworks such as DigCompEdu and the NICS offer guidelines for assessing and improving teachers' digital competence, comprehensive strategies that address these challenges holistically remain lacking. This study aims to fill this gap by exploring the current state of digital instruction and teachers' digital competence in the Bontoc District, identifying specific barriers to effective ICT integration, and proposing targeted interventions to enhance educators' digital competencies, thereby improving the overall quality of digital instruction in the region.

Conceptual Framework

Implementing digital instruction in primary schools is critical for the successful education of students in the 21st century. With the increasing availability of digital technologies in classrooms, primary teachers increasingly need to incorporate digital instruction into their teaching practices. This need arises from recognizing the benefits of digital instruction for primary learners' learning outcomes and the demand for 21st-century skills among students. Primary teachers in the Bontoc District must therefore have the knowledge and skills to integrate digital instruction effectively into their classrooms, including understanding how to use digital tools and resources, adapting instructional strategies to incorporate technology, and creating a digitally rich learning environment (Javier, 2022). However, the status of digital instruction in primary schools in the Bontoc District may vary across schools and locations. The study therefore drew on several sources and references to understand the state of digital instruction among primary school teachers in Bontoc.

One source was the DepEd Computerization Program, which aims to provide public schools with computer laboratories and other ICT facilities. The study investigated whether each school in the Bontoc District still uses the sets of computers given to them more than a decade ago under the DCP and identified the other digital tools in use. The number of DCP packages and other multimedia packages distributed to each school was obtained from the school's ICT coordinator and the Division ICT coordinator.

Another source was the training programs and workshops provided for teachers from school year 2022 to 2024 to enhance their digital literacy skills, which focused on integrating technology into teaching practices. The study aimed to identify which teachers were using digital tools and to ascertain why some were not. This exploration was crucial in determining the level of digital competence among primary teachers in the Bontoc District.

Finally, the study referred to the NICS, which defines the competency outcomes and the supporting knowledge and skills needed to use ICT in performing job roles related to teaching. The NICS for Teachers is based on broad comparative research on current industry practices in other countries. Through this approach, the study aimed to

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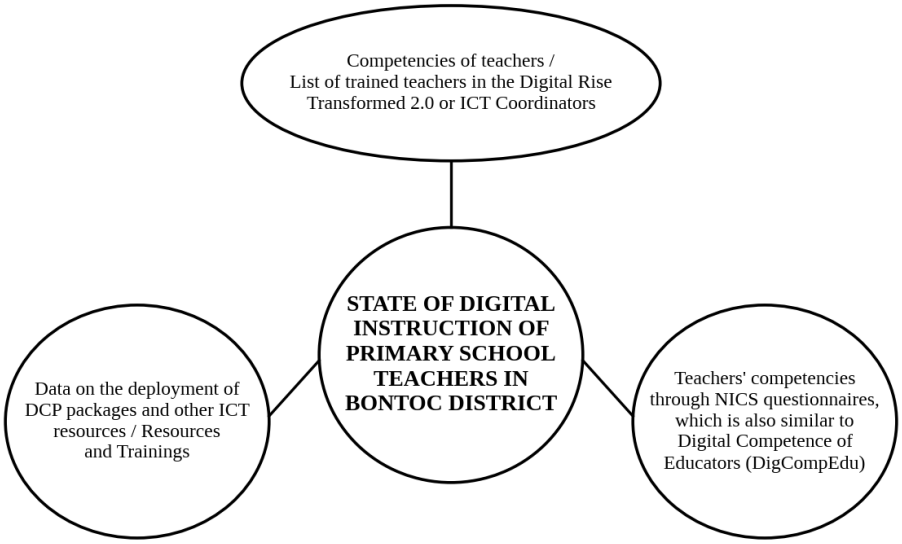
identify the skills and knowledge that primary teachers in the Bontoc District must possess to incorporate digital instruction effectively into their teaching practices (Figure 1).

Figure 1. Paradigm of the Study



To determine the state of digital instruction of primary school teachers in the Bontoc District, this study adopted the Digital Competence of Educators (DigCompEdu) as its framework. DigCompEdu is designed specifically for educators across educational contexts, ranging from early childhood to higher and adult education, including special needs education and non-formal learning contexts. This study narrowed its focus to primary teachers in the Bontoc District.

The framework was chosen because it is appropriate, specific, and apt for teachers, unlike other frameworks developed for determining digital competence in a more general way. Recognizing the importance of establishing teachers' digital competence, the European Commission developed DigCompEdu, which can be used to ascertain the digital competence of teachers and educators and to craft ways to develop it accordingly.

DigCompEdu has five areas with self-assessed competency indicators. These include Information and data literacy (Area 1), which deals with managing information; Communication and collaboration (Area 2), which deals with communicating; and Digital content creation (Area 3), which deals with creating content. This study on digital instruction focused on Areas 1, 2, and 3 to determine the digital competence of primary school teachers in the Bontoc District.

Statement of the Problem

This study focused on identifying the digital instruction practices and needs of primary teachers in the Bontoc District. Specifically, it sought to answer the following questions:

1. What is the profile of the primary schools in the Bontoc District in terms of:
    a. teacher training; and
    b. resources?

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2. What is the level of competence of primary school teachers in digital instruction as perceived by the teachers?

    a. Is there a significant difference in the level of competence of primary school teachers in digital instruction when they are grouped into pilot schools and non-pilot schools?

3. What is the impact of digital instruction on the learning outcomes of pupils in primary schools in the Bontoc District?

For question 2a, the following null hypothesis was tested: there is no significant difference in the level of competence in digital instruction of primary school teachers when they are grouped according to pilot and non-pilot schools.

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METHODS

Research Design

This research employed both quantitative and qualitative designs. The quantitative design was deemed suitable because the numerical data collected were used to uncover trends in teachers' digital competence. In addition, the presence or absence of digital resources or tools provided a snapshot of digital instruction in primary schools in the Bontoc District. The qualitative method was used to determine the impact of digital instruction on the learning outcomes of the pupils exposed to it.

2.2 Locale and Participants

The study was conducted in the Bontoc District. The respondents were all the primary teachers of the 19 schools in the district (Table 1). There were 75 teachers in total teaching in primary schools in Bontoc, but only 69 were the final respondents who answered the questionnaires, because two (2) of the teachers were substitute teachers and three (3) did not return the questionnaires. The 11 school ICT coordinators who were teaching at the primary level were interviewed to provide a balanced outlook on the teachers' answers and to ensure the objectivity of the results; the other eight (8) ICT coordinators were assigned to teach in the upper primary level. The study was conducted in the second semester of academic year 2023–2024.

Table 1. Teacher Population and Interview Participants from the 19 Schools in the Bontoc District

Primary school	Non-pilot class	Pilot class	Total teachers	Teachers interviewed	Parents interviewed
Alab Elementary School	4		4	1	
Balili Elementary School	4		4	1	
Bayyo Elementary School	2		2		
Bilig (Multigrade)	2	1	3		
Bontoc Central School	12	1	13	2	1
Bontoc Ili Primary School	4		4	1	1
Can-eo Elementary School	2	1	3		1
Chapyusen Elementary School	3		3	1	
Dalican Elementary School	4		4	1	
Dantay Elementary School (Multigrade)	2	1	2	1	
Guina-ang Elementary School	3	1	4	1	
Gonogon Elementary School	1		1		1

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Mainit Elementary School	3	1	4	1	
Maligcong Elementary School	2	1	3		1
MP-SPED	4	1	5	1	
Samoki Elementary School	4		4	1	1
Talubin Elementary School	4		4	1	
Tucucan Elementary School	4		4		1
Ut-utan Elementary School	3	1	4	1	
Total	**66**	**9**	**75**	**14**	**7**

The inclusion criteria for the questionnaire respondents and interview participants were as follows. Respondents to the questionnaires were permanent employees in the Bontoc District who had been teaching at the primary level (kindergarten to Grade 3) for at least two years. This criterion ensured that respondents had adequate familiarity with digital instruction methods. Substitute teachers were excluded because they did not spend sufficient time at the school to answer questions about digital instruction in that setting.

The ICT coordinators selected for interviews were those who had held the position in their respective schools from 2022 to the present. This ensured that they were knowledgeable about the teachers' training experiences, aware of the digital resources available at the school, and familiar with the teachers' needs in terms of digital instruction. The parents interviewed came from various schools within the Bontoc District, ensuring diverse representation of experiences and perspectives on digital instruction across different communities.

Research Instruments

A questionnaire was the primary data-gathering tool for research questions 1 and 2, while interviews were the primary tool for research question 3. Interviews with ICT coordinators were also used to supplement the answers to research questions 1 and 2.

The first part of the questionnaire focused on the status of digital instruction. It covered the availability of digital resources or tools in primary schools and how teachers used them, the training and seminars attended by the teachers, the learning platforms they were using, and their purposes for using digital instruction.

The second part of the questionnaire sought to determine teachers' competence in digital instruction. This tool was adapted from the National ICT Competency Standard (NICS) for Teachers. The researcher simplified the items so that the respondent teachers could assess themselves using the tool; some items were removed because of the broad scope of the NICS, or participants were allowed to leave them blank. The items were distributed across three domains:

- Domain 1: Technological Operations and Concepts (29 items)
- Domain 2: Social and Ethical (14 items)

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- Domain 3: Pedagogical (13 items)

Responses were rated on a 4-point scale: 4 = Expert, 3 = Experienced, 2 = Developing, and 1 = Beginning. Teachers used the questionnaire to assess their mastery of the varying aspects of technology. Thus, the more strongly teachers agreed with a statement, the greater the mastery and competence they possessed; conversely, the less they agreed, the lower their competence.

A semi-structured interview guide (Appendix B) was used with learners, teachers, and parents to determine the impact of digital instruction on pupils' learning outcomes.

A trained tool validator validated the questionnaires and the interview guide. After content validity was confirmed, the questionnaires were pilot-tested to determine their reliability among private-school teachers in the Bontoc District: 9 teachers from All Saints Mission International School and 11 teachers from Saint Vincent School. Pilot testing yielded a Cronbach's alpha coefficient of 0.998, indicating very high internal consistency of the items measuring digital instruction.

Data Gathering Procedure

Upon approval of the proposal, the researcher sought permission from the Schools Division Superintendent (SDS) and the Public Schools District Supervisor (PSDS) before February 29, 2024, to conduct the study and gather data. Once the approving offices gave the go-signal, data gathering began. In March and April, school heads were given letters to conduct the research together with the approval letters from the SDS and PSDS, and the school heads scheduled the distribution of the questionnaires.

The researcher sought the help of the school head of each participating school to administer and retrieve the questionnaires. Respondents were given at most two (2) weeks to answer, after which the researcher followed up with the school head. Teachers who could not submit the questionnaire by the deadline were given a one (1)-week extension. The retrieved questionnaires were cleaned before processing to ensure that the data to be treated were valid, and any questionnaire with incomplete answers in the scaled portion was discarded.

The interview participants were school ICT coordinators, teachers, parents, and learners. A total of 11 ICT coordinators were interviewed, as the others were assigned to teach in the upper primary level. Three ICT coordinators were interviewed face-to-face during the district meet at Bontoc Central, while four others were interviewed at their respective schools within Bontoc Central. The remaining four were interviewed online, through Messenger chat or phone calls. Parents were also interviewed: four parents from different barangays were interviewed during the district Kinder Festival at Bontoc Central School, and two others were interviewed at their homes. Learners were also interviewed, some from Bontoc Central and others from Maligcong, Guina-ang, and Can-eo.

Interviews with the school ICT coordinators gathered information on the profile of digital instruction and on the digital instruction competence of the primary school teachers. Their answers were used to balance the teachers' self-assessments and thus ensure the objectivity of the results. All participants were interviewed at a convenient time and at a venue of their choosing. Interviews with learners, parents, and teachers focused mainly on how digital instruction had affected learners' learning, and the researcher asked participants' permission to contact them again should further information be needed that was not captured during the interview.

Data Analysis

Quantitative data from the questionnaire were treated using descriptive and inferential statistics. The data on the profile of digital instruction in primary schools were analyzed using descriptive statistics and frequency counts,

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while the data on primary school teachers' competence level in digital instruction were analyzed using descriptive statistics, particularly the mean. The competence level was interpreted using the 4-point scale shown in Table 2.

Table 2. Competence Rating Scale

Level	Range	Descriptive equivalent	Description
4	3.26–4.00	Expert	Expert skills. Leads ICT initiatives and innovations in education.
3	2.51–3.25	Experienced	Advanced skills. Able to integrate ICT into teaching and collaborate online.
2	1.76–2.50	Developing	Capable of using ICT effectively in routine tasks.
1	1.00–1.75	Beginning	Basic understanding and skills. Needs further training.

Inferential statistics were used to determine significant differences in the primary teachers' digital instruction competence between pilot and non-pilot schools. The Mann-Whitney U test, a nonparametric test suited to ordinal rating-scale data and unequal group sizes, was used to ascertain the difference between the two groups and was run using Real Statistics in Microsoft Excel. Respondents' answers were first tallied in Microsoft Excel and then entered into SPSS for statistical processing. Qualitative data from the interviews were transcribed, coded, and analyzed descriptively using thematic analysis, from which themes emerged.

Ethical Considerations

The research adhered to the principles of responsible conduct. No participant was coerced into answering the questionnaire or participating in an interview. All participants were assured that their privacy would be respected and that no identifier revealing their identity would be included in the paper; their questionnaire answers were treated collectively to ensure confidentiality. Interview participants were given an informed consent form to sign and were oriented about its contents and the purpose of the study before signing. Any participant who wished to discontinue participation at any stage was free to withdraw.

The researcher informed participants that they would not receive monetary compensation but that, if necessary, the researcher would cover the expenses for snacks and meals during the interview sessions. The researcher ensured that no questions unrelated to the research were asked, especially during the interviews, and participants were informed that they were free to decline any question they were uncomfortable answering.

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RESULTS

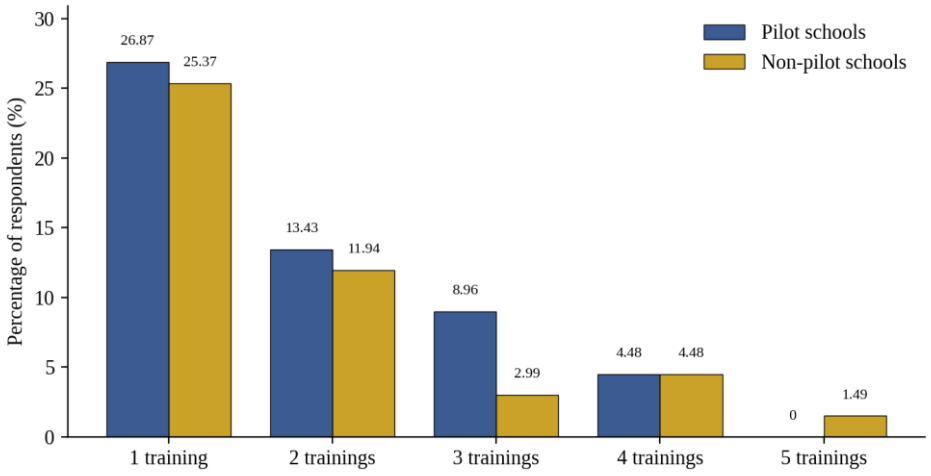
Profile of Digital Instruction in Primary Schools in the Bontoc District

The study obtained responses from the primary teachers of the Bontoc District. The profile of digital instruction is presented in terms of the trainings teachers attended and the digital resources available in the schools.

Teacher Training

Figure 2 shows the status of digital instruction in terms of the number of ICT trainings attended by teachers in pilot and non-pilot schools. Percentages are shares of all respondents (N = 67). Among pilot-school teachers, 26.87% attended one training, 13.43% two, 8.96% three, and 4.48% four, and none attended five. Among non-pilot-school teachers, 25.37% attended one training, 11.94% two, 2.99% three, and 4.48% four, while 1.49% attended five trainings, the highest number recorded in either group.

Figure 2. Status of Digital Instruction in Primary Schools in the Bontoc District in Terms of Trainings Attended



The higher attendance among a few teachers is attributed to the participation of all ICT coordinators in the Bontoc District in ICT training sessions, along with pilot school advisers who underwent the Transformed 2.0 training and the Open Educational Resources (OER) workshops. According to interviews with the ICT coordinators, most had attended at least two to five training sessions since 2022. Training opportunities were limited after the pandemic, with only a select few able to attend. In July 2022, for example, a training session on integrating ICT into remedial reading was held, but only two participants from each district were invited: one ICT coordinator and one pilot class adviser.

Table 3 outlines the ICT training sessions conducted for teachers from 2022 to 2024. During the pandemic, all teachers were required to create printed modules and audio-visual presentations for their students. All ICT coordinators were initially trained and subsequently conducted school roll-outs for those who were unable to attend the initial training. In 2022, as schools gradually returned to normal operations, teachers were encouraged to continue developing their ICT skills and integrating technology into their lessons. However, there were no comprehensive ICT training sessions for all teachers during this period. Instead, the focus was on training ICT coordinators and selected pilot teachers, as the number of participants was always limited.

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Table 3. ICT Trainings Conducted for Teachers in the Bontoc District, 2022–2024

Title of ICT training	Training provider	Level	Participants
Training on the Delivery of Remote Teaching & Learning in Filipino Using Moodle and Other Educational Resources	Filipino Supervisor and District ICT Coordinators and Team	Division	2 teachers per school
Workshop for Teachers in Utilizing Technology for Remedial Reading Interventions	English Supervisor with her ICT Team	Division	2 selected teachers
Digital Rise: Project Transformed 2.0 & HyTEQ District Roll-out	ICT District Coordinator and Team	District	School ICT coordinators and pilot class advisers
Digital Rise: Project Transformed 2.0 & HyTEQ (Sagada)	DepEd ICTS-EdTech Unit	Division	Selected ICT coordinators per district
School Training Workshop on Capacity Building on the Utilization of ZipGrade App for Assessment and Google Applications (INSET)	School ICT coordinators	School-based	School-based
Capacity Building on the Use of ZipGrade Application for Efficient Checking, Recording, and Item Analysis of Quarterly Assessments and Utilization of Google Forms	Division ICT Team	District	2 participants per school
Training on the Delivery of Remote Teaching & Learning in Filipino Using Moodle and Other Educational Resources	—	Division	2 participants per school
Training on Creating Instructional Video Lessons	MPSPC in coordination with SDO Mountain Province	—	ALBAGO and SPED teachers
Other ICT trainings: Open Educational Resources; Lumi	School ICT coordinators, among others	School-based	—

The first significant training session, attended by selected ICT coordinators, took place in Sagada in March 2022 and lasted two weeks. The speakers were from the DepEd ICTS-EdTech Unit of the national office. The trained ICT coordinators then conducted district roll-outs in their respective districts. However, the 7-day district seminar

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on "Transformed HyTEQ," held in May 2024, was attended only by school ICT coordinators who had not participated in the Sagada training and by pilot class advisers. This training focused on creating Open Educational Resources (OER) and introduced Lumi to all teachers.

All school ICT coordinators and pilot class advisers were then encouraged to conduct school-level roll-outs on OER. Most of these roll-outs took place in the following school year, with some schools incorporating OER training into their In-Service Training (INSET). According to interviews with ICT coordinators, corroborated by the teachers' questionnaire responses, most teachers attended only these school roll-outs. Some expressed that the school-level OER training was insufficient, especially for those at the beginning level of ICT competence, and many found it challenging to keep up because the roll-out was typically conducted over just two or three days.

Interviews with teachers from the participating schools revealed that some wished they had attended the same training sessions as the ICT coordinators. They also acknowledged, however, that they might not have fully understood the material, as the training was often too advanced for them to relay or implement effectively with the other teachers in their schools. In every ICT training the Division conducts for selected recipients, the recipients must also teach or conduct school roll-outs for all teachers in their schools. According to some teachers, while the trainings are helpful, they need more time to process the information before applying it, and the one- to two-day school roll-outs are insufficient for learning how to create OER. Some teachers, mostly younger ones, easily grasped the content. This observation was corroborated by the ICT coordinators, who noted that younger teachers are more likely to apply the training in their classrooms, while some older teachers try applying these techniques in their lessons, especially PowerPoint.

Since 2022, ICT trainings have focused on creating OER and installing learning management system (LMS) platforms such as Moodle. However, creating an LMS has proven too advanced for most teachers, and no one at the primary level has used one. Some teachers use the OER they created during remedial classes. Most of the training sessions from 2022 to 2023 were attended by nearly the same group of people. Although school roll-outs were held for those who did not attend, the time allocated was insufficient: some schools conducted the roll-out in just one day, while others took up to three days.

Training sessions in 2022 centered on creating OER using the Lumi app. According to the teachers' questionnaire responses, there were no trainings on other platforms besides Lumi, although during interviews one school mentioned including a workshop on using a publisher tool in its INSET. Some schools use INSET to enhance teachers' ICT skills: in addition to offering ICT training to participants, they encourage teachers to share best practices in ICT use and may invite speakers, such as teachers from their own or other schools, to discuss these practices.

Resources

Figure 3 and Table 4 present the functional ICT resources in the pilot and non-pilot schools, as reported by the school property custodians and corroborated by the teachers and ICT coordinators who were interviewed. Percentages for items marked with asterisks are based on the number of schools (pilot, 9; non-pilot, 10).

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Figure 3. Digital Instruction in Primary Schools in the Bontoc District in Terms of Resources

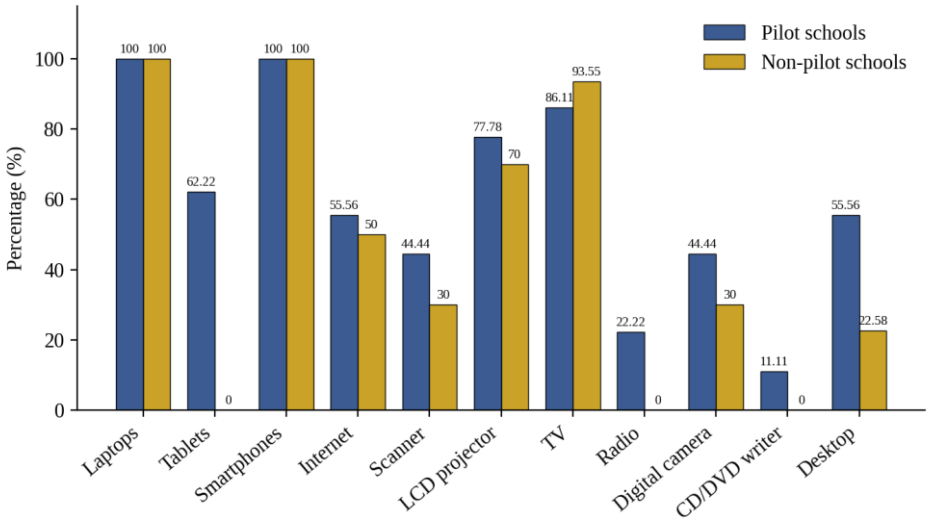

Table 4. Inventory of Available Functional Resources in the Pilot and Non-pilot Schools

Resource	Pilot schools		Non-pilot schools	
	Functional	**%**	**Functional**	**%**
Laptop	41	100.00	31	100.00
Tablet	84	62.22	0	0.00
Smartphone	36	100.00	31	100.00
Internet	5*	55.56	5**	50.00
Scanner	4*	44.44	3**	30.00
LCD projector	7*	77.78	7**	70.00
Television	31	86.11	29	93.55
Radio	2*	22.22	0	0.00
Digital camera	4*	44.44	3**	30.00
CD/DVD writer	1*	11.11	0	0.00
Voice recorder	0	0.00	0	0.00
Desktop	20	55.56	7	22.58

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Computers and mobile devices. All teachers in both pilot and non-pilot schools have access to laptops and smartphones (100%), indicating that teachers are equipped with the basic portable devices needed for digital communication and computing. Laptops are shared resources, as not all teachers have been provided with one; the goal is to eventually supply every teacher with a laptop, but almost 50% currently use personal laptops. Each ICT coordinator and pilot school teacher received one laptop, while other teachers obtained laptops through the DCP or purchased their own. Smartphones are exclusively personal property, whereas tablets and desktops are owned by the schools.

Tablets were available only in the pilot schools (84 functional units) and in none of the non-pilot schools (0%). Only nine pilot schools received tablets in 2022, and in these schools the tablets are used by the pupils. Some teachers in non-pilot schools own tablets, but these are personal devices used for personal purposes and not in school.

Most schools also have desktops, primarily for office use (55.56% of pilot and 22.58% of non-pilot). The seven desktops recorded in non-pilot schools are the functional ones currently available, even though each school is supposed to have at least one. Most desktops from the DCP package are not functional. Two big schools with computer rooms received more desktops from the DCP, which are used by learners in the higher grades; teachers are also welcome to use them, particularly for printing test questionnaires. Because not all classrooms, especially in larger schools, have their own printers, some teachers use the computer rooms to print school resources, create reports, and prepare other materials.

Internet connectivity. Internet connectivity was available in 55.56% of the pilot schools and 50% of the non-pilot schools. Teachers' responses varied by location: some schools have no internet connection, while others have insufficient connectivity, which teachers described as slow speeds or an unstable connection. Signal is available only in certain spots in their areas and frequently drops, leading to inconsistent access. Half of the teachers (50%) have internet access through their own mobile data or pocket Wi-Fi. Nearly half of the other non-pilot schools have an internet signal, but it is insufficient for online classes, which necessitates the creation of offline OER. This reveals a significant gap in access to the internet, which is crucial for using online resources, communication, and digital learning tools. During interviews, most teachers described their connectivity as "limited," meaning that their devices are connected to a network but the connection to the wider internet is interrupted, preventing access to online resources. Some schools in the Bontoc District are considering installing Wi-Fi to meet teachers' needs, but this also depends on the internet provider's assessment of whether the area is suitable for its service.

Peripherals and audiovisual equipment. Scanners were available in 44.44% of pilot and 30% of non-pilot schools, suggesting that many teachers have limited ability to digitize physical documents, which could affect their efficiency in managing paperwork and sharing materials. LCD projectors were available in 77.78% of pilot and 70% of non-pilot schools, giving many teachers access to tools for presenting digital content; however, many teachers now prefer using televisions, since almost all classrooms have one. Televisions were available at 86.11% (pilot) and 93.55% (non-pilot). According to interviews with ICT coordinators and teachers, nearly every primary classroom is equipped with a television, except in larger schools, where each department has at least one TV; two other schools in Bontoc have one classroom lacking a TV. In Part II of the questionnaire, in which respondents checked the digital learning platforms they use in their classrooms, almost 60% of the teachers selected Lumi, an OER taught to all teachers that requires a television or tablet.

Digital cameras were available in 44.44% of pilot and 30% of non-pilot schools, suggesting limited resources for capturing and creating visual content for project-based learning and documentation. However, during interviews, all teachers reported having phones with digital cameras; not everyone uses them in the classroom, but most use their phones to take pictures on various occasions. Radios were found only in pilot schools (22.22%), one pilot school had a CD/DVD writer (11.11%), and no school had a functional voice recorder. Most ICT tools, such as

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TVs and printers, were procured through the Maintenance and Other Operating Expenses (MOOE) fund; additional funding sources include the DCP and the Special Education Fund (SEF) from local government units (LGUs).

Overall, basic digital tools are widely available to teachers, but there is room for improvement in ensuring more comprehensive access to ICT resources and internet connectivity. Addressing these gaps could enhance teachers' ability to integrate technology effectively into their teaching.

Digital learning platforms. Of the platforms listed in the questionnaire, only Lumi is used in the classroom. More than half of the respondents use it only once or twice a week, and those who do not use Lumi prefer PowerPoint. According to the teachers, creating Lumi content is time-consuming; for those who use it regularly, it is initially time-consuming, but once created, the materials can be saved and reused for future lessons, and some teachers share these resources with colleagues who cover the same topics. Other online platforms such as Canva, Kahoot, Google Classroom, and Edmodo are not used by primary school teachers. Some teachers said during interviews that they are familiar with these platforms but have not used them because primary learners are considered too young. A few teachers use Canva to create designs such as resumes but not yet for classroom resources, and one teacher said that she had just learned to use Canva and might try creating posters and brochures in the future.

Level of Competence of Primary School Teachers in Digital Instruction

Table 5 presents the competence of the primary school teachers in digital instruction, as perceived by the teachers.

Table 5. Level of Competence of Primary School Teachers in Digital Instruction

Indicators	Mean	DE	SD
Domain 1: Technological Operations and Concepts (competencies related to technical operations and concepts and the productivity of various ICT tools such as computers and communication devices and online or offline applications)			
Strand 1.1. Demonstrates knowledge and skills in basic computer operation and other information devices, including basic troubleshooting and maintenance	2.71	E	0.46
Strand 1.2. Uses appropriate office and teaching productivity tools	2.42	D	0.58
Strand 1.3. Understands and effectively uses the internet and network applications and resources	2.50	D	0.47
Domain 1 mean	**2.54**	**E**	**0.50**
Domain 2: Social and Ethical (social, ethical, legal, and human issues and community linkage competencies)			
Strand 2.1. Understands and observes legal practices in the use of technology	2.58	E	0.51
Strand 2.2. Recognizes and practices ethical use of technology on both personal and professional levels	2.49	D	0.48

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Strand 2.3. Plans, models, and promotes a safe and sound technology-supported learning environment	2.57	E	0.41
Strand 2.4. Facilitates equitable access to technology that addresses learning, social, and cultural diversity	2.92	E	0.38
Domain 2 mean	**2.64**	**E**	**0.44**
Domain 3: Pedagogical (use of technology in 1) planning and designing effective learning environments and experiences supported by technology; 2) implementing, facilitating, and monitoring teaching and learning strategies that integrate a range of ICT to promote and enhance student learning; and 3) assessing and evaluating student learning and performance)			
Strand 3.1. Applies technology to develop students' higher-order thinking skills and creativity	2.69	E	0.53
Strand 3.2. Analyzes information and uses a variety of media to communicate results	2.51	E	0.54
Strand 3.3. Conducts open and flexible learning environments where technology is used	2.03	D	0.39
Strand 3.4. Evaluates the usage of ICT integration in the teaching-learning process and uses the results	2.49	D	0.48
Strand 3.5. Uses computers and other technologies to collect and communicate	2.34	D	0.42
Strand 3.6. Applies technology to facilitate a variety of appropriate assessment and evaluation strategies	1.69	B	0.45
Domain 3 mean	**2.29**	**D**	**0.47**
Overall mean	**2.46**	**D**	**0.47**

Note. DE = descriptive equivalent. B = Beginning; D = Developing; E = Experienced; Exp = Expert.

As shown in Table 5, the primary school teachers have an overall mean competence of 2.46, which is at the Developing level. Teachers therefore have some proficiency in digital instruction but have not yet reached an advanced or expert level; they are progressing. The standard deviation of 0.47 shows that teachers' competence levels are fairly consistent and clustered around the mean, with few teachers significantly below or above the Developing level.

Domain 1. Teachers rated themselves Experienced in basic computer operation and other information devices, including basic troubleshooting and maintenance (Strand 1.1, M = 2.71). This suggests that most teachers are knowledgeable about basic computer operations, such as identifying the functions of the main components and understanding the basic functions of the operating system, although many still struggle with troubleshooting even simple computer problems. Using office and teaching productivity tools (Strand 1.2, M = 2.42) and using the internet and network applications (Strand 1.3, M = 2.50) were at the Developing level.

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Domain 2. Teachers rated themselves Experienced in understanding and observing legal practices in the use of technology (Strand 2.1, M = 2.58), in planning, modeling, and promoting a safe and sound technology-supported learning environment (Strand 2.3, M = 2.57), and, highest of all strands, in facilitating equitable access to technology (Strand 2.4, M = 2.92). However, many teachers still find it difficult to recognize and practice the ethical use of technology on both personal and professional levels (Strand 2.2, M = 2.49), for example, in detecting plagiarism. One reason for this difficulty is that primary teachers do not typically require primary learners to use computers for their work, so they do not use a plagiarism checker.

Domain 3. Teachers were at the Developing level in Domain 3 (M = 2.29), which covers integrating technology in teaching and learning and assessing and evaluating student performance using ICT. Strand 3.6, applying technology to facilitate a variety of appropriate assessment and evaluation strategies, particularly conducting online testing and setting up online databases of student work, was the area with which teachers were least familiar and was rated at the Beginning level (M = 1.69).

This is corroborated by the teachers' responses to item 3 of the questionnaire (purpose of using digital tools), in which the most frequently checked answers were "preparing lesson plans," "computing grades," and "preparing assessments." When it comes to conducting online classes or preparing offline databases such as Moodle, primary teachers face significant challenges because of their limited knowledge of ICT, which indicates that teachers generally possess basic computer knowledge.

Age and experience also mattered. Most teachers aged 50 and above rated their competence at Level 1 or 2 in most of the domains in the questionnaire. During interviews, 6 of the 13 teachers with more than 20 years of teaching experience admitted that they can perform basic ICT tasks but are not proficient with various platforms and apps.

Comparison of Competence between Pilot and Non-pilot Schools

Table 6 compares the level of competence in digital instruction of teachers in pilot and non-pilot schools.

Table 6. Comparison of the Level of Competence of Primary School Teachers in Digital Instruction by School Type

School type	N	Mean	DE	Sum of ranks	U-value	p-value
Domain 1						
Pilot schools	36	2.47	Developing		531.000	.734
Non-pilot schools	31	2.48	Developing			
Domain 2						
Pilot schools	36	2.67	Experienced		529.500	.719
Non-pilot schools	31	2.64	Experienced			
Domain 3						

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Pilot schools	36	2.32	Developing		556.500	.985
Non-pilot schools	31	2.32	Developing			
Overall						
Pilot schools	36	2.47	Developing	1210	544.000	.860
Non-pilot schools	31	2.48	Developing	1068		

Note. DE = descriptive equivalent. U-values are from the Mann-Whitney U test.

The Mann-Whitney U test yielded a U-value of 544.000 with a *p*-value of .860. The null hypothesis was therefore not rejected: there is no significant difference in the level of competence in digital instruction of primary school teachers when grouped by pilot or non-pilot school. Teachers are at the same competence level regardless of the school they come from. The same holds across the three domains (Domain 1, $p = .734$; Domain 2, $p = .719$; Domain 3, $p = .985$), indicating that school type, whether pilot or non-pilot, does not influence teachers' competence in digital instruction.

The mean competence of teachers in pilot and non-pilot schools is at the Developing level, with means of 2.47 and 2.48, respectively. Teachers from both groups are thus at a similar stage in the development of their digital instruction skills: they are not yet at the proficient or expert level but are in the process of acquiring and improving their digital teaching competencies.

ICT coordinators corroborated this finding during interviews, revealing that most teachers in their schools are at a Developing level of ICT proficiency. Many teachers, particularly those without ICT training, began familiarizing themselves with computers only during the pandemic, when ICT tools became essential for online and modular teaching modes.

Impact of Digital Instruction on the Learning Outcomes of Pupils

In interviews with primary teachers, it was widely acknowledged that digital instruction enhances learners' motivation to learn. While a majority acknowledged its positive impact, a significant portion preferred traditional teaching methods because of their limited familiarity with computer technology. There was also a consensus that preparing OER can be time-consuming, and many teachers therefore preferred PowerPoint presentations for their perceived efficiency. It was evident that additional training is required to integrate these digital tools into classroom practice. Two themes emerged from the teacher interviews: enhanced engagement and improved differentiation, and a third set of views came from parents.

Teachers' Perspectives: Enhanced Engagement

Teachers reported that digital instruction has increased student engagement, citing interactive activities, multimedia presentations, and educational games as effective tools for capturing learners' interest and attention. The following excerpts illustrate this perspective:

Teacher B: "*Khag-awis tay ma motivate learners especially that I use the ready-made interactive LUMI games ay khinaeb si kakadwa, ngem adi ak makagaeb ah.*" (Using these OERs, particularly LUMI games, is beneficial because they help motivate my learners. I use ready-made LUMI games prepared by my co-teachers since I don't know how to create them myself.)

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Teacher D: "*Digital instruction has definitely improved my learners engagement in my classroom. Amed tay i-incorporate ko ginagaeb tako ay interactive activities, and educational games, which really capture their interest and attention.*" (Digital instruction has definitely improved my learners' engagement in the classroom, especially when I incorporate interactive activities and educational games we created. These elements really capture their interest and attention.)

Teacher E: "*Adik ammo in computer ngem nu ipachas ko I flash ka TV nan activities ya pana khinek nan ungang-a, amed pet nu ammok in khaeb si powerpoint presentations ta adi ak inkartikartib si pictures ya adi ta insulasulat.*" (I'm not very skilled with computers, but whenever I display activities on the TV, all of my learners suddenly become quiet and attentive. If I knew how to create more activities using PowerPoint, it would save me from having to cut pictures and write on the board.)

Teacher E, who is nearing retirement, acquired a laptop only during the pandemic and, during this time, also familiarized herself with PowerPoint, although she sought help from her nieces to create presentations. She admitted that it was only this year that she earnestly began integrating ICT into her teaching, prompted by the observation that her Grade 2 learners comprehended lessons equally well whether they were presented through PowerPoint or traditional board writing. Noting that the colorful pictures in her PowerPoint presentations enhanced learners' engagement and attentiveness, she found new motivation to incorporate technology into her teaching.

Teachers' Perspectives: Improved Differentiation

Teachers noted that digital tools allow more personalized and differentiated instruction, catering to individual learning needs and preferences. The following excerpts illustrate this perspective:

Teacher A: "*With digital tools, I can provide more personalized instruction to my students. Napintas tay mabalin i-allow na sika ay teacher to tailor the lessons to each student's skill level and learning style.*" (With digital tools, I can provide more personalized instruction to my students. This is beneficial because it enables you as a teacher to tailor lessons to each learner's skill level and learning style.)

Teacher C: "*When I attended the training for ICT coordinators, I began creating OERs and saved some activities on their tablets. I find these resources incredibly helpful in my class, especially since I handle a multi-grade class. I let one class engage in interactive activities on their tablets while I teach another class.*"

3.4.3 Parents' Perspectives

In interviews with some parents, most said that their children are more proficient in handling digital tools than they are themselves, and that their children have learned to navigate search engines such as Google. The following excerpts illustrate this perspective:

Parent 1: "*Nasuro nan anak ko uray nu grade 2 lang ay in search ka google, icheck na pay spelling na iman.*" (My child, who is in Grade 2, has learned how to search on Google and can even check her spelling using it.)

Parent 2: "*Gapu san kabubuya na ka youtubekids ya nasuro na in English.*" (My child learned how to speak in English through YouTube Kids.)

Parent 3: "*Tengaw nan TV ya cellphone iman ya amed tay kanaun ma cancel klase sinan atong aynay.*" (Television and cellphones are like caregivers for my kids, especially since classes are often suspended due to the hot season.)

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Parents expressed appreciation for the role of digital instruction in supporting remote learning initiatives, especially during school closures or disruptions. Online platforms provided a lifeline for continued learning and academic progress, ensuring the continuity of their children's education. One parent mentioned that her child rarely asked for help with her modules or activity sheets because she could simply use Google to look up unfamiliar words.

While many parents acknowledged the positive impact of digital instruction on their child's learning, others expressed concern about excessive screen time and its potential negative effects on their child's overall well-being, such as physical health, sleep patterns, and social interactions. One parent mentioned that her child cannot stop using his cell phone at home, especially on weekends, and takes breaks only when eating or doing household chores.

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DISCUSSION

Training and Resources

The findings offer a detailed profile of primary school teachers in the Bontoc District, particularly regarding their engagement with digital instruction and their digital competence. They show a growing effort to integrate digital tools into teaching, but significant challenges remain. Many teachers still possess only a basic level of digital competence, echoing Caluza et al. (2017), who highlighted the need for further advancement in ICT skills among public school teachers in the Philippines, and underscoring the importance of the professional development and training programs emphasized by Benali and Mak (2022) in building teachers' capacity to use digital tools effectively.

The impact of the ICT training programs conducted between 2022 and 2024 has been uneven. Although the programs introduced essential digital tools such as OER, training opportunities were concentrated on a small group of ICT coordinators and pilot class advisers who were expected to cascade what they learned through school roll-outs of only one to three days. The effectiveness of these roll-outs varied, particularly for teachers at the beginning level of digital competence, which aligns with Spiteri and Chang Rundgren (2020), who noted that teachers' lack of digital competence can hinder the successful integration of digital tools in the classroom. The short duration of some sessions also appears insufficient to equip all teachers with the necessary skills, which, together with the gap between self-rated competence and classroom application reported by He et al. (2022), suggests that brief exposure alone is unlikely to translate into practice.

Unreliable internet access and the limited availability of functional devices, particularly in remote areas, continue to be significant barriers. This is consistent with the challenges identified by Baticulon et al. (2021) and Maphosa (2021), who highlighted the difficulty of achieving widespread digital instruction because of infrastructure limitations in the Philippines. The many non-functional DCP desktops and the absence of trained personnel able to repair them illustrate Alsodemani's (2019) point that distributing devices alone does not catalyze adoption.

Overall, the profile highlights the critical need for ongoing support, infrastructure improvements, and more comprehensive training programs, in line with the recommendations of Barrot et al. (2021). Addressing these challenges is essential to bridging the digital divide and enhancing the digital competence of teachers in the Bontoc District, so that digital instruction can be integrated effectively to benefit both teachers and learners.

Teachers' Digital Competence

The overall rating (M = 2.46) and the small standard deviation (0.47) indicate a baseline level of competence that is fairly uniform across primary teachers: the minimum or foundational level needed to perform their core duties. Teachers can use desktop and laptop computers and mobile devices to carry out core responsibilities, such as using Microsoft Word or Google Docs to create lesson plans and instructional materials and delivering lessons through digital presentations using tools such as PowerPoint. While this foundational competence is sufficient for basic requirements, there is room for growth through continued professional development, which is necessary for teachers to adapt to new educational challenges and methodologies.

The profile is stronger in technological operations (Domain 1) and social and ethical practice (Domain 2) than in pedagogical integration (Domain 3). Teachers need further development in effectively integrating technology into teaching practice and in assessing student learning using ICT tools, especially conducting online assessments and keeping online databases of student work (Strand 3.6). The findings that teachers aged 50 and above and those with long teaching experience rated their competence lowest, and that coordinators attributed many teachers' computer familiarity to the pandemic, suggest that differentiated support is needed.

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With the school profile in view, several factors could have influenced the teachers' perceived level of competence. Although these were not measured directly in this study, they merit attention:

- **Availability of ICT resources.** Limited access to ICT tools and infrastructure, such as computers, internet connectivity, and software, could hinder teachers' ability to develop and apply their digital skills.

- **Frequency and quality of ICT training.** The number, frequency, and relevance of the ICT trainings attended could significantly affect digital competence; schools with fewer or less effective training programs may have teachers who feel less confident in using digital tools.

- **Support and encouragement from school leadership.** Where administrators actively support the use of ICT in teaching, teachers may be more motivated to improve their digital skills; a lack of such support could contribute to a lower perception of competence.

- **Access to ongoing professional development.** Continuous opportunities for professional development in ICT could affect competence levels, with higher competence expected where such opportunities are offered or promoted.

- **Collaboration and peer support.** A collaborative environment in which teachers share knowledge and support one another in using ICT could enhance perceived competence, whereas schools lacking this culture might see lower competence levels.

- **Experience with ICT integration in the curriculum.** Schools that have integrated ICT more extensively into the curriculum might have teachers who are more familiar and comfortable with digital tools, affecting their perceived competence.

In summary, while primary school teachers exhibit proficiency and experience in Domains 1 and 2, they need further development in Domain 3, particularly in integrating technology into teaching practice and assessing student learning outcomes using ICT tools. This study indicates that although primary school teachers in the Bontoc District have a foundational understanding of ICT, targeted professional development in integrating these tools into teaching and learning is still needed. Addressing these gaps can be expected to benefit student learning outcomes, teacher preparedness for future educational demands, and overall educational equity.

Tondeur et al. (2016) discussed challenges and strategies in teacher professional development for effective ICT integration and emphasized the importance of specific and practical training programs to address competency gaps and improve teachers' ability to integrate technology into their teaching practices. A study by UNESCO (2018) found that many teachers worldwide face similar challenges in integrating ICT into their teaching. Its ICT Competency Framework for Teachers underscores teachers' critical competencies for integrating ICT effectively into their practice and the need for ongoing professional development to address gaps in ICT proficiency.

Pilot and Non-pilot Schools

The absence of a significant difference between pilot and non-pilot teachers ($U = 544.000$, $p = .860$) suggests that factors other than school type play a more significant role in shaping teachers' digital instructional skills. Several features of the training profile help explain this result. Of the 19 schools, only nine are pilot schools. Teachers from pilot and non-pilot schools took part in the same seminars, and although some seminars were specific to pilot school teachers and ICT coordinators, they occurred only once. Regardless of pilot affiliation, therefore, teachers largely attended the same training sessions as the ICT coordinators and pilot teachers. This uniformity in competence across both types of schools underscores the need for continued and enhanced professional

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development initiatives to advance teachers' digital instructional abilities and to ensure that they can integrate digital tools and methods effectively into their teaching.

Perceived Impact of Digital Instruction on Learning

The teachers' reports of enhanced engagement are consistent with prior work. Connolly et al. (2012) indicated that using educational games in the classroom significantly increases student engagement and improves learning outcomes, particularly when the games align with curricular goals, and Mayer (2014) affirmed that interactive multimedia presentations can significantly boost engagement and learning by making content more engaging and accessible. These accounts parallel the teachers' experiences with interactive Lumi games and with PowerPoint presentations displayed on television.

The teachers' references to personalization and differentiation reflect two related ideas. Personalized instruction tailors the educational experience to each student's needs, skills, and interests; digital tools facilitate it by allowing teachers to monitor each student's progress and identify where more support or challenge is needed, and through flexible pacing that lets students spend more time on difficult concepts and move quickly through material they grasp easily. Differentiated instruction adapts teaching methods and materials to the diverse abilities and learning styles in a classroom; digital tools aid it by offering varied resources, such as the videos and interactive activities in Lumi, that address different learning styles (visual, auditory, kinesthetic, and others). By integrating interactive and multimedia elements, teachers can more effectively address the unique needs of each learner, and adaptive learning platforms further enable instruction to be tailored to learners' skill levels and learning styles. According to An and Reigeluth (2011), digital tools have proven highly effective in delivering differentiated instruction, underscoring technology's ability to tailor learning experiences to individual styles and improve engagement through activities such as interactive multimedia presentations, OER, online quizzes, and other digital resources.

The teachers' preference for PowerPoint over Lumi, and the time needed to create OER, indicate that the benefits of digital instruction depend on teachers' competence and available time. This resonates with the OECD (2019) and Courtney et al. (2022) cautions reviewed earlier that using digital tools without adequate digital skills may distract rather than help learners, and it reinforces the teachers' own call for additional training.

The parents' accounts of their children's growing proficiency in using digital tools align with the Pew Research Center (2020) report on parents' views of digital learning, which highlights children's growing proficiency with digital tools and parents' recognition of their children's skills in navigating the internet and using educational technology. The parents' concerns about excessive screen time and its effects on health, sleep, and social interaction temper the otherwise favorable views and suggest that guidance for parents on the proper use of digital tools is warranted.

Limitations and Directions for Future Research

Several limitations should be considered. Competence was measured through teachers' self-assessment, which, as the literature cautions, does not always translate into classroom practice; although ICT coordinators' interviews were used to balance the self-ratings, direct observation or performance-based measures were not employed. The study covered a single district and a small population of primary teachers, so the findings may not generalize to other settings. The impact of digital instruction on learning was explored through the perceptions of teachers and parents and through interviews with a limited number of learners; pupils' academic achievement was not measured directly, and the perceived effects reported here should not be read as evidence of improved test performance. Some interviews were conducted online or by phone, which may have limited the depth of responses. Future studies may combine observation or performance assessments with self-ratings, include larger and more diverse samples, and compare the learning outcomes of pupils in pilot and non-pilot classes directly.

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CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study examined the state of digital instruction among primary school teachers in the Bontoc District, covering resource availability, training attendance, teacher competence, and impact on learning outcomes. Through quantitative analysis and qualitative exploration, the following conclusions were drawn:

1. The profile of digital instruction in primary schools in the Bontoc District shows distinct characteristics in teacher training and resource availability. Teacher training in digital instruction involved both pilot and non-pilot schools, with comparable levels of engagement: 26.87% of the respondents in pilot schools and 25.37% in non-pilot schools had attended one training. A smaller share of each group (4.48%) had attended four trainings, suggesting a higher level of preparedness among a select group of educators. Notably, 1.49% of respondents in non-pilot schools had attended five trainings, indicating efforts to bridge the gap despite the initial focus on pilot classes since 2022. Both pilot and non-pilot schools have access to basic digital resources such as laptops, televisions, and smartphones. However, significant disparities exist in the availability of tablets, which were provided only to the nine pilot schools, and teachers in non-pilot schools rely on alternative resources such as televisions for instruction. This discrepancy underscores the challenge of ensuring uniform access to the technological tools necessary for effective digital instruction across all schools. Addressing these discrepancies through targeted training programs and equitable distribution of resources could enhance digital instruction outcomes across all primary schools in the district and promote more inclusive and effective learning environments.

2. Despite comparable attendance at digital training sessions in pilot and non-pilot schools, the level of competence in digital instruction did not differ between the two groups. Primary school teachers generally perceived themselves to have a moderate (Developing) level of competence in digital instruction, which indicates the need for more targeted and practical training approaches.

3. According to parents and teachers, digital instruction is perceived to have a positive impact on learning outcomes by improving learners' engagement and motivation and by supporting differentiated instruction; learners' academic performance was not measured directly. Engaged learners are more likely to be motivated, participate actively in lessons, and retain information better, and improved differentiation helps ensure that all learners receive the support they need regardless of their learning pace or style. The continued adoption and optimization of digital instructional tools in primary schools is therefore crucial for fostering a more effective and inclusive educational environment.

Recommendations

Given the varying levels of digital instruction observed across primary schools in the Bontoc District, targeted strategies are needed to enhance digital instruction and maximize its impact on learning outcomes. The following recommendations are proposed:

1. To improve the digital teaching skills of primary school teachers, DepEd should invest in teacher training programs organized to suit the needs of different teachers: some may require basic computer usage training, while others may need more advanced lessons. During interviews, many teachers highlighted insufficient training duration, which did not allow enough time to fully understand and process the material, especially in creating OER. Customized training sessions can help teachers learn to integrate technology effectively into their classrooms.

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2. A system for ongoing monitoring and evaluation of digital instruction initiatives should be set up to assess their effectiveness and identify areas for improvement. This should include monitoring each school's DCP packages: although many schools have been provided with DCP packages, most of them, especially those distributed years ago, are no longer functional, and no trained teachers are available to repair them. Regular surveys or classroom observations are needed to gather feedback from teachers, students, and parents and to ensure that digital instruction initiatives are making a positive impact.

3. Sharing best practices and encouraging teacher collaboration are important for improving digital instruction. This can be done through workshops or In-Service Training (INSET), where teachers can discuss ideas and share helpful resources that benefit their students.

4. To enhance digital teaching efforts, parents and community members should be involved by providing them with information and resources that can help improve digital literacy at home and in the community. Schools can organize workshops to guide parents on the proper use of digital tools and on assisting their children in their digital learning. This will promote a culture of collaboration and support that benefits students and the wider community.

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