

Research Article

Teachers' Competency and Students' Digital Literacy in Digital Environment

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Abstract

This study examined the relationship between the teachers' competency and students' literacy in the digital environment. Specifically, this focused on the following: level of digital competency of teachers; level of digital literacy; the relationship between the digital competency of teachers and the students' digital literacy; significant differences among aspects of teachers' competency and students' literacy in the digital environment, and the contributing and constraining elements of teachers' competency and literacy of students in the digital environment. The descriptive-comparative approach was used in this research. The Camarines Norte National High School's junior and senior high school students, and their teachers, participated in the study. The researcher utilized ready-made questionnaires to assess teachers' digital competency and students' levels of digital literacy, specifically from Moreno Integrated School and Camarines Norte NHS. Mean and One-Way Analysis of Variance were the statistical tools employed. Findings revealed that teachers have acquired the highest level of digital competence along content development and management. The Senior and Junior HS have very high media literacy but on high ICT and Information literacy. Web Resources Use and Management had the highest r-value and thus contributed the most on Information Literacy. There are no significant differences among aspects of teachers' level of digital competence and students' level of digital literacy in the virtual environment. Teachers and students' challenges were mostly technological and academic in nature. Lastly, the demands of the new learning set-up had substantially improved teachers' digital competence and students' digital literacy even in the comforts of their homes and it had brought a more convenient teaching and learning experiences.

Keywords: Digital Competency, Digital Literacy, Digital Environment.

Introduction

The development of professional digital competency is inconsistently implemented at the management level of teacher education programs, and the bulk of these programs do not address the development of such skills holistically. Enthusiasts on the academic staff are crucial to the advancement of teachers' professional digital competency. Few teacher education programs explicitly describe how digital competency connects to what a good teacher should be, what kinds of teachers they will generate, or what kind of teachers their digital skills training will produce. Digital literacy helps students' study more effectively, in general. Many students who enroll in educational settings make the learning process relevant by utilizing digital devices in digital surroundings. Education 4.0 advocates a new learning vision and unique learning methods that place an emphasis on human and machine collaboration. However, failing to handle and control digital and technical tools might expose student to hazards including accepting false information and being involved in other cybercrimes. With this, the world of education becomes increasingly challenging, especially in the digital era which demands that teachers cultivate the use of digital technology in school teaching and learning and classroom management. They are also encouraged to master ICT and digital technology competencies so as not to experience difficulties in implementing these changes.

Evidence suggests that education institutions and programs still have some ground to break before they fully integrate digital competence into their practice. Teachers are most likely not prepared to integrate the fostering of mandatory digital competence in their subject teaching even when they graduate. Thus, digital competence is often neglected or reduced into more shallow and instrumental activities, like learning to use the computer or searching the Internet. On the other hand, it is also necessary to provide a clear concept of

students' digital competence for teachers to use. Even this might be a demanding task, as digital competence is by no means clearly or unambiguously defined (Schwappach *et al.*, 2019).

Science and technology has a big impact in the society. Without science and technology, the world is a complete mess. People would become well-informed and allow them to make better decisions and choices by being scientifically and technologically literate. Through the advent of technology, science has become a very powerful tool in analyzing, exploring and discovering new concepts and ideas relevant in today's generation (Macanas and Rogayan, 2019). The ability to access, process, understand, and create information or media content in the digital environment is known as digital literacy. The ability to locate and consume, create, and communicate digital content, while simultaneously employing a process of critical evaluation are the practices involved in becoming digitally literate. Nevertheless, despite being a part of Generation Z, many students still have poor levels of digital literacy. Digital literacy facilitates better learning for the students. Many students, entering in educational settings, make the learning process meaningful by using digital devices in digital environments (Yamada-Rice, 2021). On the other hand, several studies mention barriers to the integration of digital technology in learning, such as the fact that teachers are unable to use digital technology in the classroom due to lack of knowledge, skills, training, and self-confidence as well as limited facilities (Vinathan, 2017). According to Gupta (2018), because teachers do not explore course materials well and do not want to use that time to do coursework or exercises, digital teaching will depend on the teacher's computer literacy level and burdens the teacher with the task of determining learning effectiveness through student assessment. The report by the Organization for Economic Cooperation and Development (OECD) also outlines issues preventing the implementation of teaching and learning in digital environments, such as limited access to and usage of computers. Students are using mobile devices for purposes that are not educational and the level of student inclination for the use of digital devices leads to different performance effects (Organisation for Economic Cooperation and Development [OECD], 2019).

The presence of opportunities and threats in using digital technology presents a particular challenge to the world of education to literacy the younger generation in using and utilizing digital space. Digital literacy is the most effective step in preparing individuals to adapt and compete in the era of digital transformation. Digital literacy will guide users to use digital technology wisely, intelligently, and appropriately to have a critical mindset in receiving and processing information and digital content. As an educational institution, schools have a mission to prepare students to adapt to technological developments. In recent years, studies of digital literacy accentuate the need of getting beyond the basic skills of using the information and digital literacy tools and resources and developing strategies for a critical and efficient use of these means. That's why most researchers view this literacy as "continuum, with progressive stages where the basic abilities are only the first step.

The upper end of the continuum contains increasing levels of cognitive competence in using the literacy in question for tasks, learning, creating and expressing new ideas, and this involves issues such as attitudes and social and cultural aspects" (Ala-Mutka, 2021). With the inception of Education 4.0, students are expected fully by being digitally literate. This is supported by Ministry for Education and Employment (2015) which claimed that rapid development of technology results to increase of need of digital literate students. The skills to effectively and critically utilize digital technologies, evaluate reliable sources and create useful information are the characteristics of digitally literate citizen. The challenge now is how teachers can facilitate students to better enhance their digital literacy which is one of the core skills that they need to possess to brave the challenges of the current education landscape and the FIRE. In support to this, the Department of Education (DepEd) implements the DepEd Internet Connectivity Project (DICEP) pursuant to DepEd Order Number 50, series of 2009, first among secondary schools and, later on, extended to the elementary level in consonance with the DepEd Computerization Program (DCP) of DepEd Order No. 78, s. 2010 (Department of Education, 2011). Through this program and the combined efforts of both government and private agencies, e-classrooms had been provided to elementary schools and integrated Information and Communication Technology (ICT) in the school system to raise the ICT literacy of learners and reduce the computer backlog in public schools. Therefore, this demands computer literacy among students. In the Philippines, the primary objective of spiral curriculum is to develop the students to become scientifically, technologically, and environmentally literate and innovative members of the community who solves problem critically, environment-friendly, productive and creative citizens, oriented decision makers, and communicate effectively (K to 12 Science Curriculum Guide, 2016). In senior high school under the K to 12 curriculum, Media and Information Literacy was included as a part of the core subject under the Communication Learning Area with one semester allocation to further develop students' digital literacy (Commission on Higher Education, 2016).

Assessing the students' digital skills is important so that teachers, specifically those teaching in the science, technology, engineering and mathematics (STEM) strand, will be able to develop digitally literate students. Locally, there are only few researches conducted which described Filipino students' digital literacy. This prompted the researchers to conduct an investigation on the extent of digital literacy of STEM senior high school students in two national secondary schools in Zambales, Central Luzon, the Philippines. With this background, this study aims to validate whether or not teachers' digital competence significantly influences students' digital literacy. It is on account of the aforesaid information that the researcher examined whether teachers' digital competence has something to do with digital literacy.

This study determined the relationship between the teachers' competency and students' literacy in the digital environment. Specifically, it sought answers to the following:

- 1) What is the level of digital competency of teachers along the following domains:
 - a) Web resources use and management,
 - b) Communication media, and,
 - c) Content development and management?
- 2) What is the level of digital literacy of students along the following:
 - a) Information literacy,
 - b) Media literacy,
 - c) ICT literacy?
- 3) Is there a significant relationship between the digital competency of teachers and the students' digital literacy?
- 4) Are there significant differences among aspects of teachers' competency and students' literacy in the digital environment?
- 5) What are the contributing and constraining elements of teachers' competency and literacy of students in the digital environment?
- 6) What training program may be proposed based on the result of the study?

Methodology

The study used concurrent mixed method research design. The quantitative method was employed to examine the digital competency of teachers and digital literacy of students, including the comparisons of the preceding among the aspects covered in the study in the two variables. On the other hand, the qualitative method was utilized to explore the challenges, constraints, and contributing factors to the teachers' digital competency and students' digital literacy. Then, a qualitative methodology or technique was employed to look into the limiting as well as contributing elements of teacher and students' digital literacy and competency in a virtual learning environment. The research was conducted among the Junior and Senior High School students and teachers of the Camarines Norte National High School in the Division of Camarines Norte. They were specifically from Moreno Integrated School and Camarines Norte NHS. The Moreno Integrated School respondents represented the north district and the Camarines Norte NHS respondents represented the south district. In the quantitative phase, there were two groups of respondents, teachers and students. As to teacher-respondents, 55.2 percent of the sample was from Moreno Integrated School and the other 44.8 percent were from Camarines Norte NHS. As to student-respondents, there were 367 and of these, 74.9 percent were Moreno Integrated School and 25.1 percent were from Camarines Norte NHS. They were selected using multi-stage sampling stratified proportionate random sampling and simple random sampling in the selection of participants after the computation of adequate sample size using the Lynch, et al. formula, 1978 (cited in Catoya, 2018).

Table 1. Distribution of respondents.

School	Total population	Sample	% (Sample)
A. Teacher-respondents			
Moreno Integrated School (North District)	122	78	55.2
Camarines Norte NHS (South District)	99	63	44.8
Total	221	141	100.0
B. Student-respondents			
Moreno Integrated School (North District)	5824	275	74.9
Camarines Norte NHS (South District)	1962	92	25.1
Total	7786	367	100.0

The inclusion criteria used for student-respondents were that they are regular students who are enrolled in technology and livelihood education subject, ages thirteen to sixteen years old both male and female. However, the exclusion criteria were that they are irregular students, students that were not currently enrolled and who did not sign the informed consent, as well as those who did not concur with the agreements on the orientation phase. In the qualitative phase, the selection of participants employed the non-probability sampling technique called purposive sampling. The participants were selected according to the needs of the study. They were the selected teachers and students from Moreno Integrated School and Camarines Norte, NHS. Below were some of the demographic information from the participants. Participants were from Grades 7 to 10 ageing 12 to 18. Only four of them were female, the remainder were male. However, there were only five teacher-participants whose ages were ranging between 33 and 46. Three of them were females and the remaining two, males. They have been in service for about 8 and 23 years. As to educational levels, two of whom were with units in MA and three were master's degree holders.

The researcher used ready-made questionnaires to gauge students' and instructors' levels of digital literacy. To acquire a more specific and detailed response from the respondents, the questionnaires were modified to better fit the content of the target audience or the present practices. The tool was patterned with some minor alterations from the studies of Sanchez-Caballe *et al.*, (2019) for digital competency and Baharuddin (2016) for digital literacy. In addition, because the tool's content has been modified to contextualize, a pilot test was conducted to students and teachers from other districts to guarantee the tool's validity and reliability. The instrument has been subjected to the scrutiny of her committee members including her school head before it was administered to her respondents. Moreover, semi-structured and open-ended interviews were used to gather qualitative data. They were used to support the quantitative phase's findings in further detail. In order to thoroughly immerse the essential information, an interview guide and open-ended questions were designed. In order to learn more and comprehend the phenomena under research, the right probing questions were asked. One-on-one or a face-to-face interview was conducted to preserve the natural setting and thoroughly saturate the substantial and meaningful information for the participants.

All the data gathered in the quantitative phase were subjected to statistical analyses using descriptive and inferential statistics. Data were statistically analyzed descriptive and inferential statistics such as mean, One-Way Analysis of Variance, and Pearson's Product Moment of Correlation. In the qualitative phase, the interview results were organized, clustered, described, and structured to get the most essential themes based on the participants' responses. Each interview was audio taped and transcribed verbatim. The study followed the step in the qualitative data analysis which includes: (1) preliminary exploration of the data by reading through the transcripts and writing memos; (2) coding the data by segmenting and labeling the text; (3) using codes to develop themes by aggregating similar codes together, (4) connecting and interrelating themes, and (5) cross-case thematic analysis.

When discussing and carrying out the research study, the researcher noticed and took note of all of the precautions that were taken to reduce any potential discomfort experienced by the participants. For record and reference reasons, the researcher chose students from the junior high school and senior high school of Camarines Norte National High School in the Division of Camarines Norte. The researcher also made the results and study outcomes available to the respondent-schools and other education sectors.

There was a strong guarantee that the information provided by the person who participated in this research study, such as their names and residences, were kept confidential because the researcher included demographic data in the questionnaire. It was agreed to protect their identity and uphold their right to privacy instead by using code names or numbers. Any information gathered from the individual and identified inside this research project was kept private.

Also, all subjects provided their informed permission. They received enough information on the goal and methods of the study, as well as orientation. The researcher went on to clarify that their involvement was completely voluntary and that they had the option of taking part or not. Additionally, the data gathering procedure took into account only those who indicated their desire to be interviewed and completed the informed permission form. They were also informed of their right to ask questions about anything that could come up while the research was being conducted.

Results and Discussion

The findings and conclusions pertaining to the issues mentioned are presented in this chapter in textual and tabular formats. The information was presented, analyzed, and interpreted in the following order: the level

of digital literacy and competence of teachers; the level of digital competency of teachers; the difference between teachers' and students' levels of digital literacy; the digital challenges faced by teachers and students; and the contributing and limiting factors of teachers' and students' levels of digital literacy and competence.

Digital Competency of Teachers

The level of digital competency in this study is determined in terms of the following three parameters: web resources use and management, communication media, and content development and management. The teachers' digital competency of north and south district of public elementary schools in the division of Camarines Norte and results of the survey is shown in Tables 2-5.

Web Resources Use and Management

The findings on teachers' digital competency coupled with web resource use and management are shown in Table 2. Three out of the nine indications for the instructors in the north district were regarded as very high, as can be shown. Along with this, downloading software from the online scored 3.95, understanding search engines and web browsers scored 3.48, and surfing and searching the web scored 3.33.

On the other hand, five of the indicators were rated as very high by the south district teachers. The indications include skills for downloading software from the internet (3.38), using search engines and web browsers (3.51), surfing and searching the internet (3.33), knowing about open access e-resources (3.58), and developing and maintaining websites (3.45). Regarding the order of the items, it should be noted that knowledge of open access e-resources was highest in the south district while knowledge of downloading software from the internet received the highest score from instructors in the north district. In addition, the technical capability in cloud computing for the south had the same score of 2.75 as the lowest for the north, which was their ability to develop and maintain websites.

Overall, downloading software from the web topped their ratings with 3.67, while, technical skill in cloud-based computing was the lowest with 3.00. Three items obtained very high ratings, namely: Downloading software from the web with 3.67, knowledge of web browsers and search engines, 3.50, Browse/Search the web with 3.33 average score.

Table 2. Level of digital competency of teachers along web resources use and management.

Indicators	A	B	Mean	Interpretation
Downloading software from the web	3.95	3.38	3.67	Very High
Knowledge of web browsers and search engines	3.48	3.51	3.50	Very High
Browse/Search the web	3.33	3.33	3.33	Very High
Knowledge about open access e-resource	2.82	3.58	3.20	High
Website designing and maintenance skill	2.75	3.45	3.10	High
Use of web resources and e-documents	3.24	2.76	3.00	High
Web server setup and maintenance	2.78	3.22	3.00	High
Use of cloud-based services except email service	3.02	2.98	3.00	High
Technical skill in cloud-based computing	3.25	2.75	3.00	High
Mean	3.18	3.22	3.20	High
Legend: 1.00-1.75-Very Low (VL); 1.76-2.50-Low (L); 2.51-3.25-High (H); 3.26-4.00-Very High (VH)				

All the remaining received only a high assessment rating, of which technical skill in cloud-based computing had the lowest mean value of 3.00. Between districts, the results from south with a 3.22 rating remained higher than those from north with only 3.18. Generally, this specific parameter got 3.20 mean score, equivalent to a high rating.

The findings imply that teachers' digital competency in this area was primarily focused on the downloading and usage of basic software, information searching in online databases, and the use of software intended to retrieve and read data from web pages or HTML files stored on web servers. In addition, they were accustomed to offering customers and businesses internet-based services that they could access whenever they needed them. These services are designed to enable quick, affordable access to resources and applications without the need for internal hardware or infrastructure. Whether they are aware of it or not,

most employees use cloud services during the course of the workday, from checking email to co-authoring documents. The findings show that another notable technical deficit of teachers was cloud-based computing, or the utilization of external servers to store and retrieve data as opposed to relying on local hard drives and private datacenters. These results also imply that teachers who have high to very high levels of digital competency are better at carrying out their responsibilities and may maximize their productivity across a range of tasks. Due to their expertise in using online resources, they may be able to avoid delays and can save time to complete their tasks, which leads to them working in a more pleasant workplace atmosphere.

As stated in the study Schwertner (2021), one of the major problems businesses are presently facing is integrating and experimenting with new digital technology. The consequences of digital transformation are felt across all industries and organizations. This research tries to comprehend how company tactics have altered as a result of the digital revolution through a thorough assessment of the literature. The findings indicate that research into the connection between Digital Technology and strategic management is only beginning.

Communication Media

Table 3 displays the findings from this study on communication media. As was already indicated, instructors from the north and south district who responded pointed out a few areas as being particularly good in this area. Instructors in the north district were identified as having very high levels of digital competency based on their use of meeting platforms (Zoom, Cisco WebEx, Google Meet), instant messaging skills (such as WhatsApp, Telegram, etc.), and other skills. They gave this an evaluation of 3.85 and 3.81, respectively. They appraised these with 3.85 and 3.81, respectively. However, they also stated that they had a very high level of competency in instant messaging skill, like WhatsApp, Telegram, etc.. This ranked first among the other indicators, receiving a score of 3.93.

Table 3. Level of digital competency of teachers along communication media.

Indicators	A	B	Mean	Interpretation
Instant messaging skill, like WhatsApp, Telegram etc	4.00	3.85	3.93	Very High
Use of meeting platforms (Zoom, Cisco WebEx, Google Meet)	3.84	3.81	3.83	Very High
Use of email service	2.35	3.94	3.15	High
Use of Learning Management System (LMS)	3.09	2.74	2.92	High
Use of social networking sites	2.18	2.77	2.48	High
Use of smart classroom	2.10	2.80	2.45	Low
Mean	2.93	3.32	3.12	High

The teachers in the north district stated that using social networking sites was their least strong suit; they assessed this item with 2.18 and the smart classroom with 2.10. Despite this, South District teachers acknowledged their social networking site and learning management system shortcomings and received a 2.77 and 2.74 respectively. Additionally, the ratings for the north district ranged from 2.10 to 4.00, whilst the ratings for the south district ranged from 2.74 to 3.94.

In general, teacher-respondents had high level of digital competency on Instant messaging skill, like WhatsApp, Telegram etc as evidenced by a mean score of 3.93 and the use of meeting platforms (Zoom, Cisco WebEx, Google Meet), with 3.83, and low level in the use of smart campus with a mean value of 2.45. The north district has an overall mean score of 2.93 while the south, 3.32. Largely, this parameter had 3.12 rating, equivalent to high level of digital competency in web resources use and management.

Data suggest that teachers were proficient in messaging groups, automatically translating messages for their co-teachers and students in their preferred language; they are also good at sending their colleagues reminders among others. These were some of the competencies they learned along communicative media. However, they are less familiar with EdTech-upgraded classrooms, which improve teaching and learning for both teachers and students by incorporating learning technologies like computers, specialized software, audience response systems, assistive listening devices, networking, and audio/visual capabilities.

The instructors' lack of familiarity with or comprehension of learning environments that have been modified with educational technology to improve students' teaching and learning experiences may also be reflected in their lack of skill with smart classrooms. In schools all across the Philippines, conventional or traditional

educational methods, approaches, and methods have been used, along with pens, pencils, and textbooks. The facts therefore make it undeniably evident that there are valid reasons why teachers were not comfortable with adopting smart technology. The number of engaging educational resources available to instructors and students has considerably increased as a result of the integration of smart classrooms.

The foregoing results are consistent with the research by Das (2020), which asserts that a high-quality education is crucial in today's competitive economy due to the quick advancement of technology. The idea of a "Smart Classroom" is a modern educational system that helps pupils achieve academic success, acquire higher concepts, and enhance their reading abilities, among other things. In the present educational environment, the conventional method of giving lectures and taking notes has lost its usefulness. It must be taken into account in attempts to advance academia that various teaching and learning modes are required for greater conceptual growth. It is the duty of the educational system to employ this kind of thinking in order to understand student interests and plan educational growth throughout infancy and adolescence. Information and Communication Technologies (ICT), has changed from being a technology of information and communication to a curriculum creation and transmission system for learners. With the development of technologies, new strategies of teaching are being introduced in the curriculum, one of which is known as "Smart Classroom". It uses instructional material, 3D animated modules and videos to make students understand.

Students nowadays are enthusiastic about this innovative, hands-on teaching approach. Structured discussions and assessment as and for learning are painstakingly woven into the method to create a thoughtful context for learning and to advance the thinking of all learners. The Smart Learning approach offers people of all ages a framework and a variety of Smart Thinking Tools that encourage higher levels of understanding and innovative ideas. In order to further develop the idea, instructors and students are both collaborating on "Smart Education" initiatives.

The "Smart Classroom" idea is a fantastic improvement in the current educational system and a one-stop shop for pupils in need of technology and analysis. Smart technology, including as cameras, projectors, and remote controls, let students' study more actively and adapt to a variety of instructional methods. The idea of the "Smart Classroom" has not only made learning fun, but it has also given pupils a fantastic platform to improve their performance. In addition, because visual notions make anything easier and clearer to comprehend for kids than verbal or written notes, it aids in their understanding of the topic more quickly.

Content Development and Management

As to content development and management (Table 4), the north district teachers claimed they have high level of digital competency in three indicators. i.e., Technological competencies in Multimedia development (Photo editing, Video editing, etc.) with 3.41. The second one was the use of ICT to get feedback/assess students learning with 3.48; and the third was the preparation of exercises and tasks for students with 3.50 score. The highest among them was their competence on preparing exercises and tasks for students which received a mean of 3.50 and the lowest was on preparing digital learning materials for students with only 2.75. With the south district teachers, technological competencies in Multimedia development (Photo editing, Video editing, etc.) topped their ratings with 3.58. But, additionally, the use of ICT to get feedback/assess students learning with 3.25 and preparing multimedia presentation with 3.54 ratings were among the areas where they have high level of digital competency.

Interestingly, it could be noted that the mean scores of south district teachers were all above the mean, except for preparing exercises and tasks for students and preparing digital learning materials for students. All in all, technological competencies in Multimedia development (Photo editing, Video editing, etc.) got 3.50 and use of ICT to get feedback/assess students learning, 3.37 were among the items where they had high level of digital competency. The remainders were with high levels only and lowest mean value was assigned to preparing digital learning materials for students with only 3.00 rating. Between respondents, the north had 3.20 and the south had 3.32 mean values. In general, this obtained an overall mean of 3.26, qualitatively described as high.

Regarding the creation and management of content, it should be emphasized that teachers were skilled at the process of developing material that uses a variety of media. A CD, for instance, might have audio, video, photos, etc. However, the results also show that teachers were honest in admitting that they weren't very effective at creating digital learning resources, such as textbooks, tasks, and supplemental materials, which structure and support instruction.

Table 4. Level of digital competency of teachers along content development and management.

Indicators	A	B	Mean	Interpretation
Technological competencies in multimedia development (photo editing, video editing, etc.)	3.41	3.58	3.50	Very High
Use of ICT to get feedback/assess students learning	3.48	3.25	3.37	Very High
Prepare exercises and tasks for students	3.50	3.00	3.25	High
Preparing multimedia presentation	2.84	3.54	3.19	High
Preparing digital learning materials for students	2.75	3.25	3.00	High
Mean	3.20	3.32	3.26	Very High

Corollary to this, Lin *et al.*, (2020) expressed that in the modern society when intelligent mobile devices become popular, the Internet breaks through the restrictions on time and space and becomes a ubiquitous learning tool. Designing teaching activity for digital learning and flexibly applying technology tools are the key issues for current information technology integrated education. The research results conclude that digital learning presents better positive effects on learning motivation than traditional teaching does, digital learning shows better positive effects on learning outcome than traditional teaching does, learning motivation reveals significantly positive effects on learning effect in learning outcome, and learning motivation appears remarkably positive effects on learning gain in learning outcome. It is expected to combine with current teaching trend and utilize the advantages of digital learning to develop practicable teaching strategies for the teaching effectiveness.

The summary Table of the digital competencies of teachers is reflected in Table 5. Statistics indicates that not one of the aspects gained a rating of high among the north district teacher-respondents. The results were contrary to those from the south district as three of the five aspects got high levels of technological competence.

These aspects were the content development and management with 3.32 communication media with 3.32 and the basic computer operation with 3.29. On specifics, the Setup, maintenance and troubleshooting skills was the topmost for the north district. This they evaluated with 3.22 and Communication Media with 2.93. For respondents from the south district, the Content Development and Management and Communication Media ranked first with both 3.32 mean scores.

The lowest for them was Web Resources Use and Management with only 3.22 mean mark. On the average, all of the aspects achieved high levels of technological competencies, except for Content Development and Management which obtained a mean score of 3.26, or very high. Comparatively, remained to be consistently had higher level of technological competence with an overall assessment rating of 3.32, compared to 3.20 for the north district teachers.

Table 5. Summary table of the level of digital competency of teachers.

Aspects	A	B	Mean	Interpretation
Content development and management	3.20	3.32	3.26	Very High
Web resources use and management	3.18	3.22	3.20	High
Communication media	2.93	3.32	3.02	High
Mean	3.10	3.29	3.20	High

In total, the mean value gained by public elementary schools in Camarines Norte was 3.12, or described as high. It's interesting to note from the results that instructors' proficiency levels were found to be lacking the most in fundamental computer functions. This indicates that they have a high level of digital competency, especially when it comes to entering data into computers and processing it before storing and controlling it. However, they asserted that they were proficient in the administration and development of content, which includes gathering, generating, and disseminating data in order to achieve a strategic objective.

This is in line with the notion that learners can become better informed about societal changes and advancements in both education and science and technology due to the widespread use of these two disciplines. The findings of the study revealed that Junior High School students had moderate literacy

towards ICT. Also, this study found out that the Junior High School students described their ICT self-efficacy as moderately agreeing.

Furthermore, results of the correlational analysis using Pearson r revealed that the ICT literacy of Junior High School students was significantly correlated to their ICT self-efficacy.

Digital Literacy Skills of Students

The digital literacy skills of the students were surveyed in this study along three aspects. They were along information, media, and Information Communications Technology. The results for the north and south districts were shown for comparative analysis and a 4-point Likert Scale was used with descriptive ratings of high, moderate, low, and very low. Data were shown on Tables 6-10.

Information

Table 6 indicates the survey results of the digital literacy skills of students along information. In the statistics presented, the north district students expressed that they were highly literate on using online chat features, text chat and voice chat. This item was appraised with a 3.56 mean mark. The language learning website with 3.59, and using Wikipedia with 3.35. On the contrary, their literacy levels on managing personal website/homepage just obtained a 1.45 mean score and web searching skills, with 1.51 which qualitatively described as very low.

Table 6. Level of digital literacy skills of students along information.

Indicators	A	B	Mean	Interpretation
Using online chat features, text chat and voice chat	3.56	3.65	3.61	Very High
Language learning website	3.59	3.61	3.60	Very High
Using Wikipedia	3.35	3.70	3.53	Very High
Creating and upgrading web pages	3.22	3.28	3.25	High
Using the world wide web	3.15	3.35	3.25	High
Using e-mail correlates to the requirements	3.00	3.00	3.00	High
Managing personal website/homepage	1.45	2.55	2.00	Low
Web searching skills	1.51	1.83	1.67	Very Low
Mean	2.85	3.12	2.99	High
Legend: 1.00-1.75-Very Low (VL); 1.76-2.50-Low (L); 2.51-3.25-High (H); 3.26-4.00-Very High (VH)				

For the respondents from the south, they declared the five items with high levels of literacy, namely: using online chat features, text chat with 3.61 and voice chat, language learning website with 3.60, using Wikipedia, 3.70, creating and upgrading web pages, 3.28, and using the world wide web with 3.35. However, in the rest of the indicators their literacy levels were only between low and moderate. Of the given items, web searching skills ranked last with 1.83 mean value. As a whole, students were highly literate on the following areas using of online chat features, text chat and voice chat got 3.61, language learning website, 3.60, and using Wikipedia had 3.53 mean score. Of which, the highest was their literacy on using online chat features, text chat and voice chat, in contrast, their lowest was web searching skills (Mean=1.67). This alone got very low-level rating from the respondents.

The south district students' overall rating of their literacy skills along information was 3.12 and the north was 3.85. This led to an average rating of 2.99, interpreted as moderate. The results show that using any kind of online communication that allows for the real-time transmission of text messages from sender to recipient, students' strengths or skills in this area were prevalent. Online voice and text chats are two popular forms of communicating that respondents are accustomed to.

Online chat may include audio and video chat, point-to-point communications, multicast communications from one sender to many receivers, and web conferencing. The results also point to the urgent need for students to be more flexible to changes and movements in digital literacy, particularly with regard to website management, homepage management, and web search.

As mentioned in the study of Hegarty *et al.*, (2010), digital information is becoming essential to almost every aspect of modern life which means that there is a need as never before, for learners and teachers who are information literate in a digital context. Tertiary students require digital information literacy, and a degree of

skill using computers and the Internet for many aspects of study at this level, for example, enrolment, accessing online course materials, preparing assignments, checking grades and communicating with teachers. The resulting tertiary graduates with digital information capability will be essential players in the workforce in a knowledge-based society.

Similarly, Shukla *et al.*, (2021) assess the digital information literacy skills among the library and information science students of the University of Delhi. After the analysis of the questionnaires, it has been found that the maximum 57 (79.17%) students were using a computer daily and they are familiar with MS office application software. All the students were well aware of Internet literacy skills and also, they all are using the Internet in which the large number i.e., 66 (91.67%) students were using it every day. The maximum 69 (65.71%) of students were using the Internet through their mobile data while a large number 69 (56.1%) of students using the simple searching technique.

Media

Table 7 reflects the level of students' media literacy skills. As indicated in the data, their media literacy levels were all high except for their literacy on understanding the main functions of hardware components on student's computer with only 2.50 evaluation which was equivalent to a low level. Between districts, the north district respondents had identified four where they too were highly literate, these include: using features/programs minimize, maximize, move windows on the computer screen which got 3.85, changing computer screen brightness and contrast, 3.72; using keyboard shortcuts on the computer, 3.41; and taking, editing, and recording digital photos and videos with 3.50. Their highest score was assigned along using features/programs minimize, maximize, move windows on the computer screen obtaining a mean value of 3.85 and their lowest along understanding the main functions of hardware components on student's computer with a mean score of 1.82. Respondents from south district, on the other hand, mentioned the following items where their literacy levels were high.

These were on using features/programs minimize, maximize, move windows on the computer screen with 3.90, changing computer screen brightness and contrast, 3.94, using keyboard shortcuts on the computer, 3.72, and working with MS Word, MS Excel, and MS PowerPoint programs with 3.98. Of these, they ranked working with MS Word, MS Excel, and MS PowerPoint programs, highest; while, taking, editing, and recording digital photos and videos with 3.15, the lowest.

On the whole, using features/programs minimize, maximize, move windows on the computer screen was the topmost indicator with 3.88 mean score, whereas, understanding the main functions of hardware components on student's computer was the lowest with 2.50. The respondents from the south district had an overall rating of 3.65, higher than the north with only 3.24. All in all, the media literacy of the students received an overall mean rating of 3.44 or high level.

The results indicate that students are already familiar with window basics, including how to minimize, maximize, and move windows across the computer screen. The ability to change the brightness and contrast of a computer screen is also part of this student's literacy. However, the key issues they described were controlling the fundamental operations of hardware elements like the CPU, motherboard, and random-access memory, among others.

Table 7. Level of digital literacy skills of students along media.

Indicators	A	B	Mean	Interpretation
Using features/programs minimize, maximize, move windows on the computer screen	3.85	3.90	3.88	High
Changing computer screen brightness and contrast	3.72	3.94	3.83	High
Using keyboard shortcuts on the computer	3.41	3.72	3.57	High
Working with MS Word, MS Excel, and MS PowerPoint programs	3.12	3.98	3.55	High
Taking, editing, and recording digital photos and videos	3.50	3.15	3.33	High
Understanding the main functions of hardware components on student's computer	1.82	3.18	2.50	Low
Mean	3.24	3.65	3.44	High

The study Cadiz-Gabejan (2021) who determined the level of computer literacy and its influence on the academic performance of junior high school students validated the above findings. Generally, the findings of the study revealed that the students needed to enhance the extent of their computer literacy in the areas of word processing, spreadsheet, presentation, and general computing. The results also signified that the greater the extent of their computer literacy in said areas, the higher their academic performance. This implied that classroom intervention activities are imperative to enhance the extent of the students' computer literacy. Thus, teachers should support them by implementing an intervention program that improves students' level of computer literacy in the specific areas mentioned.

Information Communications Technology

Table 8 presents the digital literacy of students along Information Communications Technology. It can be noted from the statistics that the areas where the respondents were highly literate where almost one and the same for both north and south district students. They both were highly literate along using Skype and Moodle applications, using an electronic dictionary, working with Edmodo, Canvas, Zoom, Busuu, and the like, using Google classroom application, working with the YouTube application. Students from the north district, however, have added working with the Dropbox application among the areas where they have high literacy level.

The patterns were similarly observed even with those areas that they have low literacy levels. Like on using the Blog application, using graphics software, and working with podcast applications which were three of the items with the lowest mean scores both for the north and south district students. In general, six items received high level ratings, three, moderate levels, one, low level, and one, very low level. The highest value was observed along using Skype and Moodle applications having 3.80 and the lowest was on using the Blog application with only 1.50 mean value. Comparatively, the overall mean score of south district students was consistently was higher than those from the north with 3.18 with the former having only 3.06. As such, by and large, this aspect had 3.12 mean rating which is equivalent to moderate literacy level. Findings imply that literacies of students in this aspect was paramount on Skype and Moodle applications.

Table 8. Level of digital literacy skills of students along information communications technology.

Indicators	A	B	Mean	Interpretation
Using Skype and Moodle applications	3.70	3.89	3.80	Very High
Using an electronic dictionary	3.65	3.85	3.75	Very High
Working with Edmodo, Canvas, Zoom, Busuu, and the like	3.65	3.72	3.69	Very High
Using Google classroom application	3.82	3.52	3.67	Very High
Working with the YouTube application	3.52	3.62	3.57	Very High
Working with the Dropbox application	3.25	3.40	3.33	Very High
Using the concordance program software application (for text analysis)	2.98	3.02	3.00	High
Using learning software applications, such as Google voice, CD-ROM, DVD, and the like	2.89	3.10	3.00	High
Working with podcast applications	2.85	3.15	3.00	High
Using graphics software	1.87	2.12	2.00	Low
Using the Blog application	1.45	1.55	1.50	Very Low
Mean	3.06	3.18	3.12	High

This might be as a result of the fact that this application enables users to communicate with their teachers, conduct video conferences with them, transmit files, SMS, and many other functions important to their academic development. Therefore, when compared to the rest of the items along the communication technology element, this particular item earned the greatest ranking among students. However, it's important to note that the blogging application, which gives users a place or area to write, create, and manage their entries while traveling, attending church, dining out, or engaging in other relevant activities, had the lowest ranking. This could imply that students in these districts value their education more than their extracurricular pursuits. With the foregoing results, Singh (2021) has these relevant statements, modern information and communication technology have created a "Global Village" in which place can communicate with other across the world. ICT is often studied in the context of how modern communication technologies affect society. Information and Communication Technology (ICT) has become a key factor in the future development of services industry including banking, transport, logistics, and retailing industries. Globalization has pushed the use of technology as a necessity in various business and economic functions.

Information communication technology at present are influencing every aspect of human life. They are playing roles in works places, business, education, and entertainment. The world is changing new information and communication technologies are powerful contributors to this change. The development, advancement, and implementation of Information Communication Technologies within today's ever-changing society profoundly impacts the way we lead our lives. The effects of these pervasive technologies present both a challenge and an opportunity for researchers, educators, and students worldwide. The development and convergence of computer and communication technologies; jointly termed as information and communication technologies (ICT) has affected almost all aspects of human life.

The summary results of the level of the digital literacy of the students from the north and south district is presented in Table 9. It is shown in the data that the overall assessment ratings along the three aspects, media, ICT, and information, of the student-respondents from the north were all at the moderate literacy levels. The highest among their literacy was on media with 3.24 and the lowest was on information with only 2.85. The case for respondents from south district was different.

Table 9. Summary table of the digital literacy skills of students.

Aspects	A	B	Mean	Interpretation
Media literacy	3.24	3.65	3.44	Very High
ICT literacy	3.06	3.18	3.12	High
Information literacy	2.85	3.12	2.99	High
Mean	3.05	3.32	3.18	High

They had high level of literacy along media which had 3.65, and in the ICT and information, they declared only moderate literacy levels. The overall mean scores were showing the same patterns. The media literacy also topped the ranks with the mean score of 3.44 and information literacy with 2.99 had the lowest rank. Comparatively, the overall rating of the south district respondents with 3.32 remained higher than respondents from the north with only 3.05. As can be seen, the students only had a moderate level of digital literacy. The previous research indicates that students were literate in accessing, analyzing, evaluating, generating, and engaging with communications in a range of formats, including print, video, and the internet. They possess the critical thinking and self-expression abilities required of citizens of a democracy, together with a strong knowledge of the function of media in society. However, they are least adept at developing the critical thinking abilities required to find and apply information efficiently. They are less adept at recognizing when they require information, understanding where to look for it, how to find it, and knowing how to assess it.

Corollary to this Park *et al.*, (2020) investigate the research trends of digital literacy and related concepts since the year of 2000, especially in education. The study analyzes keywords, co-authorship, and cited publications in digital literacy through the scientometric method. The journal articles have been retrieved from the WoS (Web of Science) using four keywords: "Digital literacy," "ICT literacy," "information literacy," and "media literacy." Further, keywords, publications, and co-authorship are examined and further classified into clusters for more in-depth investigation. Digital literacy is a multidisciplinary field that widely embraces literacy, ICT, the Internet, computer skill proficiency, science, nursing, health, and language education. The participants, or study subjects, in digital literacy research range from primary students to professionals, and the co-authorship clusters are distinctive by countries in America and Europe. This paper analyzes one fixed chunk of a dataset obtained by searching for all four keywords at once. Further studies will retrieve the data from diverse disciplines and will trace the change of the leading research themes by time spans. Practical implications: To shed light on the findings, using customized digital literacy curriculums and technology is critical for learners at different ages to nurture digital literacy according to their learning aims. They need to cultivate their understanding of the social impact of exploiting technology and computational thinking. To increase the originality of digital literacy-related studies, researchers from different countries and cultures may collaborate to investigate a broader range of digital literacy environments. The present study reviews research trends in digital literacy and related areas by performing a scientometric study to analyze multidimensional aspects in the fields, including keywords, journal titles, co-authorship, and cited publications.

Correlation between Teachers' Digital Competency and Students' Digital Literacy

Table 10 indicates the results of the correlation between the aspects of digital literacy which includes content development and management, web resources use and management, and communication media; as well as digital literacy which covers media literacy, ICT literacy, and information literacy.

Table 10. Relationship between digital competency and digital literacy.

(I) Digital competency	Digital literacy	(I-J) Correlation coefficient	Sig
Content development and management	Media literacy	.550	.125
	ICT literacy	.667*	.050
	Information literacy	.577	.104
Web resources use and management	Media literacy	-.200	.606
	ICT literacy	.900***	.001
	Information literacy	.946***	.000
Communication media	Media literacy	.427	.252
	ICT literacy	.837**	.005
	Information literacy	.777*	.014
Note: ***p < 0.001; **p < 0.01; *p < 0.05; ^{ns} p > 0.05			

There was one relationship with statistical significance between content development and management and ICT literacy, as shown by the correlation between content development and management and the components of students' digital literacy. The p-value of .050 and the r-value of .667* supported this. The moderate to high and positive correlation between aspects, which suggests that a change in one would probably result in an improvement in another, was another interesting finding from the test results of correlation.

There were two significant correlations at .001 found along ICT literacy with a .900 correlation coefficient value and along information literacy with a .946 correlation coefficient value in terms of the usage and administration of online resources. It was discovered that just one had no statistical significance. In the data, it is also possible to remark that these relationships have a very significant positive correlation, which suggests that a gain in their online resource management and ICT abilities would probably result in a rise in information literacy. However, the results between management and usage of web resources as well as media literacy have revealed opposing rates. It had a weak and negative link, suggesting that any enhancement of the instructors' administration and use of online resources will lead to a decline in the media literacy of their pupils.

Finally, similar patterns of relationships were found between ICT and information literacy in the communication medium. Information literacy is significant at a .05 degree, whereas ICT literacy is significant at a .01 degree. Since all of these statistically significant connections were positive, it is likely that students' digital literacy will increase as a result of instructors' increased digital proficiency. Although there was a substantial to very strong correlation between instructors' communication media proficiency and students' ICT and information literacy, the correlation between communication media and media literacy was only modest. As a result, instructors' communication media competency will likely have a higher impact on students' ICT and information literacy than their media literacy does.

Corollary to this, to live, learn and work successfully in an increasingly complex and information-rich society, teachers should use information and communication technology (ICT) competently. Today's teachers must be prepared to offer their students enriched learning opportunities in ICT. Every teacher's professional repertoire must include the preparation for ICT use, and understanding of how the technologies can support student learning. In this study, the effect of the implementation of an online course in improving the digital skills of math and science teachers from public high schools in the southeast of Mexico was investigated. The results indicate the effectiveness of the training process named Competencies Development in the Use of Communication and Information Technologies for Secondary Students (DICUTICDS) in the development of competencies and the effects of variables: gender, age, educational background and type of school in developing skills for the use of teachers in ICTS. The implications are discussed within the context of the National Development Plan (2013-2018) for Mexico (Dominguez Castillo *et al.*, 2019).

Competence of managers and teachers regarding digital literacy in kindergarten institutions, such as the ability to browse the Internet in the preparation of school programmes; ability to use digital media as a means of information to parents; the ability to share information and communicate among colleagues through social media in a safe environment; and the ability to explore in themes and learning materials, as well as the development of playing activities. Therefore, using technology in kindergarten institutions is expected to educate, stimulate and be focused on encouraging teamwork. In addition, it also supports playing-based pedagogy, engages children in responsibility, is informative, avoids aggression or stereotypes, encourages parental participation, increases knowledge and safety issues and develops awareness and

safety issues, for example, the use of digital stories in interactive learning can increase motivation, involvement, attitudes, attention and children's language skills during language lessons (Girmen and Kaya, 2019).

Comparison of Digital Competency of Teachers and Digital Literacy of Students among Aspects

To determine if there are statistically significant differences between components of digital competency and digital literacy, one-way analysis of variance tests was used. In the study, digital literacy in students was assessed along the lines of Media, ICT, and Information Literacy, whereas digital competency in teachers was assessed in terms of the following dimensions: Web Resources Use and Management, Communication Media, and Basic computer operation.

As can be seen, the estimated F-ratio for digital competency was .372 and its P-value was .744, but the recorded F-ratio for digital literacy was 2.627 and had a probability value of .219. It is thus worthy to note that the levels of digital competency of teachers and digital literacy of students among aspects were indistinguishable. Thus, the hypotheses that: (1) there are no significant differences in the teachers' levels of digital competency and (2) there are no significant differences in the students' levels of digital literacy are all accepted.

Table 11. One-Way ANOVA of the digital competency of teachers in the digital environment among aspects.

Sources	Sum of squares	df	Mean square	F	P-value
Between groups	x	2	.009	.327 ^{ns}	.744
Within groups	.084	3	.028		
Total	.102	5			

Note: **p < 0.01; *p < 0.05; ^{ns}p > 0.05

This indicates that regardless of the size of the school, the population of teachers and students, which may likely be the determinants or significant factors of the digital competency and digital literacy, the levels among the aspects of the aforesaid variables are not statistically different.

Or to put it differently, it can then be inferred from the given findings that teachers' digital competency levels among aspects (i.e., Web Resources Use and Management, Communication Media, and Basic computer operation) and students' digital literacy levels among the three aspects (i.e., media, ICT, and information) did not display any statistical differences.

With respect to digital competence of Filipino teachers, the study of Javier, (2020) revealed that, in general, the respondents claimed to be competent in the use of technology needed to discharge the duties of a teacher as host of a virtual classroom. Specifically, the respondents claimed to be competent in the following skills : (1) accessing various digital resources and tools, (2) Organizing and presenting the learning materials in digital format, (3) utilizing computers and other digital devices employed in online classes, (4) employing appropriate multimedia technologies appropriate for learning activities, (5) aligning content with pedagogical approaches and appropriate technology, (6) using online communication tools, (7) designing learning activities considering available technologies, and (8) using technology to facilitate collaborative creation and peer editing of students work.

Table 12. One-Way ANOVA of the digital literacy of students in the digital environment among aspects.

Sources	Sum of squares	df	Mean square	F	P-value
Between groups	.224	2	.112	2.627 ^{ns}	.219
Within groups	.128	3	.043		
Total	.352	5			

Note: **p < 0.01; *p < 0.05; ^{ns}p > 0.05

On another hand, the respondents asserted to be not competent about the following: (1) developing assessment through online tools and applications, and (2) troubleshooting internet connection issues, and device-related troubles. Moreover, in the advent of Information and Communications Technology in education, competence and skills for technology-based instruction are essential for teachers. With this, there is a need to continually train and equip teachers with understanding and capabilities that will enable them to maximize the utilization of ICT in their instructional practices. Hence, this research determined the correlation of teachers' level of ICT competence towards their ICT integration practices and corroborated it to existing findings in Thailand and Vietnam. Using a descriptive-correlational design, the researchers found

a link between and among variables. The chosen respondents for the study consisted of one-hundred and nineteen (119) teachers from private institutions in a district in Bulacan. Results showed that teachers exhibited competence towards ICT integration. More so, teachers highly practiced ICT integration as part of their instructional practices and strategies in teaching. Results of regression analysis of the data revealed that the six dimensions of ICT competence significantly correlated to the teachers' ICT integration practices. The pedagogical practices and competence of Filipino teachers are the same as the Thai and Vietnamese teachers towards ICT Integration. It is recommended that schools maintain teachers' competence and confidence towards ICT integration thru enhancement or faculty development programs (Hero, *et al.*, 2021).

Constraining and Contributing Elements of Teachers' Competency and Literacy of Students in the Digital Environment

The digital challenges of teachers and students were explored through the testimonies of key informants from selected teachers and students. The results of the interview have led to the subsequent themes. The presentation begins with the sharing of teachers and followed by the student participants.

Constraining Elements of Teachers' Digital Competency in the Digital Environment The Lack of Technological Development Program

The Teacher Professional Development program is a program that provides changes in teachers' attitudes, knowledge, and skills in improving their learning practices to improve student learning outcomes. In short, a quality professional development can provide guidance that enables teachers to develop and support students' learning. However, it is unfortunate that among the areas highlighted in the testimonies of the respondents was on the lack of technological development programs. They did not deny the availability of programs in other aspects of their operations. Nevertheless, in the area of technological development, they have observed certain gap and this gap has even been observed in the sudden movement from the usual conventional methods, strategies, and approaches to the contemporary and virtual set-ups. As such, as expressed by some of the key informants:

"We were completely unprepared for the pedagogical transformation brought about by the new learning environment. Because there were no substantial and widespread development programs offered prior to the epidemic, we were unprepared for technology. (Participant 4, 2023)."

"We need want assistance in this area. We want assistance in figuring out how to better incorporate our current procedures into the curriculum as a result of these new educational applications. (Participant 1, 2023)."

"To improve our capacity to adjust to the extremely sudden alterations in the teaching style, I believe that more training sessions should be made available, if required throughout the whole year (P2, 2023)."

According to the aforementioned testimonials, one of the main obstacles facing instructors as they transitioned from traditional classroom settings to the new virtual learning environments was the lack of programs in place before the epidemic. Certain features of educational systems and operations that make learning challenging and even impossible for some are severely crippled by the old system of education, including the lack of funding for education needed to pay the need for modern and state-of-the-art facilities. This implies that instructors still need the chance to grow. They need help integrating these new tools into the curriculum in ways that improve on what they were already doing rather than just replacing it. Like the general population, there are teachers who embrace the newest technology and others who continue to oppose it. Most educators lie somewhere in the center and need assistance integrating technology into their classrooms. This was supported by the study of Kasi *et al.*, (2022) determine the benefits of the Teacher Professional Development (TPD) program based on the partnership, technology, and ethnoscience approach to improving the TPACK of science teachers.

In the online method, teachers met via Zoom to analyze the concept of science in Nagekeo cultural activities, adjust the concept to basic competencies, and evaluate the results of learning implementation in the classroom. In the offline method, teachers met directly to, in group, design a culture-based science lesson plan, and 4 teachers mutually agreed to carry out direct learning in class using the designed lesson plan. The results of the pretest and posttest of science teacher knowledge on indicators in the TPACK components were analyzed. The results demonstrated a significant difference between the pretest and posttest results of the TPACK components. The pretest results showed an average value of 39.89 in the low category while the

posttest results showed an average value of 88.24 in the high category. These results indicate that the TPD program based on the partnership, technology, and ethnoscience approach is useful in improving the TPACK of science teachers.

The Lack of Technological Resources

Resources in the context of education are everything that may be utilized as a teaching tool, hence the idea is not particularly limited. The integration of information and communication technology (ICT) into the classroom is necessary given how ICT is affecting teaching and learning on a worldwide scale. Although ICT integration being a policy right in many countries, integration in specific educational environments still poses a difficulty. Divergent perspectives on how to tackle this phenomenon from a school viewpoint have evolved from dynamics related with the integration of information and communication technology (ICT) in classrooms throughout the world.

There needs to be a clear understanding of how well schools succeed in integrating ICT in teaching and learning. One of these approaches to ICT integration advocates consideration of the school context. This is because some of the challenges that schools encounter in their effort to integrate technology in teaching and learning are context-specific, thus needing context-friendly solutions. In the interview conducted, the lack of technological resources or technological integration was one of the main concerns expressed by the study participants. According to the participants, the lack of necessary equipment brought hardship to the school's key indicators, specifically, teachers and students.

The educational system of public schools is one of the biggest challenges among us teachers. The lack or limited number of books, laptops, chairs and classroom are among the constraints we, teachers normally experienced. Thus, there is the poor competence among the students. This particular problem limits them from conducting certain activities (P5, 2023).

In my opinion, it is on the lack of facilities and equipment. Because we are helpless, even if we wish to take some initiatives and efforts, we are paralyzed by these challenging situations. Added by another participant (P2, 2023).

These results were validated by National Literacy Trust (2022) on the Lack of technology in the classroom hinders literacy and work-readiness. In the survey, it is said that a new teacher survey has shown that teachers believe technology can boost pupils' literacy, but poor access to resources and teacher training means many are missing out. The survey of 219 teachers by the National Literacy Trust and funded by Crick Software found that 87 per cent of teachers believe technology can engage pupils with reading, writing, speaking and listening, specifically in terms of motivation, enjoyment and confidence. What's more, despite nine in ten teachers agreeing that education should prepare young people for the digital workplace, secondary students are at the greatest disadvantage when it comes to access to, and use of, technology in the classroom.

Three in four teachers believe technology should be made available across the curriculum to support literacy. Teachers consider technology to have a particularly positive impact on reluctant readers and writers, boys, and less able readers and writers. Teachers also believe that technology can help pupils overcome barriers to learning by providing differentiated support (63.5%), opportunities for personalized learning (61.6%) and creating an inclusive learning environment (59.4%). However, despite these benefits, teachers said that a lack of investment in hardware, software and Wi-Fi is the greatest barrier to supporting learning through technology in the classroom. Indeed, under half (48.4%) of pupils have access to an iPad or laptops and just two in five (39.3%) have access to a desktop computer. Access to newer technologies is even scarcer, with only 2.3% of schools able to provide access to Virtual Reality headsets, 1.4% to smart speakers and 0.9% to wireless headphones.

Inconsistent teacher training was also identified as a serious barrier, with 1 in 4 (23.3%) teachers reporting that they have never received initial or ongoing training in using technology to support literacy. Confidence was also an issue, with teachers almost twice as likely to be very confident using technology at home compared to in the classroom (47.4% vs 27.4%). Yet the appetite is there for increased knowledge and learning, with almost a third (30.6%) of teachers having sought self-directed learning in this area and a fifth (22.8%) wanting to pursue a formal qualification. Moreover, these findings supported the study of Granthorn (2020). According to the latter, the Philippine teachers are mostly and adamantly stressed due to

a lack of budget. The study revealed that teachers are in distress, looking for ways to ensure that their local governments' given account would meet all of their students' needs.

Unstable Internet Connectivity

One outcome of the sophistication and development of science and artificial technology is the Internet. The term "internet" is an acronym for "interconnected networking," which in Indonesian denotes a collection of linked computers across various networks. The Internet offers numerous benefits to everyone on a daily basis, but students particularly benefit from it. However, while being a relatively new medium for scientific materials, the Internet is filled with a wealth of information that differs greatly in terms of its aims, target audiences, credibility, and other factors. Thus, it's critical that end users are educated on the standards by which information content should be evaluated and are aware of the vast range of information that is available on the Internet. The telecoms industry has experienced remarkable expansion. The tremendous growth in the field of telecommunications has brought online services, specialized electronic networks, Webpages, E-mail, software and global information sources to our homes and education.

Yet, it is regrettable that among Asian nations, the Philippines has had some of the most patchy and slow internet access. Education officials around the nation have taken notice of this fact, but teachers and kids who are most directly impacted have done so more so. Throughout the interview, the majority of participants named erratic internet access as one of the main obstacles to improving digital competence. This is evident through their responses:

"I had a terrible internet connection." (P2)

"Connection interferences affect the overall experience, disruption in the internet connection of receiver or sender create gaps in the core message that the speaker may have wanted to convey" (P4, 2023)

"One of our biggest issues that has a serious impact on our ability to use technology is the internet connection." (P5, 2023)

"Slow internet connection is definitely challenging." (P2, 2023)

"The internet connection is one of the key problems that substantially impairs my ability to use technology." (P3, 2023)

This shows that improving internet connection speed and availability might ease many of the restrictions on digital proficiency that hurt not only underprivileged kids but instructors more so. Furthermore, it appears from the comments that the main problem or difficulty instructors have is the Philippines' poor internet access. Several studies have already verified that the Philippines is lagging behind among the other developing countries in Asia in terms of internet connectivity (Salac and Kim, 2016; Rico and De Leon, 2017). In 2016, the Philippines ranked 122nd in the world in terms of internet speed (Taylor, 2016). The slow internet connectivity can greatly be associated with the —lack of competition in the internet connectivity market (Salac and Kim, 2016). This lack of competition makes also the internet connection in the Philippines expensive compared with other countries in Asia. Internet connectivity issue greatly affects the motivation of virtual conference participants (Salac and Kim, 2016). Despite the continuous improvement of the internet connectivity in the country for the past ten years (Perreras, n.d.), the main challenge when using an online virtual platform is still the speed of internet connection. Based on the study of Salac and Kim (2016), the Philippines still lags behind in terms of internet connectivity among other developing countries in Asia. Meanwhile, the worldwide rank of the Philippines falls at 104 among 160 countries (Salac and Kim, 2016).

In addition, the study of Salac and Kim (2016) help address concerns about the growing demand of wider bandwidth Internet connection in the Philippines. Using articles and research of international organizations and content from official websites of the Philippine government, this paper has carefully examined the slow Internet connectivity and the high cost that the end-users pay for it. This paper suggests that this inefficiency hampers the motivation of users to innovate in a way that could contribute to inclusive growth and the development of an inclusive information society. Through a comparison of the current global ICT situation with the current situation in the Philippines, this paper shows that the country's Internet infrastructure lags behind among those of contemporary developing countries in Asia, particularly in terms of Internet connectivity. In 2015, Thailand had an average Internet speed of 7.4 Mbps, Sri Lanka 7.4, and Malaysia 4.3. Meanwhile, the Philippines had a meager average Internet speed of 2.8 Mbps, placing the country at 104

among 160 countries, with developed countries in Asia such as South Korea (23.6 Mbps) and Singapore (12.9 Mbps) ranking 1 and 12, respectively. Findings show that the lack of competition in the Internet connectivity market, among other reasons, is at the root of the dilemma of slow and costly Internet connection. Assessing the accomplishments of the Republic of Korea and other broadband-leading countries has provided practical insights and recommendations that can promote competitiveness. Furthermore, related literature argues how ISP practices may affect Internet speed and cost. This study offers an approach in improving Internet connectivity in the Philippines by bridging the gap between the Internet infrastructure market and government policies.

Difficulty in Monitoring, Feedbacking, and Assessing Learning

According to the participating teachers, there are additional difficulties in implementing teaching and learning under the new norm in Philippine public education. They include the challenge of tracking, providing feedback on, and evaluating learning. This is apparent from their responses.

"I seldom ever assess my students' performance in terms of their timeliness in submitting their modules." (P5) "I am unable to follow up with my students' online learning and keep track of their printed modules. Frankly speaking, I cannot monitor my students' learning anymore." (P2, 2023) "I am not very good at reviewing my pupils' response sheets." (P2, 2023) "Several of my students are still having a hard time adjusting to the new normal adjustments in schooling, so I was unable to monitor or contact with them. (P3, 2023)

For the public school teachers, one of the weaknesses of the new normal in Philippine education is the difficulty to monitor, feedback, and assess learning. These difficulties are tried to address by the Department of Education by continuously issuing orders and memoranda to guide teachers. Just recently, the Department of Education issued DepEd Order No. 31 s. 2020 as a guide in assessing and grading learners in light of Covid 19 pandemic. Though the order provides clear and specific guidelines on how to assess and grade learners, teachers are still experiencing problems with monitoring, feedbacking, and assessing student learning due to several gaps, such as communication, technology, and students' socioeconomic status. Tracking students' progress through the collection of their works, assessment, and grading are the best ways to measure if they are continuing to learn despite the new educational setup in the country. Similarly, in the United States of America, 58 percent of school districts expect that their teachers monitor students' progress or provide feedback among students (Gross and Opalka, 2020). Moreover, some of the narratives of the teachers are:

"I find it hard to assess my learners' intellectual and personal aspect." (P3) "I find it hard to checking students' outputs." (P2, 2023) "It is difficult to manage my time because I still have to print and distribute modules, check outputs, do paper works, and monitor students." (P2, 2023) "It's hard to assess/evaluate the exact learning of the students whether they learned or not." (P4, 2023)

This implies that teachers are concerned with students' learning. Cahapay (2020) suggested that when grading learners in the new normal, schools should change the ways they use assessment scales from "quantitative to qualitative such as pass or fail system". Teachers and students in the new normal in education are burdened just to achieve all curriculum requirements (Rasmitadila *et al.*, 2020). Students in the Department of Education are given at least seven modules or SLKs per week in at least eight weeks per quarter. In total, students have to answer at least 240 modules or SLKs for the entire school year. Each module or SLK has at least four activities. These, for the students, from the researchers' point of view are challenging, considering their limited resources to search from the web, their parents' capacity to guide them, and their socioeconomic status. On the other hand, teachers, as well, face obstacles such as they have to balance their time for printing and sorting of the modules, marking the modules, making the modules and weekly home learning plan, complying with all the documents required from them to submit, and accomplishing the attachments for their Result-Based Performance Management System (RPMS). These dilemmas in the education spectrum is not just experienced in the Philippines. Niemi and Kousa (2020) revealed that even in Finland where the best quality of education is provided, teachers also experience problems with students' assignments and examinations. Even if the students were able to accomplish their tasks, teachers remain skeptic, whether the students really learned or they just copied their answers from others.

Limited Technological Knowledge

Several of the participants said they were really devoted and worried about how well they were teaching. In order to organize and deliver a more advanced virtual lesson, they invested money in technical tools. They

also spent more time and effort acquiring new information and concepts linked to technology and pedagogy. Unfortunately, due to their insufficient expertise, mastering the new educational apps did not happen instantly. As exclaimed by a number of the participants:

"I'll be honest; I know very little about technology, especially as it relates to educational applications. But now that I've taught online for a year, I'm more conscious of how technology is used to distribute knowledge. For my synchronous session, I need to make an investment in a high-quality webcam and microphone. I looked into using free web resources as well and attempted to make my presentation more engaging and helpful for my pupils." (P2, 2023).

"Due to the poor understanding of technology-assisted learning tools, it is quite challenging to explain and convey at the early stage. I mostly rely on the software and programs that are readily available, compatible with my own PCs, and light on any bandwidth. That took me some time, and I gradually spent money on tools that greatly facilitated teaching. I then purchased a digital tablet to use while lecturing for writing and drawing." (P5, 2023).

"Conducting online lessons, creating materials, recordings, exams, and other tasks alone were all things I was unfamiliar with. But I still have a lot of other things to study and get better at." (P1, 2023).

It is obvious that the sudden transition during the initial stage of online learning left educators with little choice and respond purposefully to seek a solution for the immediate virtual learning (Campbell *et al.*, 2020). However, the findings revealed that the educators have tried out various possibilities to overcome the challenges and contingencies with optimism. They seem to be more confident after a year of experience in online teaching. They opted for alternative solutions and managed constraints independently. Educators in this study, as suggested by Pressley *et al.*, (2018), seem to have higher self-efficacy and are open to new teaching approaches, and are more determined to face challenges as they adapt to the online environment. With higher self-efficacy, educators have more favorable outcomes in their teaching practices because they are comfortable to scaffold and build relationships with students (Hajovsky *et al.*, 2020). However, the findings of the present study have provided a glimpse of positive attitudes and higher self-efficacy toward online teaching. Readiness to teach online refers to the state of preparation to teach online (Martin *et al.*, 2019). It is for this reason that Kebritchi *et al.*, (2017) state that sufficient time is needed to design and innovate online teaching practices and become competent and self-confident instructors (Kebritchi *et al.*, 2017). Teachers' positive attitude, commitment, and initiative have resulted in transforming and engaging in "pedagogical problem-solving and discovery about online teaching" (Kreber and Kanuka, 2016).

Inadequate Parental Support

The deputy secretary for education, Dads San Antonio, released Memorandum No. The DM-CI-2020-00162, dated July 21, 2020, highlighted the significant role that parents play in the adoption and utilization of distance learning at this challenging period. Many parent assemblies, consultations, and online meetings were arranged in an effort to inform parents as broadly as possible about their important responsibilities in the modern educational model. Nonetheless, parental involvement in their children's education was still lacking. Teachers underlined that parents of their kids were less likely to be active in their education because most of them worked. Also, there were parents who were illiterate who were unable to assist their children or serve as instructional coaches due to their ignorance and lack of skills. Some of the personal experiences of teachers were shared below:

"The lack of parental assistance that children received throughout this virtual learning experience was the most difficult aspect. Most of the parents in my class were workers who had to work long hours to support their families' daily needs, leaving their kids unattended". (P4, 2023)

"Some of my parents were illiterate, therefore it is unreasonable to expect them to help their children with their schoolwork. Although some parents were patient in regulating their children's response times, they were unable to check whether their replies were accurate due to their insufficient expertise." (P3, 2023)

"For me, parental support is quite important, especially given that the present teaching strategy involves some form of homeschooling. My main issue with this modular distance learning program was the lack of parental assistance." (P5, 2023)

The preceding statements from the participants suggest that among the inadequacy of support from their parents which were mentioned were on the financial aspect which would likely happen because of the magnanimous responsibilities and concerns that their parents have to attend to aside from the academic concerns of their children. Second, this situation is even worsened by the illiteracy of their parents on technology making them helpless despite their willingness to support their children. Hence, they cannot really relate with their children along this aspect. These findings were confirmed by the study of Agaton and Cueto (2021) who mentioned that COVID-19 pandemic has closed-down educational institutions and dramatically shifts the instruction to distance learning. However, students rooted from the marginalized families and from rural areas have limited access to technology necessary for online learning. Modular learning addresses this learning inequality by providing more inclusive access to education. This study explored the lived experiences of the parents who act as learning supervisor, tutor, and home-schooling teacher for modular learning during the health crisis. This research surveyed parents from the Philippines and applied Inductive Content Analysis.

The results showed an agreement on the effectiveness of the implemented educational policies to contain the pandemic including the nationwide closures of schools, delaying the reopening of classes, and implementation of various instructional modalities. On the other hand, parents have encountered various challenges from the new mode of learning in virtual setting; delivery of instruction; unsatisfactory learning outcomes; financial difficulties while working for the family during lockdown; struggle with the use and availability of technology; and personal problems on health, stress, and learning style. This study serves as a basis for providing a comprehensive and inclusive education policies while considering the perspective of the learners' parents during the pandemic and beyond.

Constraining Elements of Students' Digital Literacy in Digital Environment

Recently, the education system has faced an unprecedented health crisis that has shaken up its foundation. Given today's uncertainties, it is vital to gain a nuanced understanding of students' online learning experience in times of the COVID-19 pandemic. Although many studies have investigated this area, limited information is available regarding the challenges and the specific strategies that students employ to overcome them. This was one of the key areas of this investigation. During the interview students shared that *network issues, time constraints, lack of interactions lack of motivation, and distractions in home environment* were some of their challenges in the new learning set-up in teaching and learning. Also, all participants described their experiences with online learning as being a source of isolation challenge. Despite using a number of online communication tools, the participants in this sample seemed to find the lack of in-person engagement and immediate response to be a source of bearable concern. In terms of distractions at home while learning, one participants expressed:

"I am nocturnal. I like studying late at night when everyone is asleep. I feel more productive and learning is fast when no noise destruction around." (P1, 2023)

A participant (3, 2023) clearly pointed out:

"In the case of online class there are many distractions and it is hard to listen when the internet connection is not that strong. The sound of teacher is choppy that makes you lose interest and motivation because you cannot understand what the teacher is talking... and there are time constraints in answering assessments or answers in your mind go away sometimes."

Another participant (5, 2023) also shared about the challenges he had encountered regarding time constraints and limited interaction:

"The biggest challenges that I have encountered is the simultaneous demands of teachers to submit our modules given a very short amount of time and the interaction is limited due to the technological constraints." (P7, 2023) On the conduct of instructions, a participant shared: "Sa online class kasi limited yung interaction kaya hindi namin ma-grasp ang mga concepts ng mga lessons easily so we have to study again, review again, and research some other resources just to cope" (P5, 2023).

"While studying online, there is a forum where you can ask questions and get replies. However, sometimes I feel it's amazing simply to receive comments right immediately, as if you were meeting them in person. It might be a bit inconvenient since we are distracted with something else, so when we sort of need the answers, we don't get them immediately away (P9, 2023)."

This pandemic has brought lots of challenges to students and teachers in learning and teaching. The challenges that surfaced in this study about digital challenges explained that every circumstance is unpredictable and one has to be always ready to face challenges. Despite the students and teachers' lack of preparation, they still manage somehow and learned that preparation is the key. Although, there is no perfect preparation but every plan is flexible and this is the primary tasks of teachers to cater the needs of their students. On the part of students, this provides them valuable insights of honing and acquisition of different skills and competencies such as critical, problem solving and adaptability to survive to any crisis. Dhawan (2020) highlighted that educational institutions should build resilience systems to ensure that students have those skills to cope with different challenges.

In the study conducted by Jan (2020), it was emphasized that the unavailability of actual learning resources and materials affects the learning of the students, it may result to less learning or no learnings at all. Distractions at home remains a challenge too because the concentration or focus of the students is affected. According to Shafiei Sarvestani *et al.*, (2019) that in an E-learning environment the surroundings or external factors should be conducive to foster learning. The role of time in learning is very important, according to the study of Blackmont and Major (2020) the more time being allotted to synchronous sessions the better the appreciation and learning of students, it is also imperative that the limited time or time constraints in learning especially in science subjects hinders the continuity of learning. Together with this limited time, the interaction between student-teachers, and student-students become limited. Another challenge that has been encountered is about networks issues, this leads to lack incomplete sessions, misconceptions, dysconnectivity, lack of motivation and even failure (Shafiei Sarvestani *et al.*, 2019).

Technological Limitations

Since the school where the students were enrolled will hold synchronous and asynchronous classes, they ensure that their internet connection will be stable by subscribing to internet providers, buying prepaid Wi-Fi modems, identifying places where signal for data connection is strong and some look for places where public Wi-Fi are available. The students have also purchased different gadgets such as headphones, cellphones, and upgraded their personal computers and laptop to support software needed for synchronous classes. The participants shared:

"I told my parents, Ma, we need to buy the globe Wi-Fi plan, I also encourage my father to buy headphones because there are many distractions during online class because my sister is having her lesson about grade 7..." (P11, 2023) Participant 8 also shared about her struggles in looking for strong signal within her area as a preparation for online classes "I am struggling fetching signal Mam so what I did is that I look for some areas to find a better signal, so I walk couple of hundred meters away from home just to have my classes" (P10, 2023) In addition, Participant (7, 2023) shared also that he bought better gadget and subscribed to internet provider as part of his preparations "I had prepared my gadgets, so I purchased a better phone, and subscribed from an internet service provider..." (P12, 2023).

This is inconsistent with the study of McGuinness and Fulton (2019) where survey responses showed that the accessibility, ease-of-use, design and duration of the e-tutorials were deemed effective in terms of user engagement; however, several digital challenges were identified, such as browser incompatibility, uneven sound quality and general Internet connection issues, which disrupted their learning. Overall, students expressed enjoyment of the learning facilitated by the e-tutorials; however, rather than favoring online learning alone, they expressed a preference for a blended learning environment, with a combination of complementary learning approaches; survey respondents did not generally wish to forego face-to-face classes entirely.

Influence of digital technology in our educational system cannot be overemphasized. Hardly can any undergraduate student survive in educational institutions without basic skills and knowledge of digital technology. The composite skills require for student to fit into digital environment in achieving his/her academic pursuit is digital literacy skill. This prompted the study on the digital literacy skills of undergraduate students of Federal Universities in Southwest, Nigeria. Finding of the study revealed that majority of the students admitted that they are confident on their level of information Literacy Skills, especially in using other people's work (found online) without committing plagiarism. The students also indicated confidence in their level of Information and Communication Technology literacy skills, significantly when writing online 2 on a web page for private use.

Contributing Elements to Teachers' Digital Competency in the Digital Environment Virtual and Physical Platforms, Applications, Software

The disruption to learning has introduced new opportunities for reimagining, reimagining, and revitalizing education. It enables education leaders to step up their efforts to train teachers, bridge the digital divide and rethink curricula to equip learners with the skills and knowledge to flourish in our rapidly changing world today and every day. The teacher participants have affirmed are also notable opportunities with being digitally competent. As they expressed:

"My digital competence has served so much. I can easily learn more how to use Zoom and Google Meet as medium of communication" (P1, 2023). "I learned to use different media platforms like Google Meet and Zoom." (P3, 2023)

This was as well consistent with the statement of Participant 4 who claimed that: "I acquired with no difficulty the knowledge in using QR codes.". Participant 5 also added that: "I learned using software applications to maximize my time at work. I learned how to use Google Classroom and other virtual means of communications like Jisti, Google Meet, and Zoom." (P5, 2023)

Moreover, some relevant statements made by the key informants were:

"I learned to explore new platforms in sound made to deliver to my students the assistance they needed" (P1, 2023). Another also mentioned that: "I improve further my technology skills, especially in the computer a little but it could help" (P5, 2023). "I learn how to use some of the functions of the computer that I have never learned before" (P4) and "I was also able to discover that Google Forms can be used as answer sheet" (P4, 2023).

The preceding responses revealed that some advanced technologies aid the new learning setup in Philippine education. These technologies serve as the backbone of teachers in facing the constraints and limitations brought by the present condition where interconnectivity cannot be dispensed. The new normal in education paved the way for introducing different online and offline platforms such as "Google, TV broadcasts, resources, video lectures, and online channels" (UNESCO, 2020, as cited in Tria, 2020). Moreover, several learning modalities were introduced by DepEd and CHED, such as blended learning, distance learning, home-schooling, and more modalities that would fit the needs and capacity of learners (Tria, 2020). Moreover, the data imply that teachers' digital competence were further developed by these online and offline platforms, applications, and software even with the absence of formal training. Their current situation has forced them to be more experimental, more innovative and creative. Teachers started using educational apps, such as but not limited to: Google Classroom, WebQuest, Zoom, Kahoot, FB Messenger, and other online sites to hold classes and participate in meetings, seminars, conferences. Similarly, educational institutions, particularly private ones are empowering teachers to use digital technology (Toquero and Talidong, 2020). These platforms and set-ups provide inexpensive opportunities for teachers to teach and communicate and for the learners to learn compared to the self-learning modules and other printed learning modalities. Learning the different online and offline platforms provide teachers unique and rewarding teaching experiences that are not present in traditional face-to-face teaching.

Writing Instructional Materials Enhance Digital Competence

Another opportunity contributory to their digital competence was their exposure to writing instructional materials like modules and self-learning kits. Some of the participants responses have evidenced the significant and essential contribution of their writing experiences on the enhancement of their digital competence. As declared by one participant:

"I was able to write a Self-Learning Kit in a short period and I was given a chance to become a writer in SLK and SLM and these experiences have honed more my knowledge on technology (P5, 2023)". More than increasing my knowledge of computer and other educational technologies, I was able to enhance my skills in writing an effective self-learning kit" (P3, 2023). "I learned how to create a Self-Learning Kit (SLK) for the students". "I learned how to Quality Assure the modules and knew how to write Self-Learning Kit" (P2, 2023).

It can then be deduced from the foregoing that one of most significant strengths of the new normal in Philippine education is that teachers acquired not only skills in writing, but more so digital competence skills. Before the pandemic, only the few were provided the chances and breaks. With the pandemic,

everyone was given equal opportunities and access to technologies and everyone was encouraged to be open to the new differentiated learning and adjust to the modular and distance learning approach. One of the main purposes for adopting modular-distance learning is to cater to learners who are in low and middle income and those who have limited or no access to digital learning resources (Habler *et al.*, 2020). For the participants, acquiring skills in writing modules and SKLs can help them professionally because other than learning a new skill, it also helped them for their promotion. Being a module and SLK writer is also an additional point for the Result-Based Performance Management System (RPMS) for the plus factor.

Contributing Elements to Students' Digital Literacy in the Digital Environment

Convenient learning experiences were one of the highlighted emphases of the replies from the student participants. Students who took part in this survey emphasized how convenient the new virtual learning environment was. They accentuate it through their responses.

"Without leaving the comfort of my home, I picked up a lot of new skills, including a greater understanding of digital technology." (P8, 2023) "The convenience of not having to travel to a physical gathering made it fantastic. It also makes it less likely that I'll contract the virus, allows me to travel less frequently or not at all, and gives me more time to engage in other activities at the peak of the epidemic." (P6, 2023) "I can my digital skills comfortably at home and can connect with other people while multi-tasking." (P7, 2023) "I find virtual conferences useful since they allow me to multitask and yet hear my professors." (P3, 2023).

This is congruent with the study of Kvavik (2005) which stated that the most beneficial aspect of Information Technology is its convenience to the people who use it. Although, participants found this new set-up more convenient, it also poses an unknowing disadvantage because students could no longer focus because they had to address household problems and chores at the same time. This also separates the importance of being at home, which is primarily to relax and enjoy with the family.

The findings also suggested the students' experiences of the advantages of educational technology or of learning with the virtual classroom. As pointed out by one of the participants:

"We were able to see and hear each other in real time while presenting our assignment work to our classmates thanks to the virtual class. These audio and video elements allowed for two-way contact among us, fostering a feeling of community among learners. (P7, 2023)

As added by another participants:

"I enjoy seeing individuals when I'm speaking to them, as well as the possibility of backward and forward movement" (P2, 2023).

The participants in the virtual classroom activity system could see each other in real time, which they perceived as a positive since it allowed them to get to know one another better. The results also revealed that the audio and video capabilities of the virtual classroom enabled reciprocal conversation among participants, enabling them to resolve conflicts and offer quick feedback while participating in the activity. There were more human contacts in the virtual classroom than there were with asynchronous interactions because students recognized the benefit of having a lot of physical clues. Some of the findings of this research were consistent with Falloon's study (2021) on students' experiences of synchronous virtual classroom in which he explored the areas where educators should pay attention to gain maximum advantage from its use. In his study the students indicated that they preferred to have virtual classroom experience earlier on to get to know people better rather than towards the end of the course.

Being able to access the assignment tasks from different geographical locations was the most commonly identified advantage of online learning. However, for some participants, being physically removed from the school, services and resources meant that disengagement from their studies when other life events took priority was perceived as being more likely than if they had been studying on-school.

"I'm trying to explain that the atmosphere feels completely different, so I can learn more quickly and be more productive. "And I suppose you behave more when you have to, like if you have to go to school. However, when you study online, it seems like studying is really casual and relaxed since you can just sit at home in front of your computer, the same location where you watch Netflix and unwind." (P5, 2023)

"As long as there is an internet connection, I can do all of my work. This suggests that I won't have to think about it or look at a calendar whenever I want to do anything. There is always the worry of what if I miss this even if you have set term times and are aware that you could miss one or two classes if you are in school (P8, 2023).

Each participant contrasted the teaching and learning methods used in-person and online. The necessity for online education providers to set expectations of online learning as being fundamentally distinct from school-based learning may be suggested by this trend, which may have affected participants' expectations and experiences of online learning. It was evident that some participants found it helpful to use on-school study as a point of comparison when talking about the opportunities and difficulties that come with using online resources, even though it is unlikely that the participants regularly compared their online programs to on-school study.

This 'accessing resources advantage' on online learning showed participants weighing the advantages and challenges of online learning. The emergence of this theme is in support of research that has established the importance of the e-learning environment in creating and maintaining positive learning attitudes, specifically an environment that considers student preferences and is adapted to specific learning situations (Wongwatkit *et al.*, 2020).

Conclusions and Recommendations

Relative to the findings, the following conclusions were derived:

- 1) Teachers have very high digital competence along content development and management and high along web resources use and management and communication media.
- 2) Web Resources Use and Management had the highest correlation and thus contributed the most on information literacy.
- 3) There are no significant differences in the teachers' level of digital competence and in the students' level of digital literacy among aspects.
- 4) Teachers and students' challenges were mostly technological and academic in nature.
- 5) The demands of the new learning set-up had substantially improved teachers' digital competence and students' digital literacy even in the comforts of their homes and it had brought a more convenient teaching and learning experiences.

With the above conclusions, the following recommendations were offered:

- 1) Teacher education may continue to enable teachers to critically explore technology the basic computer operations for while technical skills are important, having the ability to progressively gain basic, intermediate and advanced levels of competence on computer operations may provide every teacher competitive advantage and may increase their level of productivity in the delivery of quality education among their students.
- 2) The Department of Education may expand the necessary digital ICT and information literacy infrastructure to encourage students' digital literacy through workshops, seminars, symposia and service orientation.
- 3) Educational leaders may provide skilled human resources, relevant technological tools, continuing education programs, technical resources, training consistency and recruit teachers based on pure merit to maintain and further enhance teachers' digital competence.
- 4) DepEd quality assurance team and the decision/policy-makers may explore new possibilities, incorporate the latest technologies into digital literacy, and implement student education management to improve training and literacy programs.
- 5) It is recommended among school heads and other concerned authorities and agencies to strategically plan not just the training and advancement of skills, knowledge, and competencies of teachers and students but more importantly the provision of necessary facilities and equipment for teachers' digital competency development and students' literacy development.

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