

## The Constraints of Students' Digital Literacy during the COVID-19 Pandemic

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### Abstract

**Purpose:** This study delved into the constraints faced by students in terms of digital literacy amidst the COVID-19 pandemic at North Eastern Mindanao State University (NEMSU) Cantilan Campus. It specifically focused on addressing the challenges encountered by informants due to their adverse experiences with information and communications technology (ICT), which subsequently impacted their academic performance.

**Methodology:** The study employed a qualitative research method utilizing an interview guide to investigate the challenges faced by students in online learning during the height of the pandemic at NEMSU Cantilan Campus. The researchers randomly selected and interviewed 22 informants, with 2 from each program of the university. The study used thematic analysis to interpret data, identify meaningful information, and organize it into themes.

**Findings:** Based on the findings of the study, the researchers identified emergent themes, namely: Unreliable Internet Connection, Poor Knowledge in using ICT, and Disruptive Background Noise. The study highlighted the significant impact of slow or unreliable internet connections on students' ability to engage effectively with ICT. The selected men and women who were interviewed expressed frustration and limitations in accessing online resources, communicating with others, and completing tasks due to connectivity issues. Moreover, the informants expressed difficulties in navigating digital platforms, understanding software applications, and utilizing ICT tools effectively. Additionally, the presence of disruptive background noise emerged as a significant barrier to effective communication and concentration during online interactions.

**Applications of this study:** The findings of the study highlighted the necessity for educational institutions like NEMSU to improve digital literacy programs. Students can gain technical

abilities in navigating online platforms by adding thorough ICT instruction into their curriculum. Educational institutions and policymakers may work together to ensure that students have stable and high-speed internet access, allowing for seamless online learning experiences and improving internet infrastructure. Addressing the problems expressed by the informants in accessing digital platforms and efficiently employing ICT tools emphasize the importance of providing continuing technical help to students. Offering workshops, tutorials, and tools can help students overcome technology barriers and improve their digital skills.

**Keywords:** Digital literacy, COVID-19, Online learning, Academic performance, ICT, NEMSU Cantilan

## 1. Introduction

The world has faced unprecedented challenges following the emergence of COVID-19 in December 2019 from Wuhan, Hubei, China, and recurrent waves of COVID-19 have worsened the adversary further. The outbreak has become an ongoing social crisis globally (Butarbutar et al., 2021). It has affected many countries and has had a serious impact on education around the globe (Jaradat & Ajlouni, 2021). It has changed the pattern of learning and information searching in the world of education (Lusianai, Rachim, Muliati & Astin, 2022). The sudden shift has presented numerous challenges for students, particularly in terms of their digital literacy (DL) skills (Villarreal et al., 2022) and overall adaptation to these new learning environments. Many higher education institutions (HEIs) across the world are forced to cancel face-to-face teaching, close campus facilities, and displace staff and students to work and learn from home (Cullinan et al., 2021). As an institution, the North Eastern Mindanao State University (NEMSU) Cantilan has shifted to online education to ensure continuous learning for its students despite the challenges. However, the sudden shift to digital learning has posed challenges on DL skills of the students, leading to a decline in academic achievement. Therefore, this study seeks to investigate the limitations students face in DL during the COVID-19 pandemic, impacting their academic outcomes. The extended effects of the COVID-19 lockdown have resulted in limited access to online learning for students at rural institutions such as NEMSU Cantilan. Many of the rural students are unable to keep up with their education due to the lack of infrastructure and other socio-economic problems (Ohle-Peters & Shahat, 2023). Among the many problems encountered by students and teachers, the lack of DL was one of the main causes of disruption, particularly in the early stages of distance education. The students felt inadequate

about DL (Ozparlak, 2022). DL is essential for students in the digital age, as it empowers them with the knowledge and skills to effectively use technology, communicate online, and navigate the challenges associated with online learning (Team, 2023).

This study revolves around the significant impact of DL challenges on students during online learning. While the lack of digital skills poses a notable disruption, particularly in the initial stages of distance education, students at NEMSU Cantilan, especially those in hands-on technology programs, face hurdles in adapting to online learning. Despite recognizing the importance of addressing DL gaps, there is a lack of study on how these challenges specifically affect students in technology programs like automotive, electronics, electricity, mechanical, garments, food tech, computer science, and others. Further investigation is needed to understand the nuanced effects of DL deficiencies on academic performance and engagement in these specialized fields, allowing for tailored interventions to enhance online learning outcomes for technology students effectively.

After recognizing the critical importance of DL for students, the researchers embarked on this study to delve into the challenges faced during the abrupt shift towards digital education. This investigation aims to uncover the specific hurdles and implications of the digital transformation on students especially in various technology programs, shedding light on the effects of DL deficiencies on their academic performance and engagement.

### ***Theoretical Background***

This study is patterned on John Sweller's Cognitive Load theory (CLT). According to CLT, short-term or working memory is limited and can only handle so much information effectively at one time. If a person's working memory is overloaded, that person may not be able to process anything well, thus leading to poor understanding, retention, and learning (Sweller, 1994, 1999, 2011; Chandler et al., 1991; Mayer et al., 2003; Nguyen et al., 2005; van Merriënboer et al., 2005; Mestre, 2014). The load on working memory needs to be minimized in each area so that people can process information more effectively and learn better. For practical instruction, careful design instruction so as not to overload the mind's capacity for processing information. Rather than adding unnecessary "bells and whistles" to multimedia instruction, it is important to incorporate elements that contribute to instruction but do not overload limited working memory.

## **2. Purpose**

The study seeks to investigate the challenges and negative experiences faced by the college students at NEMSU, Cantilan, Surigao del Sur amidst the COVID-19 pandemic, affecting their academic performance in the school year 2021-2022.

## **3. Methodology**

### **3.1 Research Method**

The study employed a qualitative research method utilizing an interview guide to investigate the challenges faced by students in online learning during the height of the pandemic at NEMSU Cantilan Campus.

### **3.2 Sampling**

The researchers randomly selected and interviewed 22 informants with 2 from each program of the university, ensuring diverse representation across various disciplines such as industrial technology, criminology, teacher education, hospitality management, and computer-related courses.

### **3.3 Research Instrument**

An interview guide questionnaire was utilized to explore the challenges and negative experiences faced by students in online learning. This structured tool ensured consistency in data collection and covered relevant aspects during the interviews. The interview guide provided a standardized set of questions, allowing researchers to systematically gather detailed information from each participant, thus ensuring that all relevant topics were addressed uniformly. By employing this approach, the study was able to collect comprehensive and comparable data across different informants, which was crucial for the subsequent thematic analysis and interpretation of findings.

The use of an interview guide is well-documented in qualitative research for its effectiveness in maintaining focus during interviews and ensuring that all pertinent issues are explored thoroughly. In this study, the interview guide was instrumental in eliciting detailed responses about the digital literacy challenges faced by students during the COVID-19 pandemic, thereby contributing significantly to the reliability and validity of the research findings.

### **3.4 Data Collection**

Before conducting interviews, the researchers obtained informed consent from the participants, emphasizing confidentiality and the right to withdraw from the study. Transparency was maintained by providing contact information to the participants, ensuring they understood the purpose of the study and their role in it. Audio recording was used to capture responses during interviews, which ensured accurate data collection and enabled detailed analysis. This approach allowed the researchers to maintain a high level of reliability and validity in their data collection process, as it provided a precise record of the participants' responses for subsequent thematic analysis.

This process of obtaining informed consent and using audio recordings is essential in qualitative research to protect participants' rights and ensure the integrity of the data collected. The structured approach to data collection, combined with thorough documentation, facilitates a comprehensive understanding of the research problem and enhances the credibility of the findings.

### **3.5 Data Analysis**

Thematic analysis was employed for data analysis, identifying recurring patterns, extracting key themes, and generating insightful interpretations. Data analysis commenced after reaching data saturation, ensuring a thorough exploration of the research problem.

The process involved coding the data to recognize patterns and themes that emerged from the interviews. This method allowed the researchers to systematically analyze qualitative data by categorizing and interpreting significant themes related to digital literacy challenges. By reaching data saturation, the researchers ensured that the data collected was sufficient to provide a comprehensive understanding of the issues faced by students, as no new themes were emerging from additional data.

Thematic analysis is a widely used method in qualitative research for its flexibility and ability to provide detailed, nuanced insights into complex issues. It involves a rigorous process of familiarization with the data, coding, theme development, and review, which enhances the validity and reliability of the research findings.

## **4. Research Results**

In this study, 22 informants from NEMSU Cantilan were interviewed, with 2 informants representing each university program. The interviews focused on DL constraints impacting students' academic performance, revealing emergent themes that shed light on the challenges

faced during the transition to online learning amidst the COVID-19 pandemic. The research method involved random selection to ensure diverse representation, and the data collection was guided by a structured interview guide. Thematic analysis was used to identify and interpret the recurring patterns and key themes from the interviews. These emergent themes included unreliable internet connections, poor knowledge/skills in using ICT, and disruptive background noise, all of which significantly impacted the students' ability to engage effectively with online learning platforms and ultimately their academic performance.

#### **4.1 The Constraints Which Affect the Students' Academic Performance**

##### **4.1.1 Unreliable Internet Connection**

This theme emerged as informants shared their struggles with digital literacy (DL) impacting their academic outcomes through information and communication technology (ICT). Unreliable internet connections, ranging from slow speeds to complete outages, significantly hindered their online learning experience. The primary issue revolved around the lack of consistent internet connectivity, leading to frequent disruptions in virtual classes. Some educators displayed a lack of empathy towards students' connectivity challenges, expecting them to overcome technical obstacles independently.

The study by Marinoni & Land (2020) revealed the challenges faced by students due to inadequate internet infrastructure and the urgent need for improved DL skills to ensure equitable access to education during crises (Marinoni & Land, 2020). The inadequate internet infrastructure in remote areas compounded these issues, forcing students to resort to alternative measures like relying on friends' Wi-Fi networks for participation in online classes. Students in these areas often struggle with low internet speeds, frequent disconnections, and limited access to online resources. This lack of reliable internet connectivity directly impacts their ability to fully participate in online classes, access course materials, and engage in virtual discussions (Cullinan et al., 2021).

Gierdowski (2021) added that many students faced issues with reliable internet access and device capabilities for remote learning, emphasizing the urgent need for enhanced DL skills and improved infrastructure to ensure all students have equal and effective access to education during times of crisis like the COVID-19 pandemic. The opinions expressed by the informants in this direction are as follows:

*"The main issue is the unstable internet signal causing disconnections during online classes."* ID12

*"During virtual classes, the internet connection is very weak and sporadic, as if you were listening to a broken audio device." IDI01*

#### **4.1.2 Poor Knowledge/Skills in using ICT**

Another critical theme identified was the lack of knowledge and skills in utilizing ICT tools for educational purposes. Many students found themselves unprepared for the shift to online learning, lacking familiarity with essential educational technologies and struggling to adapt to new digital platforms. The absence of knowledge and experience in navigating these digital tools negatively impacted the academic performance of the students.

A study by Adnan & Anwar (2020) shed light on the challenges faced by students in adapting to digital platforms, highlighting how the sudden transition to online learning during the COVID-19 pandemic exacerbated existing gaps in digital literacy (Adnan & Anwar, 2020). The majority of the informants expressed disappointment about the constraints that hindered their academic progress, admitting that they lacked prior knowledge and struggled with communication and submission of assignments. The viewpoints shared by the informants in this regard are as follows:

*" It was really hard to adapt especially in the digital world or even using the internet. I had to ask someone's help when using a laptop instead of a cellphone because it has bigger screen. There was a time when I uploaded my outputs via Google Classroom and only to find out, all my submitted outputs were tagged late because I didn't know that I had to click turn in button to submit." IDI01*

*"During online learning we used Google Meet, Google Classroom and Fb Messenger. I didn't have prior knowledge on how to use these tools. It was hard for me because I didn't know how to turn in my outputs. It was my first time using a touch screen phone." IDI06*

#### **4.1.3 Disruptive Background Noise**

This theme arose when the students experienced challenges during synchronous classes with environmental distractions and noise. Informants raised issues regarding unforeseen background disturbances during online classes where both audio and video might need to be activated. Students highlighted the challenge of reducing noise disturbances caused by animals like dogs and chickens, as well as passing motorcycles. This finding aligns with the results identified by Kasımoğlu, Bahçelerli, and Ufuk (2022), where communication is one of the leading problems for students and instructors while adapting to the new educational environment (Kasımoğlu, Bahçelerli, & Ufuk, 2022). Environmental

distractions and background noise introduce extraneous cognitive load, diverting attention and reducing working memory capacity, thus hindering effective communication and concentration during online interactions. This underscores the importance of addressing environmental factors to create conducive learning environments and enhance students' digital literacy experiences. The perspectives expressed by the informants on this matter are as outlined below.

*"Unexpected background noise, Sir. We're occasionally required to turn on audio and video; we should be the only ones visible on the video. We cannot eliminate the noise from dogs and chickens." (IDI 5).*

*"I feel embarrassed in online classes especially when it is my turn to report and suddenly interrupted due to uncontrollable neighborhood noise, such as motorcycles passing by." IDI18*

## 5. Discussion

The study's findings regarding the challenges faced in the study illustrate how unreliable internet connections, poor knowledge in using ICT, and disruptive background noise contribute to increased cognitive load, affecting students' ability to engage effectively with ICT. CLT provides a valuable framework for understanding these constraints. One of the major challenges identified is the unreliable internet connection. Slow or unreliable internet connections impose an intrinsic cognitive load by making tasks more complex and demanding, as students struggle to process information due to connectivity issues. Students who lack a stable and high-speed internet connection often face difficulties in accessing online learning materials, attending synchronous virtual classes, or submitting assignments on time. According to Richards, Aspegren, & Mansfield (2021) millions of students still lack reliably fast internet or a working computer which are the basic tools to participate in live lessons from home. Online learning during the pandemic has exposed the extent of internet access disparities among students. As stated by Asio et al. (2021), millions of students are affected worldwide, and some already gave up their status as a student. Governments and organizations need to invest in improving internet infrastructure to ensure reliable connectivity for all students, especially those in underserved areas. Initiatives such as expanding broadband access and providing subsidies for internet services can help bridge the digital gap.

Poor knowledge and skills in utilizing ICT tools added to the intrinsic load, requiring additional mental effort to navigate digital platforms and software applications. The lack of

familiarity with essential educational technologies highlights a significant gap in their DL skills. The gap in ICT proficiency hindered their ability to navigate online resources, participate in virtual classrooms, and effectively engage with course materials. Rahiem (2020) identified technology hurdles and challenges in using ICT, including device issues, internet access, technology expenses, and a lack of technological expertise. Despite these challenges, the possibility of replaying training regardless of time or location is one of the positive aspects of this process. It is recommended to adapt distance education technologies to education programs and introduce planning and development practices to follow new technologies in distance education (Kasımoğlu, Bahçelerli, & Ufuk, 2022). In addition, educational institutions should prioritize providing comprehensive training programs to enhance students' ICT skills and knowledge. Offering workshops, tutorials, and resources on using educational technologies can empower students to navigate digital platforms effectively. The need for comprehensive ICT training and support became evident as students grappled with technological challenges during the pandemic.

Moreover, disruptive background noise introduces extraneous cognitive load, diverting attention and reducing working memory capacity, thus hindering effective communication and concentration during online interactions. The presence of distracting noises in home environments or shared spaces created barriers to concentration and communication during online learning sessions. Students faced difficulties in maintaining focus, following lectures, and actively participating in discussions due to external disturbances. Learners experience communication problems during this process as they try to adapt to new educational environments (Can, 2020; Daniel, 2020; Telli & Altun, 2020). These challenges highlight how environmental factors can impact cognitive processes, supporting the application of CLT in understanding the cognitive demands imposed by technological limitations and distractions. Addressing environmental noise pollution became crucial for creating conducive learning environments and enhancing students' DL experiences. Educators should also address environmental factors like background noise by promoting strategies for creating quiet study spaces at home or implementing noise-canceling technologies during online classes. Encouraging effective communication practices can mitigate the impact of distractions on student learning as well.

## 6. Conclusion

The study's findings highlight the growing digital gap and its implications for students' access to technology and online resources. Addressing issues like unreliable internet connections, insufficient ICT skills, and disruptive background noise is critical to improving students' digital literacy (DL) experiences throughout the pandemic. Recognizing the impact of these challenges on academic achievement highlights the need for focused interventions to assist students who face technological hurdles.

Strategic investments in infrastructure improvements, extensive ICT training, and conducive learning environments are critical for assisting students in overcoming these challenges and succeeding in digital education. By supporting equity in education, boosting educational quality, and investing in professional development through ICT training, stakeholders may build inclusive learning environments and improve student results. This approach aligns with the need for enhanced digital skills and improved infrastructure to ensure all students have equal and effective access to education during times of crisis like the COVID-19 pandemic (Marinoni & Land, 2020).

The inadequate internet infrastructure in remote areas compounded the challenges, forcing students to resort to alternative measures like relying on friends' Wi-Fi networks for participation in online classes. This lack of reliable internet connectivity directly impacts their ability to fully participate in online classes, access course materials, and engage in virtual discussions (Cullinan et al., 2021). Additionally, many students faced issues with reliable internet access and device capabilities for remote learning, emphasizing the urgent need for enhanced DL skills and improved infrastructure (Gierdowski, 2021).

Furthermore, the need for comprehensive ICT training and support became evident as students grappled with technological challenges during the pandemic. Educational institutions should prioritize comprehensive training programs to enhance students' ICT skills and knowledge. Offering workshops, tutorials, and resources on using educational technologies can empower students to navigate digital platforms effectively. These efforts are essential to mitigate the impact of technological barriers on students' academic success (Adnan & Anwar, 2020).

The limitations of this study include the potential lack of generalizability due to the specific context of NEMSU Cantilan and time constraints. This limitation is significant because the study was conducted within a specific institutional and geographical context. NEMSU Cantilan has unique characteristics, including its infrastructure, student demographics, and

local educational policies, which might not be representative of other universities or regions. Therefore, while the findings provide valuable insights into the challenges faced by students at this particular institution, they might not be applicable to students in different settings who may experience different obstacles and possess varying resources and support systems.

Another limitation arises from the time constraints under which the study was conducted. The research was carried out over a limited period, which might not capture the full spectrum of experiences and challenges that students face over a more extended timeframe. Online learning during the COVID-19 pandemic was a rapidly evolving situation, with students and educators continually adapting to new tools and methods. A longer study period would have allowed for a more comprehensive understanding of how these challenges evolved and how students' coping mechanisms and academic performances changed over time.

Additionally, the study's generalizability is constrained by its relatively small sample size, drawn from a single institution. While the detailed qualitative data gathered provides deep insights into the specific issues at NEMSU Cantilan, the findings may not be easily transferable to other educational contexts with different student populations and institutional resources. This limitation underscores the need for caution when applying the study's conclusions to broader populations. The qualitative nature of the study prioritizes depth over breadth, offering rich, context-specific insights but potentially limiting the ability to generalize these findings to other settings.

Overall, these limitations highlight the importance of conducting further research across diverse contexts and over more extended periods to validate the findings and develop more universally applicable solutions. Future studies should aim to include a broader range of institutions and extend the research timeline to capture more comprehensive data. Understanding these constraints is crucial for interpreting the results within their appropriate scope and encourages future research efforts to build on these initial findings, thereby contributing to a more robust understanding of the challenges and solutions in online learning environments. Future research should focus on:

- 1) Longitudinal Studies: Investigating the long-term impact of digital learning obstacles on students' academic performance is crucial for designing sustainable solutions. Longitudinal studies provide comprehensive insights into how digital learning challenges, such as inadequate internet access and insufficient ICT skills, affect students' academic outcomes over

time. These studies help identify persistent issues and the effectiveness of interventions, contributing to the development of sustainable and effective strategies.

For example, a study emphasized the need for longitudinal research to assess the long-term effects of mobile learning on educational outcomes and environmental sustainability, highlighting the importance of ongoing evaluation to understand the impacts thoroughly (Asadullah et al., 2023). Additionally, another study found that longitudinal studies of digital learning are essential for understanding how digital technology influences students' learning experiences and outcomes over extended periods (Harju et al., 2019).

2) Comparative Analyses: Comparing interventions in different educational settings is essential to identify effective strategies tailored to diverse contexts. Comparative analyses allow researchers to evaluate the effectiveness of various interventions across different populations and environments, providing insights into which strategies are most effective under specific conditions.

For example, a systematic review highlighted the importance of tailoring interventions to address specific barriers in different settings, which can improve care and patient outcomes, although the effectiveness of these tailored interventions can vary significantly (Cheater et al., 2005). Another study demonstrated the effectiveness of educational interventions in diverse nursing contexts, suggesting that combining different teaching and learning methods can produce several positive outcomes (Häggman-Laitila et al., 2017).

A meta-analysis of learning strategy instruction showed that specific strategies were more effective in improving academic performance across different domains such as writing, science, mathematics, and reading, highlighting the need for tailored approaches in diverse educational contexts (Donker et al., 2014).

3) Intervention Strategies: Developing and testing innovative solutions to mitigate technological barriers and enhance students' academic success is essential in modern education. These strategies aim to address challenges such as inadequate access to technology, insufficient digital literacy skills, and other obstacles that impede effective learning.

A study on technology-enhanced learning in higher education emphasized the importance of methodical development and thorough testing of educational innovations to identify and address gaps in students' learning experiences (Reid & Baker, 2018). Another research highlighted the significance of understanding structural and cultural barriers in

technology-enhanced innovation to ensure the successful adoption of new learning technologies in universities (Schneckenberg, 2009).

Further, a case study on leveraging e-learning for enhancing employability demonstrated the impact of innovative service delivery, including webinars and online contests, on developing problem-solving abilities and technical skills among engineering students (Chatarajupalli et al., 2010). This highlights the potential of technology to transform educational practices and improve academic outcomes.

Additionally, the use of technology to prevent student dropout in Latin America, through the ACACIA project, illustrates how innovative solutions can support emotional well-being and attention of at-risk students, ultimately contributing to their retention and success (Sarraipa et al., 2016). These avenues can inform policy decisions and contribute to creating a more equitable and inclusive digital learning landscape.

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