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# A Case Study of Students' Lost Learning in Mathematics on Post-Remote Learning

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#### **ORIGINAL ARTICLE**



# A CASE STUDY OF STUDENTS' LOST LEARNING IN MATHEMATICS ON POST-REMOTE LEARNING

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#### **ABSTRACT**

The objective of this case study concentrated on examining the learning gap, going through some components of the transformation process, and coming up with some ways for aiding students who were experiencing lost learning. A qualitative research design was utilized by the researchers to understand and solve the cases related to Mathematics learning difficulties. Creswell (2008) asserts that qualitative research can be used to discover and comprehend the significance that certain people or groups assign to social or human issues. The researchers used purposive sampling to determine 15 student participants to understand the cases of learning loss and prescribe better interventions to the students. To solve the problems associated with loss of learning experienced by the learners after remote learning, a case study will be utilized as the strategy of inquiry since it fits the situation that is to focus the said key cases, discuss some transforming process, and develop interventions. After analyzing the interviews, researchers identified three common themes across the three cases which serve to clarify the learners' experiences after the post-remote learning: the learners' learning experiences during remote learning, factors that caused learning loss in Mathematics, and learners' coping strategies. In a deeper analysis, the impact of distance learning on students during the pandemic goes beyond just the difficulties in learning and understanding lessons which resulted in difficulty in learning math during in-person classes. The lack of in-person interaction with classmates and teachers also contributes to a sense of isolation and boredom, negatively affecting students' overall well-being and mental health.

Keywords: Lost Learning, Mathematics, Post-remote Learning

#### **INTRODUCTION**

The education system in the Philippines had made curriculum modifications and adopted innovative teaching strategies to ensure that learning continues without compromising the health, safety, and well-being of learners and teachers, combatting education despite pandemic situations. DepEd Order no. 12 s. 2020 revealed distinct learning modalities through the guide of the Basic Education Learning Continuity Plan (BE-LCP). Modular, online, and TV/radio-based instruction were some of the various forms of distance learning. When using these modalities, learning occurred between the teacher and the students who were separated by distance during instruction. MDL involves individualized instruction that enables students to use Self-Learning Modules (SLMs) in print or digital format depending on what is appropriate for them, as well as other learning resources like textbooks, activity sheets, study guides, and other study materials; ODL positions the teacher in the role of facilitator, encouraging students' active participation through the use of various technologies accessed through the internet while they are remote geographically.



In the Most Essential Learning Competencies (MELCs), the first topic in Math 9 is Quadratic Equations. Even in handling the fundamental operations, some of her grade 9 students were not able to do so. Most of them can't even operate integers and lacks knowledge of exponents. Topics intended for grade 9 are being halted for her to review her students with the basics. Thus, compromising the time in addition to meeting just three days a week. The students, on the other hand, have a hard time coping with the transition from distance learning to face-to-face learning. Due to the missed chances of learning previous topics due to the absence of their teachers, they have difficulties in understanding complex lessons like quadratic equations which should be preceded by some concepts in integers, exponents, and skills like completing the square, FOIL method, etc.

The two-year implementation of remote learning in Agusan Del Sur College, Incorporated brought a lot of adjustments not only to teachers but also to students, especially in understanding the topics in the learning modules and guiding the learners in answering their LMsAlthough some researchers have noted that learning difficulties are a key problem in the field of research (Du, 2003; Tao, 2004), there hasn't been much work done on learning loss in mathematics among high school students. In particular, there lack of effective strategies to improve struggling students in their mathematics learning processes. As a result, the researchers want to look into how much learning students lose after receiving remote instruction, while also analyzing some aspects of the transformation process and coming up with some solutions to support those students. It includes hearing students' feedback on how were their experiences with the learning activities given during remote learning, and how were their experiences with the abrupt implementation of in-person classes.

As a result, the case study's main objectives were to examine the learning gap, go through some of the transformation's key components, and come up with some aids for students who were losing their learning.

#### **Research Questions**

- 1. What are the cases that arise during post-remote learning?
- 2. What do students encounter when learning remotely?
- 3. What are the factors that caused learning loss in mathematics as observed in post-remote remote learning?
- 4. What practices can be employed to assist students who are experiencing learning loss?
- 5. What output can be proposed out of the findings of the study?

#### **REVIEW OF RELATED LITERATURE**

According to data from the Learning Enrolment Survey Form (LESF), 8.8 million parents preferred modular instruction, followed by 3.9 million who preferred blended learning, 3.8 million who selected online learning, 1.4 million who liked educational television, 900,000 who preferred radio, and roughly 500,000 who preferred other modalities. This means that modular learning was the most accessible of all the modalities (Adonis, 2021) and this modality considered the learners in rural areas where the internet is inaccessible for online learning. It offered students unrestricted self-learning modules and learning in their stride (Ambayon, 2020). However, communicating with them was difficult for teachers (Castroverde & Acala, 2021), which is important to engage and interact with them to provide timely feedback (UNICEF, 2020) and monitor their performance (Castroverde & Acala, 2021). Teachers were unable to contact them because of inactive phone numbers, lack of gadgets, and unstable internet connectivity. It has the same scenario with their parents (Castroverde & Acala, 2021). In addition, parents also admitted they are having a hard time understanding the lessons (Llemit, 2020) and are unable to help their children because of their lack of content knowledge or pedagogy (Garbe, et al.,



2020). In Tadalan's (2021) report, a student found it hard to understand his modules because he was not used to learning on his own, and he needed a teacher, especially in understanding complex lessons. In these situations, the team effort of the parent-student-teacher triangle is vital because each role must be the same and interconnected (World Education Network, 2021).

Long-term shutdowns of schools have widened already-existing educational gaps. According to a report from Authors' calculations using learning poverty data (reflecting late-primary level of reading) from UNESCO and the World Bank and MICS Foundational Learning Skills data (reflecting early-grade level of reading) from UNICEF Global, many countries that had poor learning outcomes before the pandemic also tended to have longer school closures. The Philippines is one of the identified countries.

It has taken a while for data on learning loss during lockdown to surface. School systems typically do not provide statistics at high-frequency intervals, in contrast to society sectors like the economy or the healthcare system. Even for assessment and accountability, educational institutions and teachers have had difficulty implementing web-based solutions (Kuhfeld, M., Soland, J., Tarasawa, B., Johnson, A., Ruzek, & Liu, 2020; Grewenig, E., Lergetporer, P., Werner, K., Woessmann, L., & Zierow, 2021). While education institutions struggle to support them in their pedagogical roles, teachers and school administrators frequently struggle to determine the best strategy to stimulate learning in their students. It is common for teachers to lack specialized pedagogical training in teaching fundamental reading and numeracy abilities. In this area, formative assessment is not frequently used.

By ignoring more extensive changes in educational inputs, plans for the education sector frequently fall short of providing concrete action plans to enhance learning. An effective analytical framework is needed to first comprehend the processes that affect student learning, as well as a monitoring framework to offer measurement data for all students, to improve student learning within education sector planning. Education has been severely affected by the COVID-19 global epidemic over the past two years. The first objective worldwide in response to this catastrophe is to continue providing support for every child so they may go back to school and make up for lost learning.

# RESEARCH METHODOLOGY

#### **Research Design**

This case study concentrated on identifying the causes of lost mathematics learning and formulating plans for enhancing math instruction for kids who had encountered learning difficulties. The researchers utilized a constructivist approach since the problems that existed were co-constructed between the researchers and participants based on their experiences. Social constructivists, according to Creswell (2008), assume that people want to comprehend the environments in which they live and work. The researchers respond to the problems regarding two types of learning difficulties experienced by the students and understand the situation based on the attributes and background experiences of the learners.

Since the researchers used the case study to solve the problem, a descriptive-narrative method will be utilized in the study. An intrinsic case study is the type of case study the researcher intends to portray. The researchers will employ triangulation to address the research questions by using a variety of data sources, including an interview with the student, examination analysis, and conversations with parents and teachers (Wang, Du, & Liu, 2009). The researchers used the profile/document data of the participants to illustrate the student backgrounds. Observation data will be utilized to illustrate learners' learning characteristics based on key cases. The researcher then used the data gathered from the interviewees' responses to diagnose the students. Lastly, these data were analyzed and interpreted by inducing meanings to develop some strategies to change participants' learning.



#### **Research Respondents**

The respondents of the study were the 12 students of Agusan Del Sur College, Inc. purposively selected. The researcher selected these learners which represent the cases of the said concern in the study. The study was carried out at Agusan Del Sur College, Inc., a performing private secondary school located in Poblacion, Bayugan City, where some of the researchers were assigned. This is a few meters away from the city proper and it is led by a school principal and faculty teachers.

#### **Research Instrument**

The researchers crafted an unstructured questionnaire with open-ended questions since the data needed were texts and interviews coming from the research participants which will be utilized in coding and theming, which was validated by qualitative research experts. Subquestions were contextualized and assessed whether they measured the desired quality of the conduct of the Round Table Discussion (RTD). To ensure the degree of desirability based on student interview replies, the questions underwent a pilot test.

#### **Data Analysis**

The methods used in this study were described as inductive, emergent, and influenced by the researchers' experience with data collection and analysis. The researchers induce ideas from the evidence gathered by the researchers in the case. In response, the approach for gathering data was changed to go along with the inquiries to solve the case. The researchers followed a method for data analysis to gain a deeper understanding of the subject under investigation. In this case, the researchers utilized an inductive approach to emergent concepts discovered through interviews, observation, and document analysis.

Before the conduct of the case study, the researcher asked for approval from the school principal to conduct a research survey of the research participants. Then, the researcher sent an intent letter to the student advisers and subject teachers to clarify the purpose of the study to be conducted. This procedure was carried out to make sure that each school was ready and willing to take part in the study.

- Identify the type of case study situated.
- 2. Select the number of participants included in the case.
- Identify the participants' backgrounds.
- Conduct diagnostic assessment using interviews, observation, profile analysis, etc.
- Analyze and interpret the data gathered through thematic analysis.

# RESEARCH FINDINGS AND DISCUSSION

After analyzing the interviews, researchers identified three common themes across the three cases which serve to clarify the learners' experiences after the post-remote learning: the learners' learning experiences during remote learning, factors that caused learning loss in Mathematics, and learners' coping strategies. The learners' learning experiences during remote learning describe how the junior high school students lived during the distance learning period for two years. Factors that caused learning loss in Mathematics highlight the reasons for the difficulties of the learners in learning the competencies during in-person classes. Learners' coping strategies illustrate the students' coping mechanisms to bridge the difficulties encountered in learning Mathematics at present after experiencing the two-year modular distance learning. These themes, described for each case in detail below with supporting examples from interviews and documents, help to shed light on the experiences that the learners experienced in their classrooms during post-remote learning classes. This section concludes with a comparison and commentary across the three different cases, highlighting the stark differences and



commonalities in learners' experience of post-remote learning classes after the two-year modular distance learning.

#### Learners' Learning Experiences During Remote Learning

During the pandemic, household chores and leisure activities have been prioritized over online education. Despite this, they have been on a journey of adapting to online learning and utilizing technology to aid in their studies. However, it has been a struggle to balance their household responsibilities, leisure activities, and online education all at the same time. This highlights the challenges that come with the shift to online learning and the importance of finding a balance between multiple responsibilities in a pandemic.

The impact of remote learning on math learning and persistence has been a topic of concern. The shift to remote learning has brought about challenges in math learning outcomes, with students facing difficulties in grasping the concepts being taught. Remote learning has introduced new challenges in math learning that were not present in traditional in-person classes. These challenges highlight the importance of addressing the unique difficulties that come with remote learning and finding ways to support students in their math learning journey.

As the world adjusts to the "new normal" after the pandemic, preparing for limited face-to-face classes is a top priority. One key aspect of this preparation is fostering active listening in the classroom, as it is essential for effective learning. The shift from virtual classes to limited face-to-face classes can be a challenge, but it's important to navigate this transition smoothly. By anticipating and preparing for the limited face-to-face classes, students and teachers can ensure a successful transition back to in-person learning.

The students' statements highlight several challenges that students face in their education, particularly during the pandemic. One of the main challenges is loneliness, which is affecting students' motivation and engagement in online classes. This disconnection from peers can lead to feelings of isolation, and in turn, impact a student's academic performance.

Additionally, the statements emphasize the challenges that students face in balancing their responsibilities at home, such as work, and their studies. This can lead to difficulty in finding the time and energy needed to focus on their academic work and achieve their goals.

Another issue raised by the students is the lack of support and resources for mathematics learning. This can make it difficult for students to grasp the concepts and perform well in their math classes. This challenge is particularly pronounced during remote learning, as students may not have access to the same level of resources and support as they would in an in-person setting.

The students also highlight the importance of preparation for in-person learning, both in terms of preparing students and creating a positive classroom environment. This includes ensuring that students are ready to return to the classroom and have the necessary supplies, as well as fostering a positive atmosphere where students feel comfortable and supported.

#### **Challenging Learning Experiences during Remote Learning**

The statements expressed the experiences of different students during the pandemic when distance learning became the norm. Despite being isolated from teachers and classmates, many students still found ways to continue their education. Some students struggled with the new format and the lack of interaction with teachers, while others were able to adapt and continue to learn despite the challenges. Similarities among the students include:



- All the students are undergoing distance learning due to the pandemic.
- Many of them are isolated from their classmates and teachers.
- All the students have some kind of support system, either through family members or classmates they can contact through group chat.
- Without the assistance of a teacher, some of the kids struggle to understand the teachings and activities.

Differences among the students include:

- The schedule and routines of the students vary, with some answering modules in the morning, and others in the afternoon or evening.
- Some students have family members who can help with the activities, while others must rely on cousins or friends.
- The support systems of the students also differ, with some having older cousins they can talk to, others having a best friend or a parent who is a teacher.
- The students have different levels of success with their distance learning, with some finishing several subjects within a day, and others struggling to complete even one.
- Some students have had video calls with their classmates and teachers, while others have not been able to interact with their teachers at all.
- Some students find distance-learning boring, while others are okay with it and prefer it to traditional school.

# **Diverse Factors that caused Learning Loss in Mathematics**

The common themes in these statements are the difficulties faced by the students in understanding and retaining mathematics concepts due to various factors, including the lack of teacher interaction, fear of asking questions, absence of communication devices, difficulty in learning prerequisites, difficulty in grasping complex topics, low scores in remote learning, and the difficulty in participating and retaining lessons in both remote and in-person classes.

The similarities between the student's statements were:

- Difficulty in learning math concepts due to the absence of teacher interaction.
- Fear of asking questions to the teacher and seeking help from peers or family members.
- Difficulty in understanding the lessons, especially during remote learning.
- Low scores in mathematics due to the difficulty in understanding the lessons independently.
- Difficulty in retaining and grasping concepts, both during remote and in-person classes.

The differences between the students' statements were:

- The presence or absence of communication devices affecting the student's ability to ask questions.
- The difficulty in retaining concepts even before the pandemic and how it has worsened during the pandemic.
- The level of engagement and participation in in-person classes as compared to remote learning.
- The impact of remote learning on students' ability to retain and grasp concepts during in-person classes.
- The level of independence in answering questions and the reason for seeking help from peers or family members.

These statements highlight the challenges faced by students in mathematics due to the various factors discussed. It is important to address these difficulties to ensure that students have a positive learning experience and retain their math skills.

# **Learners' Coping Strategies**

The student respondents have mentioned several coping strategies in preparation for post-remote learning and limited face-to-face classes.



The similarities among the student respondents' statements include:

- Preparation: All the students are preparing in some way for the return to face-to-face classes, whether it be through purchasing school supplies, preparing for lessons, or grooming themselves.
- Emotional response: All the students have expressed some level of emotion regarding the return to face-to-face classes, whether it be excitement, anxiety, or a combination of both.
- Importance of teachers: All the students recognize the important role that teachers play in the learning process, and many have made suggestions for how teachers can improve their teaching style.

The differences among the student respondents' statements include:

- Type of preparation: While some students are preparing by purchasing school supplies, others are preparing by reading ahead or grooming themselves.
- Level of emotion: Some students are more excited about the return to face-to-face classes, while others are more anxious.
- Suggestions for teachers: While some students have suggested that teachers should be stricter, others have suggested that teachers should be more understanding of personal problems among students.
- Focus of concerns: Some students have expressed concerns about their behavior and preparation, while others have raised concerns about the behavior of their classmates.

# MDL on remote learning: A failed implementation?

While each case presents a unique picture of lost learning experiences, the students encounter challenges regarding learning acquisition and suffer learning loss on a two-year distance learning modality. Their activities at home influenced their learning and study habits, unfortunately, they had developed a negative impact during its implementation. With these, it affected their teaching-learning interactions in the classroom during in-person classes.

The given interview responses provide insight into the experiences of students during the pandemic, particularly in terms of their distance learning activities. Several common themes emerge from the responses, which can be discussed as follows:

- Daily routine: The responses indicate that students have a set routine for their distance learning activities. They generally eat breakfast, complete household chores, and then work on their modules/online activities. Some students also work on the farm, help their parents in the business, or spend their time playing games.
- Study schedule: The responses suggest that students generally answer modules/online activities in the evenings, although some students complete them in the morning or afternoon. Some students also finish answering activities for a limited time and watch TV or play games.
- Difficulties in studying: Many students face difficulties in completing their modules/online activities, such as having limited time, confusion in answering questions, and lack of assistance from family members or teachers. Some students also indicate that they sometimes guess the answers, which might negatively impact their learning outcomes.
- Interactions with classmates and teachers: The responses indicate that students had limited interactions with their classmates and teachers during the pandemic. Some students had video calls with their classmates, but not with their teachers, and others had no interaction with their classmates at all.
- Learning outcomes: The responses suggest that students have varying levels of success in their distance learning activities. Some students can complete their modules/online activities independently and without much assistance, while others face difficulties in understanding the lessons without their teachers.



One study found that students who participate in distance learning tend to experience more difficulties in learning and understanding lessons without direct interaction with teachers compared to in-person learning (Leech, Gullett, Cummings, & Haug, 2022). This is consistent with the students who reported having difficulties in answering activities without the help of their teachers during modular distance learning. Another study found that students who participated in distance learning experienced feelings of isolation and boredom, as they were unable to interact with their classmates in person (Baltà-Salvador, Olmedo-Torre, Peña, & Renta-Davids, 2021). This is reflected in the response of the students who reported preferring to be at school rather than learning from home and feeling bored while learning at home. Moreover, a study on the impact of the pandemic on students' mental health found that students who participated in distance learning experienced stress and anxiety due to the lack of inperson social interaction (Son, Hegde, Smith, Wang, & Sasangohar, 2020). This is evident in the response of the students who reported not being able to see their classmates during the pandemic and only being able to talk to their cousins most of the time.

Overall, the responses of the students highlight the challenges faced by students during distance learning, such as difficulties in understanding lessons, feelings of isolation, and lack of social interaction. These findings align with previous research and highlight the need for support and resources to address the challenges faced by students during distance learning.

#### Student Perspectives for Learning Recovery to Face-to-Face Classes

The responses of the students provide insight into the current state of their preparation for the return of limited face-to-face classes. The students seem to be preparing well for the onsite classes, by purchasing school supplies, grooming themselves, and reading up on the topics they might expect to encounter during the first day. Additionally, they seem to be very excited about the prospect of having in-person classes, indicating that they value the opportunities that face-to-face interactions offer. However, there is also a hint of anxiety among some students, who are worried about meeting their classmates for the first time after the pandemic and having math class onsite. This highlights the importance of creating a supportive and inclusive learning environment that addresses the emotional needs of students.

The students also made some suggestions for the school to improve the learning environment. One of the suggestions is for the teachers to be stricter in their teaching style, to ensure that students are paying attention during class and are held accountable for their actions. Additionally, students suggested that teachers should talk to students who are having personal problems to help them focus on their studies.

There is also a call for students to have self-discipline and time management after class, for parents to guide their children, and for teachers to remind them of their responsibilities. Moreover, there is a suggestion for teachers to check students' bags to prevent the introduction of prohibited items such as alcohol into the classroom.

Studies have also shown that students who have experienced online or remote learning during the pandemic have faced several challenges, including feelings of isolation, lack of motivation, and difficulty in staying engaged with their coursework (Parker, Hansen, & Bernadowski, 2021). These findings align with the student's experiences and suggest the importance of returning to face-to-face classes to restore a sense of community and foster student engagement.

In terms of classroom management and discipline, previous research has shown that a supportive and structured learning environment, where students are held accountable for their actions, can positively impact student behavior and achievement (Campbell & Brigman, 2005). This confirms the students' recommendation that teachers enforce the rules more strictly and monitor their students' compliance.



Finally, previous studies have demonstrated the importance of addressing students' needs and concerns in the return to face-to-face classes (Limbers, 2021). This includes providing students with opportunities to voice their opinions and having open and honest communication between students, teachers, and parents. The students' suggestions for teachers to talk to students with personal problems and for teachers to check students' bags align with this research, highlighting the importance of addressing practical and emotional needs in the return to face-to-face classes.

#### CONCLUSION

In a deeper analysis, the impact of distance learning on students during the pandemic goes beyond just the difficulties in learning and understanding lessons which resulted in difficulty in learning math during in-person classes. The lack of in-person interaction with classmates and teachers also contributes to a sense of isolation and boredom, negatively affecting students' overall well-being and mental health. This highlights the importance of not just focusing on academic outcomes, but also on the social and emotional needs of students. Schools and educational institutions must provide a supportive and inclusive environment, even during distance learning, to help students overcome these challenges. This can be achieved through virtual communication tools, such as video conferencing if available, and by creating opportunities for students to interact and engage with one another such as home visitation, periodical consultation at school, and the like.

Also crucial to take into account are the varied experiences that students have while pursuing distance learning. Some students may have access to more resources and support at home, while others may face financial, technological, or personal challenges that hinder their ability to participate fully in distance learning. It is imperative to address these disparities and provide equal access to resources and support for all students to ensure that no student is left behind.

It is important to create a supportive and inclusive learning environment that addresses the emotional needs of students and fosters student engagement. This can be achieved by having strict classroom management and discipline and addressing the practical and emotional needs of students through open and honest communication between students, teachers, and parents. Additionally, the students' suggestions for teachers to be stricter in their teaching style, talk to students with personal problems, and check students' bags align with the importance of creating a structured learning environment.

In a nutshell, the impact of distance learning on students during the pandemic has been profound and has highlighted the importance of addressing the challenges faced by students. A more holistic approach is needed that considers both academic outcomes and social and emotional well-being and provides equal access to resources and support for all students, the return to face-to-face classes is an opportunity to restore a sense of community and provide students with a supportive and engaging learning environment.

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