

Experiences of Teachers on Using Modular Distance Learning (MDL) in Teaching Mathematics During the COVID-19 Pandemic

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Abstract – This study aims to present and analyze thematically the experiences of mathematics teachers in the implementation of modular distance learning in the first year of its implementation. Using transcendental phenomenology, twenty-two basic education mathematics teachers were involved in the study. Teacher-participants were purposively selected taking into consideration their mathematics teaching loads during the time of the COVID-19 pandemic. A top-down approach to thematic analysis was utilized in the analysis of data. Results of the analysis show that communication and mobility, as well as the content of the instructional modules, are the two categories considered by the mathematics teachers as challenges in terms of preparations while monitoring of learning and limited knowledge of students' family members on the topic provided in the modules are the challenges in terms of learning delivery; and late and incomplete submission of students' outputs are the challenges in terms of learning assessment. Several coping strategies and practices were emphasized such as doing home visitation, translation of modules in Tagalog language, creation of online group chats, tutorial sessions, provision of supplementary video materials, among others were identified by the participants. Finally, this study highlighted the characteristics of teachers as facilitators of learning, motivators, innovators, risk-takers, communicators, and technologists.

Keywords – Modular Distance Education, Experiences of Teachers, COVID-19 Pandemic, Mathematics

INTRODUCTION

The Philippine Basic Education aims to ensure continuity of learning amidst pandemic. Despite several calls to freeze academics, the education sector in the country continues. The new normal setup in basic education highlights the importance of distance learning. Distance learning refers to a modality where learning still takes place despite distances between the teacher and the students. This includes modular distance learning, online distance learning, and TV/Radio-Based Instruction (DO, 012 s. 2020). In modular distance learning (MDL), students are allowed to use self-learning modules whether printed or digital in which teachers are the ones responsible to monitor their learning progress and provide necessary remediation when needed. Teachers in distance learning are also tasked to do home visitation to the learners specifically those who are in dire need with the help of the student's family members who may also serve as para-teachers. However, the new normal education faced a lot of challenges specifically in its first year of implementation. Problems include stress (Hidalgo-Andrade, Hermosa-Bosano, & Paz 2021), knowledge and skills needed in the delivery of distance learning education (Alea, 2020), parental roles on distance learning (Agaton, 2021), availability of resources (Robosa, 2021), time for the implementation of

competencies (Arrieta, 2020), and loss of interest among students (Chan, 2021). These problems, if not addressed properly, could significantly impact the academic behavior and performance of the students (Agarin, 2021).

In teaching mathematics, where lessons are expected to be discussed in a more comprehensive way (Anzaldo, 2021), it is important to determine the experiences of teachers' experiences in order to ensure the upliftment of the mathematics competencies of the students which were previously identified by the Trends in International Mathematics and Science Study result in 2019 as rank 58th out of 58 participating countries (TIMSS, 2019). The TIMSS result about the performance of students in mathematics was reported before the pandemic which reflects the initial performance of the students prior to the occurrence of the COVID-19. Thus, given the scenario brought by the prevalence of COVID-19, and the pre-pandemic performance of the students in mathematics, it is necessary to study the experiences of teachers during the implementation of distance education, more particularly in Mathematics in order to provide the necessary support to the teachers who are the frontliners of education.

Even before education during pre-pandemic, several pieces of literature claimed that the use of modular instruction in teaching mathematics is effective. In a specific instance, the modular approach is found effective in teaching integration techniques in Calculus subject specifically in trigonometric transformation (Gonzales, 2015). Another study on the effectiveness of the modular approach is highlighted in the findings of (Guido, 2014) that instructional modules in materials science and engineering influence learners' knowledge adaptation. A similar result is reported by the study of (Charles and Sasikumar, 2018) that levels of concept mapping and modular learning techniques are associated with learning gains of students in Trigonometry and Differential Calculus. The effectiveness of the self-paced modular approach over the structured approach is found in the result of the study of Paspasan (2016) that the self-paced modular approach in teaching plane trigonometry helps students improve their level of performance compared to the structured approach.

With the cited pieces of literature, the researcher moved to conduct the study on determining the experiences of the teachers in teaching mathematics using the modular distance education in order to extract the common as well as unique experiences of teachers and to recommend appropriate aids to ensure maximum learning among students.

OBJECTIVES OF THE STUDY

The main objective of this study is to present and analyze thematically the experiences of mathematics teachers in the implementation of modular distance learning in the first year of its implementation. In particular, it aims to extract important themes on the experiences shared by the mathematics teachers about learning preparations, learning delivery, and learning assessment.

MATERIALS AND METHODS

This study is qualitative research focusing on a specific understanding of the relationship of methods and issues (Flick, 2010). Specifically, this study used the phenomenological approach in which the participants were interviewed using the online platform. Creswell (2003) provided an explanation of phenomenological research study, the information collection procedures include the primary in-depth interview with as many as 10 participants can describe the phenomenon since they have experienced it. There were twenty-two secondary mathematics teachers participated in the study. The

participants were purposively selected following these criteria: they are all Mathematics teachers and have mathematics teaching loads during the time of the COVID-19 pandemic. Participants were informed of the purpose of the study. Informed consent was secured by the researcher taking into consideration the information provided by the participants for further research dissemination and publication. Participants were also assured that data collected would be treated and presented collectively and that anonymity of each one of them would be given high considerations.

The instrument used in the study is composed of two major parts. Part I consisted of the demographics of the participants. This first part is used in providing an interpretation of the information collected for each participant. Part II focuses on their experiences and practices in teaching Mathematics using modular distance learning. The questionnaire was adopted and modified from (Roman, 2021) and validated by 10 Mathematics experts in the field of education. During the implementation of community quarantine, face-to-face transactions are prohibited. Hence, the interview guide was converted into several questions presented using open-ended and floated through google form online platform. The participants were given two months to provide their responses to consider their reflections on their experiences during the implementation of modular distance learning. They were also informed that they are allowed to make necessary changes to their responses if they wanted to ensure the accuracy of the responses according to their actual experiences. Triangulation was done using an online interview with some of the participants who made themselves available and document analysis on the collected materials from the participants.

Solicitation of feedback was also done by the researcher to the participants about the extracted meaning from their responses to ensure that the interpretation provided was not of the researcher's but of the participants'. After the researcher presented the objectives of the study, participants were invited to answer the 13 open-ended questions about their experiences in teaching mathematics using modular distance learning. Participants were also informed that their participation should be voluntary and if they wished to withdraw their participation in the middle of answering the online interview questions, they might do so by informing the researcher. The researcher explained further that participants' responses would be treated with

confidentiality and that after the analysis, the answered online interview guide together with the responses would be deleted in the drive storage. Data were analyzed using the 6-step thematic analysis process provided by Braun and Clarke (2012) which includes data familiarization, code generation, theme searching, theme reviewing, theme defining, and reporting. To ensure precision on the data interpretation, the researcher conducted some follow up messages to the participants to confirm that the meaning provided in the interpretation is what the participant wanted to say. The top-down approach of thematic analysis was also used to analyze the data gathered in this study. The top-down approach as discussed by Maguire and Delahunt (2017) is driven by specific research queries which are against to bottom-up approach where data is driven itself. The participants of the study are in the age bracket 24-61 years old, varied in terms of sex (F=17; M=5) and civil status (Single=7; Married=14; Widow/er=1), as well as highest educational attainment (Bachelor's degree = 3; With Master's Units = 11; Master's degree = 5; with Doctorate units = 3), academic rank (Teacher I – Master Teacher I) with years in teaching ranging from 1 to more than 30 years; and 1 to 7 mathematics subjects handled using the modular distance learning.

RESULTS AND DISCUSSION

The experiences of the mathematics teachers on using modular distance education have been documented based on the six-step thematic. The responses of the teacher-participants were grouped into three themes namely: learning preparation; learning delivery; and learning assessment and evaluation. For each theme, three categories were identified based on the participants' responses. Each theme and category were discussed and presented below. The thematic map, as a result of the thematic analysis, showed that for each theme, identified, participants highlighted their practices, challenges, and coping strategies. According to Jamon, Cabanes-Boholano, Jamon, and Pardillo (2021), there are several experiences of teachers on using modular instructions which include the difficulties they encountered in modular distance learning and the likes.

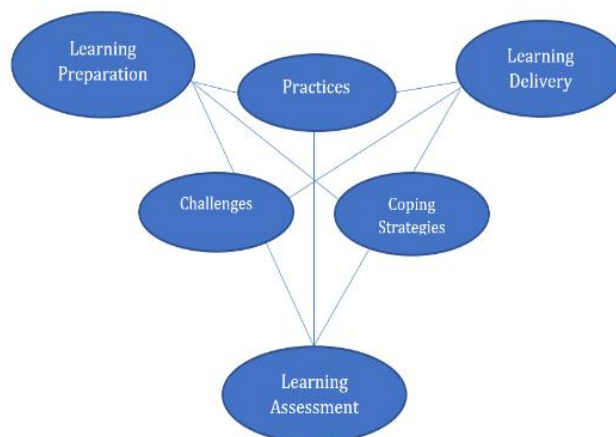


Figure 1. Thematic Map showing the Experiences of Teachers on Using Modular Distance Learning (MDL) in Teaching Mathematics During the COVID-19 Pandemic

Learning Preparation

Challenges of Teachers on Using Modular Distance Learning in Teaching Mathematics During the Covid-19 Pandemic in Terms of Learning Preparation

Based on the results, mathematics teachers experience challenges in learning preparation when it comes to the following: communication and mobility; and the contents of the materials. For communication and mobility, mathematics teachers mentioned that students are difficult to reach out while others could not communicate with their students due to mobility restrictions and no internet connection in the place where students reside. One of the obtained responses of the teachers is the constraint of reaching out to students who really need remediation specifically students who live outside the area (town) where the teachers teach and have no other means of communication, for instance, online.

...some of my pupils are hard to reach out – Pythagoras.

Reaching out to those who really need remediation (especially if the student are living outside the town and doesn't have means of communication) ...- Euclid.

Due to these restrictions, teachers find it difficult to diagnose students' needs to consider these needs in the preparation of the instructional materials or supplemental materials. In addition, because of mobility restrictions, teachers are being obliged (by the situation) to go individually to students' houses to distribute the modules

despite having fear about a possible encounter with infected individuals. This has been reflected in one of the participants' excerpts,

[One of] the challenges I encountered was the distribution of modules, where in that we need to find the house of the students to deliver the modules, sometimes the students or parents were not their house aside from that I can't hide my fear that one of the people I will encounter possibly a covid carrier – Archimedes.

For the contents and materials, teacher participants make their own learning materials to be given to the students while copies of the modules are not yet available. In this case, teachers consider it as one of the challenges. Another challenging experience of the teachers is the visibility of the pictures presented in the modules when these are replicated while it noted also that there are some typographical errors found on the modules provided to the students. The result of the study agrees to what (Galano, 2021) found that mathematics teachers experience difficulties on preparations of materials (Weekly Home Learning Plan, Learning Activity Sheets, Modules, Packaging) in which further confirms the claim of (Malipot, 2020) that teachers are facing 'myriad of issues' when it comes to learning preparations. Also, teachers are being challenged by the scarce resources of the students and unresponsive parents (Abante, 2021).

Making IDEA exemplar while copy of learner's modules are not yet available – Agnesi.

Pictures that are not so visible because the modules are photocopied, typo-error, etc. – Lobachevsky.

One thing that I experience is the minimal typographical error on the module – Bolyai.

Coping Strategies of Teachers on Using Modular Distance Learning in Teaching Mathematics During the Covid-19 Pandemic in Terms of Learning Preparation

Preparations for learning delivery require time and management. Despite challenges faced by the mathematics teachers, there are several coping strategies they provided to prepare themselves for the delivery of learning to the students. In a specific instance, one of the participants mentioned that time management and proper budgeting of plans help to cope up with the challenges in terms of learning delivery preparations. Another participant said that in order to ensure learning, crafting supplementary learning materials is necessary hence; the

participant does it. Similarly, one participant mentioned putting hugot lines in the lessons to be provided to the students so that students might find the lesson enjoyable and not boring. There is one participant also who localized learning activity sheets for the students to easily understand the topic since students are familiar with the things mentioned in the materials provided to them. Here are some of the excerpts,

Time management and budgeting of plans – Agnesi
Sinasamahan ko ng hugot lines ang mga instruction na ibinibigay ko sa to keep them motivated – Neumann.

Search for interventions and ask co-teachers for their practices – Hilbert.

I developed my own supplementary materials to aid them understand the lesson much better - Fibonacci

Make localized learning activity sheets - Descartes

As revealed by the study of De Villa (2021), as education migrates to new normal, teachers continue to do necessary preparations in order to equip themselves with distance learning. Even though, they have a lot of challenges, they find ways to cope up and continue performing their duty.

Practices of Teachers on Using Modular Distance Learning in Teaching Mathematics During the Covid-19 Pandemic in Terms of Learning Preparation

Although there are lots of common preparations done by the mathematics teachers in modular distance learning, there are some distinct practices implemented by the teachers. These include providing a printed version of the learning materials (modules) translated into the vernacular language of the students; converting the module into easy-to-understand instructions or simpler instructions. On the other hand, several common practices are found in the mathematics teacher participants' responses. These include printing of additional explanations on difficult topics, checking the accuracy of the answer sheets vis-à-vis the content of the assessments provided in the module; and making an online group chat to communicate with students and parents ahead of time. Similar to what Dayagbil (2021) noted, teachers made several adjustments in teaching and learning designs anchored on the policies and guidelines of the institutions to they are connected to.



Learning Delivery

Challenges of Teachers on Using Modular Distance Learning in Teaching Mathematics During the Covid-19 Pandemic in Terms of Learning Delivery

Learning delivery as experienced by the mathematics teachers is quite challenging. Several mathematics teacher-participants mentioned that the absence of teachers in independent modular learning affects the students' understanding of the lesson because, despite instances that there are relatives who might help the students to understand the lesson, some of them have insufficient knowledge on the topic being presented. One of the participants mentioned also that the challenge is on putting instructions in the module. Another sound challenge of the teachers in the delivery of learning is the barrier in communication or communication gap. In this communication gap, mathematics teachers professed that some of the learners have no gadget to use hence; it has been very difficult on the part of the teacher to connect them instantly to respond to the queries of students concerning their lessons not well understood. As an effect, teachers are not able to determine if the students learn the required learning competencies set in the curriculum. These are some of the excerpts from the data corpus,

Students do not understand the lesson because they are dependent on the teacher's explanation – Riemann.

Some of the parents are telling me that they cannot teach their children because of lack of knowledge in the topic – Pythagoras.

As a math teacher it is really challenging to deliver the lessons. Especially with the making of instructions it's hard but I see to it that I was be able to deliver the lesson very well and clear – Archimedes.

Inability to communicate instantly to the queries of students concerning their lessons not well understood - Euclid.

Since there is no face-to-face learning, I am not able to determine if the students learn the required learning competencies – Agnesi.

In terms of facilitating learners, some of the learners have no gadgets that's why it is very hard for the part of the teacher to connect them – Euler.

The result of the study confirms the claim of Deslandes-Martineau, Charland, Arvisais, and Vinuesa (2020) that many parents experienced difficulties supporting their children to study due to a lack of knowledge and abilities on the subject matter.

Coping Strategies of Teachers on Using Modular Distance Learning in Teaching Mathematics During the Covid-19 Pandemic in Terms of Learning Delivery

To ensure that learning takes place in modular distance learning, Mathematics teachers do home visitation to their students. During the home visitation, some of the teachers do a one-on-one tutorial for the students. Some teachers communicate with the students and parents online about the problems they encounter in answering the module. Other teachers provide supplementary video materials for their students. The result of the participants' responses highlights the intervening characteristics of online technology. Despite modular distance learning, both teachers and students made use of the online platforms to communicate and ensure that learning takes place. This signifies that modular distance learning is supported by the available technology at home. Meanwhile, to those who reported doing home visitations, results showed the passion and compassion of the teachers in performing their duties and responsibilities amidst the threat of being exposed to the virus. This reveals that teachers, regardless of high risks to their health, showed commitment in delivering learning to the students and ensuring that the learning competencies have been achieved by the students. According to the findings of Roman (2020) even if the instructional module has the capability to increase the performance of students in mathematics, without proper facilitation, guidance, and supervision of the teachers, the learning would not totally achieved. The findings conform to what Castroverde and Alcala (2021) concluded that teacher's coping strategies in combating challenges in modular distance learning include time management, innovation in the strategies of teaching, adapting to the changes in education, flexibility, alternative planning, having a positive mindset and upgrading skills for new normal education set-up.

Practices of Teachers on Using Modular Distance Learning in Teaching Mathematics During the Covid-19 Pandemic in Terms of Learning Delivery

Different teachers, different practices. In terms of facilitating learning, one teacher-participant mentioned that to ensure learning among students, lessons provided are translated to *Tagalog* language to be easily understood by the students. Another participant mentioned also that they do home visitation specifically to those students who experience difficulties in terms of doing or performing the tasks provided in the module to do one-on-one tutoring. Some of the teacher-participants provide PowerPoint presentations, additional printed materials, videos, and invite students to join in a group chat so that when they experience problems in answering the tasks in the modules, they could easily tell the teacher and in return, the teacher might find ways to help them. According to one participant also, despite being modular modality, once a week, they hold an online class to address the concerns of the students while one participant mentioned that in order to monitor learning progress, the teacher requires the students to write their mathematical solutions to the given problems and need to submit these solutions together with their modules every week.

Learning Assessment and Evaluation

Challenges of Teachers on Using Modular Distance Learning in Teaching Mathematics During the Covid-19 Pandemic in Terms of Learning Assessment and Evaluation

Challenges in terms of learning assessment and evaluation of mathematics teachers revealed that some of the learners return their activity sheet late and incompletely in which some students' submissions have no name indicated. In addition, teacher-participants mentioned that most students do not show their solutions while others do not have answers. Also, there is a question about the absorption of learning among students due to some concerns about intellectual honesty. Some teacher-participants mentioned that they are not sure if the learners are the ones who answer the given tasks in the learner's modules. These challenging experiences of mathematics teachers are reflected in the following excerpts:

Not all of the students return their activity sheet on time and completely. There are some who don't put their names on their output - Archimedes

Most of them don't show their solutions and some of them don't have answers - Agnesi

In terms of assessing and evaluating learners, some of the learners did not answer the learner's task because they really don't know the answer.

Some students are copying the exact answer from their classmates, it is really obvious especially in essay or in their reflection paper. I cannot tell who is the source of their answer so it is impossible to tell who is absorbing the lessons and who are just copying from others – Napier.

Unsure if the students test were really their own ideas – Euler.

There is no guarantee on the validity of the answers of the students. Maybe some students' answers came from someone else. - Euclid

I am not so sure if it was my learners who really answer their modules. - Descartes

The findings of the study on assessment support the findings of Gueta and Janer (2021) that it is a challenge on the part of the teachers to assess students' performances. In particular, the high level of assurance about validity and reliability. Hence, it was concluded that it is imperative for the education department to give enough attention to producing assessment tools and proper training in assessing performance. In addition, the result is in consonance with what Gelleagan-Alivio and Abadiano (2021) found that teachers have no assurance that students do not cheat in answering the specific tasks included in the provided module.

Coping Strategies of Teachers on Using Modular Distance Learning in Teaching Mathematics During the Covid-19 Pandemic in Terms of Learning Assessment and Evaluation

The coping strategies in terms of assessment and evaluation of the teachers include the designing of assessment in an easier approach where some provide additional worksheets to the students. One of the teacher-participants mentioned that whenever the students return the module without an answer, the teacher immediately asks the adviser to help the teacher reach the students and their parents for remedy or intervention. Similarly, one of the participants said that constant communication to the students and parents to address the concern about

assessment tasks while some of the teachers focus on how to communicate with the students and parents regarding the assessment. Other teacher-participants do necessary steps in order to ease the checking of students' papers such as the use of technology and providing immediate feedback on the students' progress.

Practices of Teachers on Using Modular Distance Learning in Teaching Mathematics During the Covid-19 Pandemic in Terms of Learning Assessment and Evaluation

Assessment of students' learning outcomes is very necessary. This concern in the educational evaluation process should be given emphasis in order to ensure that students grasp the most essential learning competencies along the way. Mathematics teachers have to shift from traditional preparations to new normal preparations and still need to develop plans, worksheets, assessments sets, and similar materials (Jain, 2021). As to practices of mathematics teachers in terms of assessment, one of the participants mentioned that they use technology in checking the outputs of the students. Another participant commented about providing reinforcement activities to the students and they ensure that competencies have been acquired by the students before proceeding to the next topics.

CONCLUSION AND RECOMMENDATION

Undeniably, the first year of implementation of modular distance learning in mathematics brought a lot of issues and concerns to both teachers and students but even though the modality being used is 'distance learning' teachers made strategies in order to connect to their students and their family through the use of available technology. Based also on the result, it concluded that teachers, aside from being facilitators of learning, serve also as innovators who made strategic practices in order for students to understand the most essential competencies set in the curriculum, motivators who do home visitations and tutorials just to show students the importance of meaningful learning, risk-takers who go individually to students' houses despite the threat of being exposed to the virus, communicators who find ways to connect to students and family in order to monitor the learning progress, and technologists who maximize available resources for the sake of learning.

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