

Research Article

Instructional practices of Filipino teachers in remote mathematics education in COVID-19 times

Michael B. Cahapay¹ and Mark Gil P. Labrador²

¹College of Education, Mindanao State University, Philippines (ORCID: 0000-0002-0588-0022)

²Department of Education, Schools Division of South Cotabato, Philippines (ORCID: 0000-0002-9087-980X)

The COVID-19 crisis has drastically transformed how mathematics education can and should be delivered to students. The main objective of this article is to describe the emerging instructional practices of Filipino teachers in remote mathematics education amid the current global crisis. Following a descriptive approach in qualitative research, mathematics teachers from Mindanao, Philippines were involved in this study. The data were collected through online interview procedures and examined following the thematic analysis technique. The result revealed four themes: 1.) selecting the most suited remote learning modality for students; 2.) providing alternative teaching approaches for difficult concepts; 3.) assessing and monitoring the learning progress of the students; and 4.) involving the community in the teaching and learning delivery. These themes shape the instructional practices of the teachers in remote mathematics education in the context of the present crisis. Based on the conclusions of this study, some insights are discussed at the end of the paper for further improvement of the current practices in remote mathematics instruction.

Keywords: Instructional practices, Mathematics education, Remote education, COVID-19 crisis, Philippines

1. Introduction

The COVID-19, a communicable viral infection caused by a new strain of severe acute respiratory syndrome coronavirus, was first reported in Wuhan, China in late December 2019 (McLeod, 2020; Shereen et al., 2020). Since its exponential growth across countries and territories around the globe, it has radically transformed education in unimaginable ways. Safety is a priority concern as schools have been interrupted to an extent never experienced in recent history. When schools unexpectedly close for unknown periods, teaching and learning become challenging processes. While no one can envisage how teaching and learning will be molded in shape in the immediate future, educators all over the world are facing the tall order of developing alternative instructional practices to support educational continuity and recovery.

The UNESCO (2020) proposed alternative instructional practices as a key element in ensuring continued learning: the remote learning strategy. It is a learning modality that occurs when the teachers and students, or source of content, are geographically separated, making it impossible to physically meet in the traditional brick-and-mortar school environment. Remote learning may include online learning as well as low technology options such as radio, television, mobile phone, and print materials. Within the context of the COVID-19 crisis, Hodges et al. (2020) proposed the term emergency remote education, characterized by a temporary change in the delivery of instruction caused by a crisis. It offers a transient practical alternative for school administrators and teachers to continue instruction and give students the necessary support.

The Philippines contextualized this remote learning in the light of the COVID-19 crisis through three types of modalities: online distance learning (ODL), modular distance learning (MDL), and television- and radio- based instruction (Llego, 2020; Sari & Keser, 2021). It is part of the Department of Education Order No.

Address of Corresponding Author

Michael B. Cahapay, PhD, College of Education, Mindanao State University, General Santos City, 9500, Philippines.

✉ mbcahapay@up.edu.ph

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012 series of 2020, which mandated the adoption of the Basic Education Learning Continuity Plan (BELCP) to address the educational impacts of the current crisis. With primary emphasis on the resources and capabilities of the students, the plan underscores equity considerations, urging the schools to adopt the most suited modalities (Department of Education, 2020). Of the three types of remote learning modalities, reports showed that modular distance learning in print format has been the most favored modality of most students this school year (Bernardo, 2020; Magsambol, 2020).

As a tool subject in the basic education curriculum, there is a need to refashion how mathematics could and should be taught in the light of the changing situation. According to Bass and Ball (2002), a distinctive capacity of mathematics is to compress information into abstract and greatly practical forms. When concepts are represented in compressed shapes, their structures become more visible and actionable. Relative to this, the teachers have an essential task to compress mathematical knowledge, so that they can become meaningful and teachable units. Traditionally, mathematics thrives in face-to-face spaces (Khirwadkar et al., 2020) through effective teaching strategies such as inquiry-based learning and the use of real-world examples (McAfee, 2012) with the frequent use of gestures and body (Cassibba et al., 2021). Considering the recent educational transformation from physical to different modalities of distance education, however, teachers face a great challenge of unpacking mathematics concepts in new different ways that have never been tested.

The teaching of mathematics through different modalities amid the ongoing crisis has been discussed in recently published works (e.g. see Attard & Holmes, 2020 on teacher perceptions of blended learning in mathematics; Irfan et al., 2020 on the challenges encountered by teachers in the use of e-learning in mathematics education; Mailizar et al., 2020 on barriers in the online implementation of mathematics; Cassibba et al., 2021 on ways teachers faced the challenge of teaching distance education). This current paper will add to these studies by investigating the instructional practices of the teachers in remote mathematics education in the Philippines whose context is dominantly characterized by modular distance learning in print format (Bernardo, 2020; Magsambol, 2020). This area of interest within remote mathematics education amid the COVID-19 crisis has not been well explored in the field. The researchers believe that such a unique context in remote mathematics education, when given attention, will contribute in significant ways.

This work is hoped to contribute useful knowledge about the current practices in remote mathematics education. A closer look at the instructional practices of teachers will provide a depiction of the current instructional state of remote mathematics education in the field. The outcomes that will be generated in this study can be practically used by school administrators and instructional designers to draw actionable recommendations toward a more improved remote mathematics education. Furthermore, this study will provide teachers a glimpse of educational experiences from the perspective of mathematics teachers in a particular circumstance. It will also contribute to the emerging body of knowledge on instructional practices in remote mathematics education in a global emergency context.

Thus, the overall purpose of this study is to describe the instructional practices of Filipino teachers in remote mathematics education amid the COVID-19 crisis.

2. Method

This section presents the methods used in this study. It includes the design, participants, instrument, procedure, and analysis. They are elaborated as follows.

2.1. Research Design

This study is mainly qualitative research. According to Creswell (2013), qualitative research is a kind of research that does not focus on testing a hypothesis but describes a given phenomenon of interest. Specifically, this present qualitative study uses a research design that is descriptive in nature. A descriptive research design is defined by McCombes (2019) as a design that aims to describe a population, situation, or phenomenon accurately and thoroughly. This design is appropriate to the current study as it attempted to describe the instructional practices of teachers in remote mathematics education amid the COVID-19 crisis.

2.2. Sampling Technique

This research involved nine Filipino teachers currently handling remote mathematics classes in public secondary schools in Mindanao, Philippines. They were selected following the purposive sampling technique, in which the participants are chosen by applying a set of criteria (Lavrakas, 2008). The participants in this study were primarily selected based on the criterion as mathematics teachers who have current experience in remote mathematics education. Moreover, while the researchers wanted to involve as

many participants as possible, the COVID-19 restrictions and poor internet connectivity affected the sampling outcome. The current sample size does not represent the entire population, but it is considered acceptable to demonstrate the purpose of this study. The researchers do not intend to generalize the results but to qualitatively describe the instructional practices of teachers in a certain field and context.

2.3. Instrument

An interview guide was tailored by the researchers. It consists of main three sections: overview, short survey of participant information, and guide questions. Specifically, the last section contained questions directed to generate information regarding the instructional practices of teachers in remote mathematics education amid the COVID-19 crisis. These questions were content validated by two teacher education professors and a mathematics master teacher to ensure their appropriateness.

2.4. Data Collection

The data were collected through online interviews from March 29 to April 09, 2021. An online interview is a procedure in which the data can be gathered synchronously or asynchronously in different forms ranging from text messages, video calls, and immersive worlds (Salmons, 2015). Considering the resources of the participants, a series of online interviews mainly based on text responses were conducted by the researchers in this study. The researchers initially introduced the purpose and process of the research to the target participants. The ethical considerations were discussed, underscoring that participation in this study is fully anonymous, confidential, and voluntary. After securing consent, the participants received the interview guide in Word format either through Messenger or Gmail. Most of the participants answered offline and submitted after three to five days. When the initial responses were gathered and reviewed, the researchers returned to selected participants in some cases especially when some responses needed illumination. At the end of the data collection process, all the gathered responses were organized by the researchers in a master transcript for data analysis.

2.5. Data Analysis

The researchers analyzed the instructional practices of the teachers in remote mathematics education through thematic interpretations. Thus, the gathered data were mainly treated through thematic analysis, a method of examining qualitative data usually used to a set of texts to identify common themes or patterns of meaning that recurrently emerge (Caulfield, 2019). Following this technique, the researchers conducted an analysis procedure in some stages until the themes were derived. First, the analysis of the responses provided the initial identification of the relevant codes. Then, these relevant codes were repetitively evaluated, noting their similarities and differences to eventually group them into categories. Based on these categories, the themes were carefully developed and structured to address the interest of this study, which is the instructional practices of teachers in remote mathematics education amid the COVID-19 crisis. Furthermore, a presentation of selected participant narratives was also employed. Consistent with the anonymity principle as articulated in the ethical considerations of this research, the participants were provided with codes, such as Teacher A, to protect their privacy when presenting their narratives.

3. Results

This paper was guided by its purpose to qualitatively describe the instructional practices of Filipino teachers in remote mathematics education in COVID-19 times. The result is presented in Table 1 and discussed as follows.

3.1. Theme 1: Selecting the Most Suited Remote Learning Modality for Students

The analysis initially revealed that the participants make the students the central consideration for selecting the most suited remote learning modality to implement remote mathematics instruction. The students have different capabilities and resources for learning. While modular distance learning is the most common preferred modality for most students, online distance learning and blended learning are also appropriately adapted for other students. The essential consideration of the students in this aspect of instructional development is reflected in the following responses of the participants:

“Our school choose to adopt modular learning modality since it is quite fitted to our students, having limited technology and electricity resources. Modules are being printed and sorted in school by the teachers and being distributed to the students through their parents/guardians.” -Teacher A.

Table 1
Instructional practice of teachers

<i>Sample code</i>	<i>Emergent theme</i>
<p>Our school choose to adopt modular learning modality since it is quite fitted to our students, having limited technology and electricity resources.</p> <p>Since we have a considerable number of students who have technological access, the remote teaching modality that our school adopted is online teaching.</p> <p>We adopted two learning modalities depending on the capacity of our students: modular distance learning and blended learning.</p>	<p>Selecting the most suited remote learning modality for students</p>
<p>The concept of graph of a polynomial function needs to be meticulously explained for the students to understand. It needs to have more illustrations and drills on the part of teachers and students.</p> <p>With the aid of the internet, teachers can help the students in their learning difficulties through sending video lessons in their group chats the most challenging topics.</p> <p>I have to publish a video clip in the course material to reinforce learning. Some of my students come from different schools. So I have to adjust with my lessons and I have to use different strategies.</p>	<p>Providing alternative teaching approaches for difficult concepts</p>
<p>Students who are at risk of dropping out are being traced, giving them encouragement and supplementary learning materials. They are also being given extended time in terms of accomplishing their modules.</p> <p>Considering that learners already have the difficulties in understanding mathematics in the old normal, I learned to adjust to every learner when it comes to my expectations of their outputs this new normal.</p> <p>Especially for my modular distance class, I do constant communication through group chats, follow up through phone calls and text messages, and coordination with the class advisers.</p>	<p>Assessing and monitoring the learning progress of the students</p>
<p>The parents and guardians help and guide students in answering the modules. They also provide conducive learning space to their children at home.</p> <p>I benefit support from the expertise of my colleagues, especially in math department. We are open to share our teaching strategies to cope in this new normal school year.</p> <p>Our community stakeholders are our partners in information dissemination and material distribution. The barangay officials help in the distribution and retrieval of modules especially in a remote places.</p>	<p>Involving the community in the teaching and learning delivery</p>

"We adopted two learning modalities depending on the capacity of our students: modular distance learning and blended learning. Aside from learning through the print module provided, there is a time for online classes complemented by extended session through group chats" -Teacher F.

3.2. Theme 2: Providing Alternative Teaching Approaches for Difficult Concepts

Moreover, the analysis showed that the participants design alternative teaching approaches especially for mathematics concepts that seem hard to unpack in print modular distance learning and other modalities. The teaching approaches in remote mathematics instruction have never been tested by the participants in the past and are currently being experimented with by them. It is inevitable that alternative teaching approaches are devised from time to time as new needs and situations arise. This instructional phenomenon of providing alternative teaching approaches to augment remote mathematics instruction was shared by the participants as follows:

"Majority of the math concepts are really difficult to teach remotely. The concept of graph of a polynomial function needs to be meticulously explained for the students to understand. It needs to have more illustrations and drills on the part of teachers and students" -Teacher E.

"When solving word problems, I have to show the process. I have to publish a video clip in the course material to reinforce learning. Some of my students come from different schools. So I have to adjust with my lessons and I have to use different strategies" -Teacher B.

3.3. Theme 3: Assessing and Monitoring the Learning Progress of the Students

The analysis further disclosed that the participants assess and monitor the learning progress of the students in a more focused manner especially that mathematics instruction is delivered remotely. It is a constant worry that is expressed by the teachers in the field that, given the new modality of learning, they are not sure if their students are learning the mathematics concepts the right way. As such, they closely assess and monitor the learning progress of their students. This response to ensure that students learn is expressed in the following responses of the participants:

"The tolerance must be stretched at its maximum level. Students who are at risk of dropping out are being traced, giving them encouragement and supplementary learning materials. They are also being given extended time in terms of accomplishing their modules." -Teacher H.

"Considering that learners already have the difficulties in understanding mathematics in the old normal, I learned to adjust to every learner when it comes to my expectations of their outputs this new normal" -Participant D.

3.4. Theme 4: Involving the Community in the Teaching and Learning Delivery

Lastly, the analysis indicated that the participants seek support in the teaching and learning delivery of remote mathematics education by involving the community. This community refers to their immediate professional circle in school and the stakeholders in the society concerned with the education of the students. The teachers involve various key persons for different particular mechanisms to deliver remote mathematics instruction. This instructional experience of shared responsibility in implementing remote mathematics instruction was narrated by the participants as follows:

"I benefit support from the expertise of my colleagues, especially in math department. We are open to share our teaching strategies to cope in this new normal school year" -Teacher I

"Our community stakeholders are our partners in information dissemination and material distribution. The barangay officials help in the distribution and retrieval of modules especially in a remote places. We seek their invaluable help in these aspects" -Teacher G.

4. Discussion

Based on the result, there emerged four themes of instructional practices of teachers in remote mathematics education amid COVID-19 crisis: 1.) selecting the most suited remote learning modality for students; 2.) providing alternative teaching approaches for difficult concepts; 3.) assessing and monitoring the learning progress of the students; and 4.) involving the community in the teaching and learning delivery. These themes were a result of the analysis of the pattern of ideas that emerged across the responses of the participants. They were linguistically framed as process codes since the interest of this study is on instructional practices. They are further discussed as follows.

First, the students - their interests, abilities, needs, and capacities - must always be accounted for in the selection of instructional approaches (National Research Council, 2002) in remote mathematics education.

This consideration is evident in this study as schools and teachers conveyed to select the most suited remote learning modality based on student characteristics and backgrounds. As reported earlier, modular distance learning in print format has been the most preferred modality (Bernardo, 2020; Magsambol, 2020) although a few also chose online distance learning or a combination of these modalities. The instructional decisions as regards the most suited remote learning modality are grounded specifically on the resources and backgrounds of the students. For example, Dangle and Sumaoang (2020) mentioned that internet access especially in Philippine rural areas seems to be the reason for the popularity of modular distance learning over other modalities.

Furthermore, mathematics is traditionally taught in a face-to-face setup (Khirwadkar et al., 2020). Researchers also advocate the use of practical and experiential teaching strategies like inquiry-based learning and the use of real-world examples (McAfee, 2012) to teach mathematics. However, with the forced change to remote mathematics instruction, teachers in this study were found to have been continuously experimenting for better alternative teaching strategies to deliver especially some difficult concepts. Cassibba et al. (2021) investigated how mathematics teachers adapted themselves to the new teaching modality. They discovered that the teachers have turned to lecture with writing tablets, slides, or mathematical software. Set in a developing country, the Philippine teachers in this study were similarly found to provide alternative teaching strategies by making use of the most available and applicable online resources to augment especially the teaching of difficult concepts through modular distance learning modality.

Assessment is also another equally affected instructional component when mathematics education had to be delivered remotely this time (Lieberman et al., 2020). As voiced out by the teachers in this study, they constantly worry as regards how their students are learning or if they are learning at all, thus the need for more focused assessment and monitoring measures. Some practices found in this study are supported in the field. For example, as disruptions should be anticipated, teachers will need to be open in their deadlines for requirements submission (Townsend, 2020). When students are further not able to demonstrate performance or product by the set period, teachers consider employing alternative assessment requirements (Cahapay, 2020). Some Philippine schools, especially during the acute phase of the crisis, have also resorted to sort of emergency assessment and monitoring strategies like mass promotions, waived requirements, and deferred grades (Yumol, 2020).

Lastly, it sounds cliché but the quote “it takes a village to raise a child” has never been more real and needed than today. For one, with learning continuity plans directing children to learn at home, parents play a big role. Brossard et al. (2020) stated that the involvement of parents serves a significant position for remote learning in the current context. Moreover, Iyengar (2021) stressed the involvement of the community in education even after the current global crisis. They urged that educational programs driven by the community must be braced to provide supplementary education opportunities to students. Within the Philippine school circles, administrator and peer assistance is the way that educators support each other whether inside or outside the school. Gallagher (2020) also suggested that this assistance may include how teachers collaborate, network, socialize, share, and help each other in times of need.

Considering the above discussion, this paper provides important contributions in the knowledge about instructional practices in remote mathematics education as far as the current crisis is concerned. The discussion sought to reconsider traditionally accepted assumptions about instruction in the light of the ongoing instructional experiment to improve remote mathematics education amid the COVID-19 crisis.

5. Conclusion

Amid the instructional experiments to improve remote mathematics education, there is a need to account for the practices of the teachers in the field. This study sought to qualitatively describe the instructional practices of Filipino teachers in remote mathematics education amid the COVID-19 crisis. The result uncovered four emergent themes: 1.) selecting the most suited remote learning modality for students; 2.) providing alternative teaching approaches for difficult concepts; 3.) assessing and monitoring the learning progress of the students; and 4.) involving the community in the teaching and learning delivery. These themes reimagine the traditionally accepted instructional practices, emerging from the current situation. They may serve as practical points to create transformative opportunities for the continuous improvement of remote mathematics education.

A recommendation that can be learned from the study includes the careful instructional development processes, especially in designing relevant, appropriate, and responsive teaching modalities and assessment strategies that suit the learners amid the current crisis. This implies that consideration of learner

characteristics and backgrounds, which traditionally has been always regarded, should be more carefully and sensitively deliberated in the current instructional development processes given the changed situations. For example, keeping the integrity of learning assessment should be coupled with consideration of available resources of the learners as well as possible alternatives when one assessment option does not work. Another recommendation that can be taken from this study is the continuous effort to involve different stakeholders for different types of support. This insight underscores the importance of multisectoral engagement in the implementation of remote education. This means that all types of support - technical, financial, structural, social, and emotional - from different stakeholders count especially in these times when schools are forced to engage in a kind of experiment of which solution works better given a context.

It should be noted that the results of this qualitative study should be complemented with other sources of evidence as a way to validate them. Hence, it can be suggested that other data collection techniques such as document analysis and direct observation, whenever feasible, should be designed for this study and other similar studies in the future. Moreover, the small sample size might have hindered the saturation of all other possible themes. Thus, more participants should be sought to illuminate other instructional practices in remote mathematics education. It should be also stressed that the results obtained in this study are sensitive to the context and can only be applied to this context. There is a need to conduct similar studies in other fields and environments to gain more insights about emerging instructional practices given the relative differences.

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