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RESEARCH ARTICLE

CHALLENGES, COPING STRATEGIES AND PRACTICES OF TERTIARY FACULTY ON USING FLEXIBLE LEARNING MODALITY IN TEACHING MATHEMATICS DURING THE COVID-19 PANDEMIC

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ABSTRACT

The study attempted to determine the challenges, coping strategies, and practices of tertiary mathematics teachers in preparation, facilitation, and assessment and evaluation of learning during the COVID-19 pandemic. Using phenomenological approach of research, 10 mathematics faculty of institute of higher learning participated in the study. Based on the result of this study, mathematics teachers faced a lot of challenges in terms of learning module, strategy in teaching, time constraints, and multiple preparations. Likewise, the study was able to show that there is a problem when it comes to internet connectivity resulting to communication gap between teachers and students. However, on the top of these challenges, teachers' quality and commitment are more visible. Several coping strategies were identified such as utilization of technology and teaching tools, bridging the communication gap through online (verbal and chat). Teachers also ensured that instructional materials are prepared ahead of time. They also provide varied instructional assessment to cater individual learning capability of the students as well as they establish conducive and enticing online classroom environment where materials are already installed.

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INTRODUCTION

Flexible learning is a pedagogical approach that allows flexibility among teachers, learners and learning environment. It varies depending on the level of technology, availability of resources, and literacy and approaches [1]. In the advent of COVID-19 pandemic, education platform in the Philippines shifted from traditional to flexible learning. In this shifting of the education paradigm, flexible learning does not only pertain to virtual teaching and learning (synchronous, real time) but also other learning modalities such as the use of asynchronous online learning (with time delay), offline e-Learning, and remote learning with modules and other printed teaching and learning materials. One thing that is certain for this flexible learning is that, it is not face-to-face. For this reason, the conventional way or method of teaching is not applicable. One of the subjects that is being taught using the physical face-to-face interaction is mathematics. For the past years, teaching mathematics using the face-to-face approach has been identified as effective. Both teachers and students are convenient in a way that both of them can freely and boundlessly express themselves during the discussion proper. Teachers can explain thoroughly the lessons without thinking of possible interruption such as in other modes of teaching.

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Similarly, students can ask questions to their teachers without worrying whether their questions are being heard or not. However, given the shifting of platform in teaching tertiary mathematics, teachers have their own experiences that need to be documented and presented. Several researches showed that teachers face a lot of challenges in teaching during the COVID-19 pandemic which include poor connectivity of internet resulting to communication gap [2], range for innovative teaching [3], and lack of direct interaction with the students paired with sudden change of setting [4] and student's psychological distress Hasan, N., & Bao, Y. (2020). For this reason, there is a need to conduct a study focusing on the challenges experienced by the mathematics teachers, their coping strategies and their practices.

OBJECTIVES

The primary objective of this study is to document the challenges, coping strategies and practices of tertiary faculty on using flexible learning modality in teaching mathematics during the COVID-19 pandemic. In particular, it tries to determine the challenges, strategies, and practices of the mathematics teachers in terms of preparation, facilitation, and assessment and evaluation. It also attempted to find out the perspective of teachers in a post-pandemic mathematics

teaching and identify their confidence level about students learning using the current flexible learning mode.

METHODOLOGY

This study is a qualitative research that focuses on specific understanding about the relationships of issue and methods [5]. In particular, this study uses phenomenological design where the participants are interviewed using online platform. Creswell [6] explained that in a phenomenological research study, the methods of collection of information includes primary in-depth interview with as many as 10 individuals who have experienced and can describe the meaning of the phenomenon. There were 10 tertiary mathematics teachers participated in this study. The participants were purposively chosenbased on the criteria that they are all Mathematics teachers and have teaching loads during the time of COVID-19 pandemic. Participants during the conduct of the study were informed about the objectives of the study. An informed consent was also secured by the researcher that the information provided by the participants would be used for research dissemination and publication. They were also assured that their responses would be treated collectively and not singly and that anonymity of each one of them would be highly observed. The instrument is composed of two parts. Part I consists of the personal profile of the participants and the modality they use in teaching Mathematics. This part I is used in giving interpretation of the information provided by each participant. Part II focuses on their challenges, coping strategies and practices in teaching mathematics using the flexible learning modality. The instrument was validated by five faculty-researchers of one state university and mathematics professors from the different institutions with similar educational setting with the institution where the study was conducted. The challenges, coping strategies and practices of the participants for each of the learning preparation, facilitating learning, and assessment and evaluation of learning were documented.

Since there is a restriction on the conduct of face-to-face transactions, the interview guide of the researcher was translated into several open-ended questions floated online through Google forms. The participants were given one month to provide their responses. They were also given permission to make necessary changes to their responses if they wanted to. Participants were also allowed to use mother tongue language in answering the open-ended questions. Triangulation was done using an online focus group discussion and document analysis on the collected materials from the participants. Some clarifications were also done by the researcher to the participants about the extracted meaning from their responses. After the researcher discussed the objectives of the study, participants were requested to answer the 13 open ended questions about their challenges, coping strategies, and practices in terms of learning preparation, facilitating learning and assessment and evaluation. Participants were also informed that their participation is voluntary and if they wished to withdraw their participation in the middle of answering the online interview questions they might do so. They were also informed that their responses would be treated with confidentiality and that after the study, the answered online interview guide would be deleted together with the generated data. Data were analyzed using six-step thematic analysis procedures as discussed by O'Connor and Gibson [7] and Braun and Clarke [8].

The six-step thematic analysis procedures include data organization; searching and organizing concepts and ideas; establishing overarching themes from the data; ensuring validity and reliability of the data; searching possible explanations; and final report. In the data organization, the responses of the participants were transcribed and organized into matrix form. The researcher then looked for patterns. The researcher used codes from the responses of the participants then merged several codes to create a sub-theme. Several sub-themes were combined to create a theme. After the themes have been identified, the researcher presented and interpreted the theme. To further provide quality interpretation, the researcher conducted some follow up to the participants to ensure that the meaning provided in the interpretation is what the participant wanted to convey. The top-down approach of thematic analysis was used in this research. Top-down approach as discussed by Maguire and Delahunt [9] is driven by the specific research queries in contrast to bottom-up approach or data driven itself. The participants of the study are in the age bracket 22-55 years old, varied in terms of sex, with years in teaching ranging from 1 to 30 years and 1 to 10 mathematics subjects handled using the flexible learning modality. Two of the participants are using asynchronous online teaching, one with synchronous online teaching while the remaining seven participants use the combination of synchronous, asynchronous, e-Learning offline, and Modular teaching.

RESULTS AND DISCUSSION

This part includes the presentation of the results and the discussions vis-à-vis the objectives of the study.

General Preparations: Three themes emanated from the responses of the participants on how they prepare themselves in teaching mathematics using the flexible learning modality. These include allocation of specific time to prepare in advance the teaching materials using technology; participation to Online Seminars/Trainings/Workshops; and positive perspective. Tertiary mathematics teachers equip themselves with tools, innovative strategies and technology. They also made advanced preparations of teaching materials. Tertiary mathematics teachers attended online seminars, trainings and workshop about flexible teaching and learning. Given the scenario that the participants experience, they still have positive perspective on teaching through being adaptive to the new normal wayof teaching and learning. Tertiary mathematics teachers also convinced themselves to accept the paradigm shift in teaching both physically and mentally. Teacher's preparation has a lot of great influence when it comes to teaching. The plans of the teacher provide locus that leads to the achievement of the educational target. Without these plans, the teaching and learning process will not be organized and centralized.

Challenges of Tertiary Faculty on the Use of Flexible Learning Modality in Teaching Mathematics in Terms of Learning Preparations, Facilitating Learning and Assessing/Evaluating Learning: The challenges of tertiary education faculty on the use of flexible learning modality have been thematically analyzed and presented on this section. Four themes have been identified based on the challenges of the participants. These include: learning module and technology; strategy, time, and multiple preparation. Participants of the study consider learning module and technology utilization as

one of the challenges in teaching mathematics subjects. In one of the responses obtained, it is difficult on the part of the teachers to create a learning module given the very limited period of time. They also have to orient themselves about online teaching specifically the use of different learning portals such as zoom and google meet. Participants also mentioned that they have to strategize more to make the lesson easy to understand and be self-explanatory since there are some students who have poor internet connectivity or not at all. Similarly, participants are being challenged by the very limited time to prepare modules for 3 to 5 different mathematics subjects. Participants mentioned also that aside they have to convert the content of the module to power point and audio-video presentation for the students who have chosen asynchronous and synchronous learning modality.

> *Teachers need bunch of preparation for teaching-learning amidst the pandemic. It has been a challenge for me to create modules, to prepare instructional materials, master the technology as a tool for teaching and to think of the possible effective strategy at a short period of time. The reality is that, I am handling 5 different subjects per week –Bolyai.*

Preparation of learning module requires a lot of time. However, due to the sudden change or shift in the continuity plan of the education sector, teachers need to strategize and use their flexibility in order to adjust to the new teaching and learning environment. Modules need to be carefully prepared. There should be a keen and careful checking of the contents and other features. In terms of facilitating learning, three themes emanated: the communication gap and insufficiency; low internet connectivity; and technology orientation. Based on the result, mathematics teachers in the tertiary level are being challenged by the low internet connectivity particularly when facilitating an online class. In addition, not all students are familiar with the use of online learning platform.

> *"During google meeting we cannot actually see what the students are doing, some of them are not familiar in navigating google meet (when to mute/unmute) and the worst internet connection in several areas"– Euclid.*

"There are some students who had difficulty in their internet connection, resulting to late submissions of students' activities"-Pythagoras.

Since teachers are addressing several learning options based on the students' resources, there is a gradual communication gap being formed between the teacher and students. Very limited interaction between the teachers and students particularly those who use a combination of asynchronous and remote learning. Two-way communication process is necessary when it comes to teaching. However, when there is a barrier between the teachers and students, both will experience communication problem. One the part of the teachers, based on the result, they experience difficulties in delivering well the lessons to the students in contrast to the boundless discussion and interaction they have while inside the face-to-face classroom. Though alternative modality is being used, the low and poor internet connection affects greatly the facilitation of learning. According to Tria (2020) the implementation of flexible learning modality would pose problems on students who have limited access to internet. Poor internet connectivity affects both teacher's and student's performance during synchronous discussion. The result of the analysis also revealed that even students who choose synchronous online experience problems in terms of internet connection. Intellectual honesty, lack of participation to formative assessment, late submission of outputs, and technology related difficulties are the three identified challenges in terms of assessing and evaluating learning. Though participants persuade students ensure academic honesty, they are not sure among themselves that students are the ones doing the activities being provided to them. However, they do not have any other options but to put their trust on the students.

> *"It is quite difficult to find out whether they themselves are answering honestly the assessment/evaluation since all are done online"-Descartes.*

> *"We do not know if the students are completing the assessment task, assignment and activities with honesty. All the channels and temptations are moreclose to them. There are possibilities that they tend to look for answers online, asking someone to do it for them or they are just going to copy the work of others"-Galois.*

Another challenge is the limited number of students who participate in the online recitation. Based on the participants, they cannot include all students in the recitation for the reason that not all students are able to attend online class. Hence, there should be no single assessment and evaluation tool to be used that fits to all students. Teachers need to resort to several tools to assess and evaluate the learning progress and outputs of the students. According to Alea, et al. (2020), teachers encountered challenges in the use of technology related activities, students' participation and utilization of features in online classes, together with time management and other matters concerning online classes. Academic honesty is an important value that should be present to each and every student in the academe. Academic honesty leads to integrity. However, based on the result of the analysis, teacher-participants are not sure whether the students are the ones who answer the activities. They do not have any choice but to put their trust and confidence to their students. Based on the result of the study conducted by Moralista & Oducado[12], HEI teachers agreed that there is difficulty in managing online education and there is a high prevalence of cheating and plagiarism. Similarly, HEI teachers have no means of determining whether students do the research in this mode of learning. Likewise, based on the study of Niemi &Kousa (2020) many teachers are worried about issues related to assessment of learning and outcomes. Specifically, on the reliability of students when doing examinations and tests at home.

Coping Strategies of Tertiary Faculty on the Use of Flexible Learning Modality in Teaching Mathematics in Terms of Learning Preparations, Facilitating Learning and Assessing/Evaluating Learning

Mathematics faculty-participants made some coping strategies in response to the challenges being met. Coping strategies include providing themselves planning schedule ahead of time to prepare everything for the students despite very limited time. Participants also maximize the use of available technology in preparing lesson guides, modules, presentations, and assessments.

"I am making a time table for the things that I need to do. making my modules and instructional materials (PPT presentation) concise, simple, interactive but not compromising the quality and its effectiveness. I am continuously trying variety of strategies and choosing some of those that worked"-Descartes.

In learning preparations, it is necessary for the teachers to exert extra efforts to combat the challenges being experienced by them. Maximizing the use of available technology is found helpful by the participants in terms of learning preparations. The use of technology is helpful enough to prepare instructional materials and assessment tools to ensure meaningful learning. Participants, to cope up with the challenges in facilitating learning, allow students to do a reflection and self-assessment of learning. They also establish a two-way good communication process between them and their students. Also, they maximize the use of available tools and technology in teaching. Participants also ensure that all of their students receive the lesson whether soft or hard copy. They also suggest tutorial sites/links to those students who cannot attend the synchronous discussion.

"(We make an) agreement to build and implement some rules and regulations during class discussion. This includes some guidelines when to mute/unmute, letting students to open their cameras for the duration of the meeting so that we know if they are paying attention, and utilizing the chat box for queries/ permission to something"-Gauss.

Technology is a crucial part of the educational process. With the use of technology in the delivery of learning, students become more attentive and aggressive to learn the subject being taught by the teachers. The result conforms to the theory of facilitative learning by Rogers (1983) illustrating that people have natural eagerness for learning that involves self-learning concept implying that learning takes place when somebody acts as a facilitator. Mathematics faculty respondents based on the analysis use some motivational, trivial and logical questions to assess students learning during online class. When it comes to modular learning, teachers require students not only to show the final answer to the given problems and activities but also to present the solutions on how to arrive on the final answer. Mathematics teachers also maximize the use of technology by utilizing available reading materials for assessment. They also provide various assessment strategies to maximize the potentials of the students in answering the problem. Aside from that, teachers use reflective questions to encourage students reflect on their own learning. Teachers also exercise leniency about the deadlines of submission of the activities. Lastly, teachers put their trust in the students that they are the ones answering the given problems and activities.

"I ensure trust in my students, giving them enough time to answer their activities and also being lenient in all of their request, specially on extending submission deadline"-Bolyai.

Practices of Tertiary Faculty on the Use of Flexible Learning Modality in Teaching Mathematics in Terms of Learning Preparations, Facilitating Learning and Assessing/ Evaluating Learning

Considering the practices employed by the mathematics teachers in terms of learning preparations, one theme is identified. Mathematics teachers ensure that instructional materials are prepared paired with variety of assessment tools and strategies. In this, mathematics teachers prepared modules prior to the start of classes. The contents of the modules are converted and enriched. Teachers also prepare powerpoint presentations and use google meet. They also include links of videos to be watched by the students. Mathematics teachers ensure establishment of conducive and enticing online classroom environment where instructional materials are readily available. In order to ensure learning of the students, teachers exercise the two-way communication between them and their students through encouraging them to ask questions and respond to the questions being given to the students. As one of the practices, teachers try to get all the students involved in the discussion.

"Building a conducive and less-threatening environment by being approachable and open for questions/ feedback and suggestions. Securing some ice breaker to lighten the environment. Constant communication with students with the aid of questioning, soliciting answers, insights and suggestions, as well as personal experiences"-Descartes.

Mathematics teachers make varying assessment strategies and processes. Based on the participants, students are assessed/evaluated through engaging activities such as worksheets and performance tasks. During online class, students are asked questions to check if concepts are made clear to them. In addition, some of the teachers provide students mini live quizzes.

Preferred Learning Delivery Mode of the Teachers: Teacher participants are asked about their preference on method of teaching mathematics. Based on the result, 50% of the participants would like to go back to the previous face-to-face learning once the pandemic is gone while 50% of the participants would like to use the flexible learning modality in teaching mathematics. For those who would like to go back to face-to-face teaching, they consider the effectiveness of this in learning mathematics. According to them, when mathematics is being taught using the pre-pandemic ways, it would encourage boundless interactions between the teachers and the students. They also consider the significance of knowing each other in addition to the convenience on the part of the teachers to identify and address the capability of students specially in analyzing a mathematical problem as well as poor internet connectivity of some students.

"I would still prefer to teach Mathematics in the physical setting. Teaching using flexible learning modality has its own advantages but the teacher-student connection is weak. I value that aspect because as a student, I know that knowing your instructor is a factor in learning. On the other hand as a teacher, not seeing your students genuine reaction when learning is also a downside. Because i do not see them physically, my awareness for the points I have to adjust is limited" - Euclid.

On the other hand, teachers who prefer to use the combination of online and face-to-face believe that it will better address other issues and challenges such as limitations on the number of classrooms and mobility.

"I think combination of face-to-face and online learning will be better so as to address insufficiency of classrooms,

congested areas intended for learning where I think learning is not taking place, to save energy, lessen mobility of people (so that students' expenses may be reduced if they stay at home)"-Archimedes.

More so, some of the teachers believe that they need to innovate the way they teach the subject through incorporating various strategies from old and new modality.

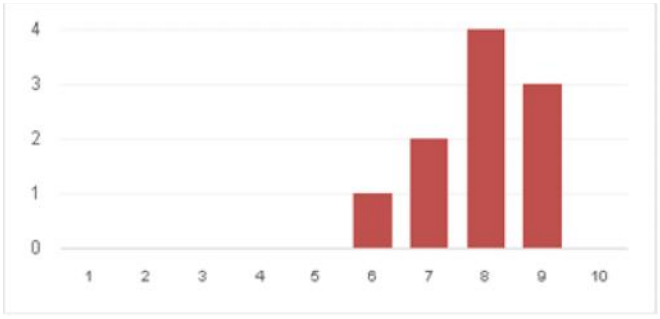
"I will innovate my method of teaching in mathematics. Incorporating and combining those effective strategies and practices in the old and the flexible learning modality"-Descartes.

Ensuring Learning amidst Pandemic

Teacher-participants were also asked how they ensure learning takes place despite of no face-to-face delivery of instruction. Based on the responses, three themes are identified: formative assessment through verbal or written recitation; open online communication (verbally or through chat); and provision of engaging online/offline activities and supplemental materials. According to the participants, though they experience challenges brought by the sudden shift of teaching and learning modality in mathematics, they still ensure learning through giving varied activities to the students. They also ensure that their communication with their students are always connected.

"During synchronous online teaching, I make sure that everyone is giving their full attention by randomly asking questions to them either orally or in the chat box. During asynchronous learning, I encourage the students to answer their activity sheets on their own"-Pytagoras.

Teacher's Confidence on Students Learning: The confidence level of the teachers about students learning as shown in the figure is ranging from 6 to 9. It is noteworthy that no participants answered 1 through 5 in the scale of 10. However, it is surprising that no participant has a confidence level of 10. This result reveals that while teachers are confident enough that students grasp the lesson being taught by them using the flexible learning modality, there is still a space that needs to be filled when it comes to learning using this kind of modality.The result of this confidence level of the teachers about student's learning provides an implication about the commitment of the teachers to continuously provide boundless learning opportunities to the students to fulfill their main function as teachers.



Conclusion and Recommendation

The study attempted to determine the challenges, coping strategies, and practices of tertiary mathematics teachers in preparation, facilitation, and assessment and evaluation of learning during the COVID-19 pandemic. Based on the result of this study, mathematics teachers faced a lot of challenges in terms of learning module, strategy in teaching, time constraints, and multiple preparations. Likewise, the study was able to show that there is a problem when it comes to internet connectivity resulting to communication gap between teachers and students. However, on the top of these challenges, teachers' quality and commitment are more visible. Several coping strategies were identified such as utilization of technology and teaching tools, bridging the communication gap through online (verbal and chat). Teachers also ensured that instructional materials are prepared ahead of time. They also provide varied instructional assessment to cater individual learning capability of the students as well as they establish conducive and enticing online classroom environment where materials are already installed. Though this study was able to determine and explain the latent variables, it has lot of limitation such as limited number of participants and the way data were being gathered. To optimize the result, similar study is encouraged to be conducted using quantitative type of research using the variables identified.

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