



EXPERIENCES OF GRADE SCHOOL MATHEMATICS TEACHERS DURING ONLINE CLASSES THROUGH THE LENS OF TPACK

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ABSTRACT

This study sought to describe the experiences and challenges of grade school mathematics teachers through the lens of TPACK. This study utilized a qualitative phenomenological design to discover how the participants made meaning from their experiences and challenges during online classes. Ten private elementary school teachers at a university were selected as participants. The results revealed seven themes for the experiences of grade school mathematics teachers during online classes. These themes are 1) digital drills in developing mastery in mathematics, 2) subject integration for meaningful learning of mathematics, 3) applying real-life contexts in problem-solving, 4) considerations in choosing interactive sites to teach and assess mathematical skills, 5) instructional management skills of the teacher, 6) administrative support, 7) teachers' attitude towards the paradigm shift. Meanwhile, future researchers should also consider more respondents and a longer duration of doing this kind of research to unveil the experiences of grade school Mathematics teachers in online classes.

Keywords: *experiences of grade school mathematics teachers, challenges of grade school Mathematics teachers, online classes, TPACK*

INTRODUCTION

The COVID-19 pandemic brought unprecedented changes to the global educational community (Huang et. al, 2020). The United Nations Educational, Scientific and Cultural Organization (UNESCO) report in 2020 unveiled that educational institutions temporarily closed to mitigate the spread of the virus affecting 70% of the student population. The herculean challenge was the continuity of learning beyond the usual face-to-face instruction. Different institutions and organizations around the world proposed a pool of solutions from UNESCO's call to provide solutions

and support countries in preventing the total shutdown of schools.

As the education community ventured into different learning modalities to stop the spread of the virus and considering the learning atmosphere, the use of electronic learning (e-learning) has been considered to be the best possible learning modality to deliver and continue a successful teaching and learning process (Mailizar, et.al, 2020).

In the Philippines, the Department of Education (DepEd) created a Basic Education Learning Continuity Plan (BE-LCP) to offer education interventions in response to the pandemic's basic education issues. This also serves as a school's guideline to protect the safety of all stakeholders. BE-LCP distilled the K-12

curriculum. Remote learning has several advantages, such as accessibility and comfort, while the great challenge that is seen is maintaining academic integrity (Mukhtar, 2020) in the Most Important Learning Competencies (MELCs). Following the timetable, basic education instructors aligned the lessons to be addressed in the MELCs. In this regard, DepEd (2020) recommended a variety of learning modes, including blended and distant learning. SLMs (Self-Learning Modules) were also made accessible in print and digital form.

However, online learning was emphasized as the new learning modality requiring technology. The experiences in its use are access to the internet, teacher's training, parent supervision, hands-on sessions, and system preparations. With this, teachers are entitled to capacitate themselves to ensure that online classes are done creatively, holistically, and with a personal touch (Gonzales, 2020).

Teachers, as educational frontliners, felt the influence of the paradigm change in the teaching and learning process. Kumar et al. (2020) described many types of issues and obstacles that instructors encounter in the new normal of education. According to the author, educators found it challenging to shift from conventional to online education since they were forced into this new technique or method of teaching with little preparation. Additionally, teachers who do not know or are not familiar with gadgets and other technologies have to struggle with tools such as preparing subject presentations and meetings through different kinds of video call/chat software. The experiences and obstacles of the teachers affirmed that while uncertainty is facing the educational community, the duties of the teachers endure providing access for all children, inclusivity, and equity (Carlsen et al., 2020).

On the other hand, the difficulty is not only a move to online mode but a system that delivers and employs technology. The school must offer a favorable educational atmosphere and opportunities for instructors and students. Above all, effective preparation to prepare students for pandemics should be included in the system so that future crises may be dealt with (Saxena, 2020).

In the implementation of emergency remote teaching as a paradigm shift adopted by various schools worldwide (Ni Fhloinn & Fitzmaurice, 2021), educators have had to adjust from their traditional teaching methods into online-based lessons, and e-learning has become an essential educational approach. Mathematics teachers, especially, encounter specific subject-related challenges online, such as trouble inputting mathematical symbols and malfunction of software-associated lessons. Pedagogical difficulties affecting online mathematics instructors include arranging online discussions, structuring online engagement, and modifying mathematical task learning outcomes as a result of the online medium (Huang & Manouchehri, 2019).

Further, explaining and presenting mathematics using online services as well as assessing students' knowledge in the subject were also considered as challenges (Bringula et al., 2021)

This research investigation is anchored from the Philippine education context during the onslaught of the pandemic which may suggest improvements in its aftermath. Teachers who are considered as the educational front liners engaged in major adjustments in their instructional duties, which includes creating instructional materials, delivering instructions, and developing instructional assessments to adapt to the distance learning paradigm shift. This shift from face-to-face classes to distance learning during the pandemic gives way to the adaptation of hybrid learning, a combination of in-person classes with online and modular learning. Teachers in today's reality are now facing another recalibration of their duties, adapting the positive outcomes brought by the pandemic in hybrid learning. Thus, this study examined the lived experiences of grade school mathematics teachers in online classes in continuing the teaching and learning process and adapting to the new learning modality.

OBJECTIVES OF THE STUDY

The purpose of this phenomenological study was to describe the lived experiences in online classes for private grade school Mathematics at a University. Specifically, it sought

to examine the following objectives: (1) Investigate experiences of grade school mathematics teachers in online classes and (2) Provide inputs of the findings to teacher development

METHODOLOGY

This study used qualitative phenomenology since it enabled the researchers to discover how the participants made meaning of their experiences. According to Creswell (2007), qualitative phenomenology design focuses on identifying and analyzing what the participants have in common and more on the participants' descriptions of their experiences, giving researchers an in-depth understanding of what and how the participants experienced the phenomenon.

Ten private school primary teachers at a university were chosen as participants using a targeted criteria sampling technique. A set of criteria was also utilized in the selection process to guarantee that the participants had knowledge and experience teaching elementary school utilizing online learning. Each member has 5-30 years of teaching experience, is between the ages of 25 and 50, and specializes in primary mathematics education.

Data were acquired by seeing recorded courses and conducting a semi-structured interview with probing questions. Thus, the researchers' task was to get access to the instructors' ideas and emotions free of subjectivity, biases, and personal preconceptions. A moderator manually transcribed the audio-recorded interviews of the participants. The transcripts were forwarded to the participants to verify and clarify their replies. The researcher investigated the core and significance of their comments and enlisted the assistance of a research professional to validate the study. Moustakas (1994) used bracketing, horizontalization, and theme clustering to evaluate the data (Creswell et al., 2007) detailed. Before producing the themes, members were checked to verify that the codes accurately represented the participants' real experiences (Factor et al., 2017). After the school heads approved the study proposal, the researcher issued an invitation letter to the participants outlining the aims and nature of

the inquiry, as well as the participants' expectations. This is to solicit the assistance of the recommended individuals, so creating rapport. After agreeing to participate in the research, individuals were given an information sheet and a permission form. Only then were the observation and interview schedules established. The actual interviews lasted an hour and a half and were done through Google Meeting. The researcher asked the participants for permission to record the interview at the start of the session so that replies could be correctly transcribed during data coding.

RESULTS AND DISCUSSIONS

After a detailed analysis of the significant statements and the entirety of the verbatim transcriptions, twelve emerging themes were identified describing the experiences of grade school mathematics teachers during online class. The following were the identified themes describing the experiences and challenges of grade school mathematics teachers.

Theme 1: Digital Drills in Developing Mastery in Mathematics

The participants utilized digitized drills for developing various skills in Mathematics. As observed, Teacher 7 is using powerpoint presentation for drills. The content of drill activity is about multiplication, where pupils supplied the product of each set of numbers. Additionally, Teacher 8 gave skip counting drills with the use of Kahoot to her Grade Four pupils. Meanwhile, some participants mentioned that drills check pupils' computational skills and review the past lesson.

To wit:

Sometimes we do drills to check their computation skills and then give them problems; sometimes, we give nonroutine problems because we also try to test that in our summative assessment.”(T9)

Another participant added,

"We try to provide them with drills to check their understanding and to review. It is a one-way or another form of assessment" (T10).

Drills are the usual training and development of Mathematical skills in schools. However, drill activities often lead to routine skills instead of learning higher-order thinking skills. (Lehtinen et al.,2017).

Theme 2: Subject Integration for Meaningful Learning of Mathematics

The participants have variety of ways to integrate teaching Mathematics to different subjects. Some teachers utilize integration of Mathematics to other subjects like values and Science.

To wit:

"We have this visible thinking skills, we have at the end of every lesson, and we do our best to end it with values integration" (T9).

Another teacher added:

"We try to synergize with other subjects, for example, Science when we do that for example but it's more of in the higher grades when we do integration or sometimes what we do is we use their lesson as our springboard."(T8).

Integrating math into different subjects is beneficial to students. It provides students with the vital tool to integrate math into their everyday lives, thus giving them skills that can be extremely valuable to them in the future. Interdisciplinary studies combine multiple disciplines together in a complete fashion, allowing students to obtain a meaningful grasp of the topic's complex linkages and impacts (Balenger,2017)

Theme 3: Applying Real-life Contexts in Problem Solving

The participants acknowledged the use of real-life examples, current events, and daily experiences in teaching mathematics and developing problem-solving skills of the learners.

As the participant put it *"I give examples where the pupils could relate so that I can hook their attention in doing the activity. I integrate activities in the motivation in order to fire up the interest of my students. For example, I have 7 pencils, I will ask them to count it. I also ask them to count the things they have at home."* (T1).

The idea was further supported by another participant's transcriptions:

"Scenarios and situations where the students could relate like Kpop and online games were usually being used in the set of problems that I give. In our discussion, I asked them to reflect on their daily routine, such as the number of their sleep time per day, and then combine all of those to get the total sleep hours per week." (T5).

It can be inferred from the response that the teacher participants include the use of real-life applications of the lessons for the learners to understand and relate to the topic being discussed easily. The adviser can give real-life setup, and sometimes students relate it to their own experiences. This is similar to what another participant stated,

"Real-life contexts help in discussing mathematical concepts since the pupils enjoy applying what they learn to something they can relate to or something familiar to them. For example, in our topic on graphs, I included some real events that they see and observe within the community as well as the shows they watch on TV. We are doing some parallel discussion in relation to the topic being discussed in the presentation" (T6).

According to the OECD (2020), employing a broad range of settings is critical. The setting

might be personal, comprising issues or obstacles that an individual, family, or peer may face. Instead, the issue might be placed in a sociological context (focused on one's society, whether local, national, or global), an occupational context (based on the workplace), or a scientific framework (relating to the application of mathematics to the natural and technological world).

Felda and Klanjek (2017) advocated for learning and teaching mathematics based on actual issues and problem situations in order for learners to gain knowledge of mathematical ideas via the experience of resolving a real-life problem scenario. Students improved their understanding and were better able to grasp, interpret, and make critical evaluations of mathematical information, as well as a better and more permanent understanding, because students in the experimental group were better able to grasp, interpret, and make critical evaluations of mathematical information and achieved a higher level of mathematical literacy. Other research from throughout the world has corroborated this (Best, 2004; Chick & Pierce, 2013).

Theme 4: Considerations in Choosing Interactive Sites to Teach and Assess Mathematical Skills

In the absence of face-to-face meetings, the teachers explored online applications that they can use to create an interactive classroom discussion, realistic samples and authentic assessments. The teachers employ different online applications in teaching and assessing Mathematics. Aside from being interactive, fun and easy to use, the teachers use these applications because they track pupils' understanding in a lesson.

One participant mentioned:

"For formative assessments, we use Kahoot, Zish, Quizelies. These are the applications which are interactive, fun and easy to use. Aside from being interactive and fun, these applications can track whether the pupils understand a lesson(T1)

In using different online applications, teachers were able to collect different representations of student understanding. Regarding productivity, teachers saved time in administering and collecting paper and pencil formative assessments during instructional time through applications. The use of applications delivered faster feedback to students and parents. It was also viewed as an effective approach involving students and parents in the formative assessment process (Mitten, Jacobbe, & Jacobbe, 2017).

Moreover, some teachers explained that their schools utilize the digitized versions of their manipulatives which they use in teaching Mathematics. One teacher explained: "When our school shifted to online class, our school bought digitized versions of our manipulatives like counters, base 10 blocks, place value discs and chips."(T3).

Another participant shared:

"Normally, I buy and bring real objects in the class and let the students explore it as they solve or do certain tasks in Math, like the dice for example. But since I cannot do it anymore, I looked for sites which can be a laboratory in learning Mathematics. I use Phet simulation and Labaster."(T9)

Virtual manipulatives affect the engagement of pupils. It also promotes self-correction, verification and making connection among children (Litser et al., 2019). Methods and approaches were developed to improve Mathematics teaching. These include integration among course content, use of different pedagogies and technology as suggested by (Morris et al., 2012) as well as computer-based activities and interactive multimedia, which are some of the specific teaching strategies that can be used. In education, technology provides countless opportunities for information sharing and storing in and outside the classroom. It can improve the variety and intensity of knowledge intake.



Theme 5: Instructional Management Skills of the Teacher

The teachers encountered some misbehaviors during online class in Mathematics such as making extra noise and not opening their camera. However, some teachers manage these misbehaviors by messaging the students immediately.

One participant respondent:

"It is part of the class rules during synchronous sessions to always mute their audio. If they are not reciting, I immediately message those pupils who are making extra noise during online classes."(T7)

Another participant added:

"There were students who were not responsive when they were asked to open their cameras. After the class, I message them through facebook messenger."(T5)

However, some teachers lamented for those students who constantly misbehave during online class.

One participant emphasized,

"If the student is constantly doing some misbehaviors during online class, I am talking to their advisers to talk to their parents."(T3)

Teachers may cope with these misbehaviors in online classes by checking attendance, enlisting family support, encouraging students to switch on webcams, establishing intrinsic incentive, and scheduling parent meetings (Akkas Baysal & Ocak,2021).

Theme 6: Administrative Support

The administrative support and assistance in all forms especially in planning and preparation of instructional materials, delivering instruction and

developing assessment has equipped the teachers to be able to be successful in online class. The teachers underwent training and assessment in preparation for online teaching. They were equipped for the demands of the new learning modality. Things took a drastic change starting with the adjustment of the curriculum using the MELCs. Teachers rely on curriculum guides and previous planning as primary sources in meeting their learning goals for a lesson (Knaub et al., 2016). Pedagogy and assessment methods were also recalibrated. According to Gonzales (2020), evaluations and grading systems should be re-evaluated alongside the instructional techniques that schools will use. Monitoring assessment is critical in an online class. It should be the focal point of the class, assessing the pupils' progress (Xiong, et al, 2018).

As the participant put it:

"The administrators provided us training regarding the conduct of online class. We were also given assessments to check if we are capable of teaching in online class" (T3).

Another participant shared:

"The school-built facilities to address the needs in teaching during online class. They built an e-learning room where we can conduct our online class" (T8). "The school purchased and developed a learning management system that we will use in our online class. We were trained and assessed how to use it" (T1). Our ITS gives us support on our needs, especially when it comes to technology and tools to be used (T7).

Access to specialist teams comprised of subject matter experts, instructional designers, technologists, and even student learning center personnel should be made available to instructors by institution management (Wilson et al.,2020) Administrative assistance is also helpful in lowering faculty stress, enhancing work commitment, and improving faculty job satisfaction (Aldosiry, 2020).

Theme 7: Teachers' Attitude towards the Paradigm Shift

This refers to the teachers' adaptability, flexibility and positivity. The participants acknowledged that their duties as teachers should continue despite the challenges in the educational landscape brought by the pandemic. They need to accept the situation and adjust to the new normal in education for the students.

To wit:

"You cannot say no to changes even if you are old, you need to find ways to learn" (T3). This is similar to what another teacher participant has stated, "I need to adapt whether I like it or not." (T1). Despite the perplexing preparations, the teachers managed to be adaptive and appreciate the beauty of online class.

Through online learning, time can be saved and equal access to information can be given regardless of the location (Joshua, et al, 2016). The participants increasingly appreciate using technology in the learning environment as long as they maintain their enthusiasm for teaching and tolerance for learning. Online learning, as opposed to conventional face-to-face engagement, gives flexibility (Stone et al, 2019), allowing them to access learning materials regardless of time or location. This also makes studying easier and appealing to people who live in distant places or work as professionals. However, in order to achieve important results, reflection is required. Online educators should consider their pedagogy and ask themselves whether being enthusiastic about their work is important to them. The goal of teaching may be more significant than the practice itself in this sense. Furthermore, perceiving pupils as one's own kid or friends may enhance and add meaning to online education (Vallerand et al., 2013)

Inputs of the findings to teacher development. In terms of experiences of grade school mathematics teachers during online class, the themes are digital drills in developing mastery

in Mathematics –technological pedagogical knowledge, subject integration for meaningful learning of Mathematics-technological content knowledge, applying real-life contexts in problem solving-technological knowledge, considerations in choosing interactive sites to teach and assess mathematical skills-technological content knowledge, instructional management skills of the teacher-pedagogical knowledge, administrative support-technological pedagogical content knowledge, and teachers' attitude towards the paradigm shift-technological pedagogical content knowledge.

As inputs to the findings, schools should conduct seminars and train on capacitating teachers in terms of utilizing drills effectively, integrating mathematics with other subjects, synergizing real-life context in developing problem-solving skills, and choosing the appropriate interactive sites in teaching Mathematics. According to Cordingley et al.(2012), every teacher should have the opportunity to be engaged in professional development. Professional development helps teachers identify new modes of instructional and assessment practices that will fit the new generation of pupils. In addition, school leaders must address teachers' professional development. If teachers' professional development is not prioritized, teachers could not be able to adapt to the educational changes happening (Hargreaves & Rolls,2020).

Moreover, teachers should announce rules and regulations in online classes before the start of the school year is an example of the instructional management skills of the teacher to avoid student misbehaviors. According to Fekadu (2019), students' attitudes toward encouraging good behavior would be improved by an increase in their comprehension of school rules and regulations. When students understand school rules and regulations well enough, they can act appropriately, which creates a positive learning environment.

For administrative support, the school should support teachers by facilitating a mentorship program that supports onboarding new teachers with resources, constructive feedback, and consistent support when needed. Tickle et al. (2011) enumerated the two essential findings of

having administrative support in teaching. Administrative support was pointed out as the significant predictor of teachers' job satisfaction and is also identified as an essential factor in the intent to stay in teaching.

As an input to teachers' attitude towards the paradigm shift, Schools should provide the necessary support for teachers to maintain teachers' motivation and positivity towards the paradigm shift. To satisfy the demands of the new educational paradigm, educational leaders must reconsider content creation and sharing and create working communities. We may create an online education model that captures the new methods of knowing and thinking about educational processes using our present experiences with online curriculum delivery. Such a model would serve as a tool for comprehending the instructional environment (Mbhiza,2021).

CONCLUSIONS

Resiliency in grade school teachers is very evident in preparing and delivering the new learning modality despite all the challenges that they encounter. Adjustment in online teaching is undeniably a tedious task wherein the teachers were confronted with a lot of different demands in the new normal set up. The participants acknowledged that the success in online learning modality is a shared responsibility among the students, parents and school leaders – the stakeholders of the community.

RECOMMENDATIONS

Additional investigation in the context of other schools and other participants is essential. Extensive research on the needs of the teachers and students through quantitative and qualitative analysis would also be useful. There is a pool of topics to be explored for further investigation. Same study can also be conducted to high school and tertiary level to determine their experiences during online classes. Meanwhile, future researchers should also consider more respondents and longer duration of doing this kind of research to really unveil the experiences grade school Mathematics teachers in online class.

Lastly, replication studies can also be done in other subjects such as English, Science and Filipino.

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