TEACHERS' PRACTICES IN TEACHING MATHEMATICS: AN EXPLORATORY STUDY

JOHN LLOYD D. ERISIN
DR. CYNTHIA S. ASUNCION
Central Mindanao Colleges, Kidapawan City, Philippines.
Corresponding email: johnlloyderisin1993@gmail.com

ABSTRACT

This study aimed to explore teachers' practices in teaching Mathematics. Exploratory-sequential design was utilized in this study. A total of ten (10) teachers of selected secondary schools in Kidapawan City Division and North Cotabato Division were invited for in-depth interview and seven (7) participants for the Focus Group Discussion. For the quantitative measurement, 150 school teachers for Exploratory Factor Analysis and 150 for the Confirmatory Factor Analysis in Kidapawan City Division using the purposive sampling technique were the respondents of the survey. Thematic Analysis and Factor analysis were the statistical tools used in the research. On the integration of quantitative and qualitative results, the participants confirmed the applicability of the three themes that emerged in the qualitative aspect namely, Confidence –Focused practices, Engagement-Focused Practices, and Progress and Intervention-Focused Practices. This study discovered new information that may help researchers and teachers develop programs related to practices of teachers in teaching Mathematics subject.

Keywords**:** *Teacher' Practices, Mathematics, Thematic Analysis, Factor Analysis, Exploratory-Sequential, Kidapawan City, North Cotabato*

INTRODUCTION

The Philippines performed significantly lower' than any other countries that took part in the grade 4 math and science examinations, according to The Trends in International Mathematics and Science Study (TIMMS) 2019 results. The Philippines' 297 and 249 combined math and science scores are "significantly lower" than those of any other participating nation. As per the DepEd - National Report of the Philippines (2019), the Philippines placed second-to-last among the participating nations in the most current Programme for International Student Assessment (PISA) 2018. This troubling finding showed that Filipino children had a mean score in mathematics literacy that was 353 points, much lower than the OECD average of 489 points. Additionally, it has been estimated that just 1 in 5 Filipino pupils, or roughly 19.7%, achieved the required level of proficiency (Level 2) in knowledge of mathematics.

That is why, instructors always bring preconceived notions about what mathematics is about, how to teach and learn it, to their professional preparation

program. Combes (2013) furthermore suggested that the only time that teaching mathematics is actually useful is when it positively affects the learning of students. We know that classroom activities and teaching methods can both significantly affect students' learning outcomes.Given the alarming status of Filipino learners in PISA and TIMMS, interventions should be in placed to improve overall ranking. This goal may be realized through looking into different factors that affects academic learning outcomes.

Moreover, existing researches provided a notion about the mathematics contextualization, preparation and teaching methodologies impact on student outcomes. There are different related factors affecting student learnings such as school-related, learners-related and teacher-related elements, this studyfocused on exploring teachers' practices about teaching mathematics and identified how these practices affect students' learning outcomes in various mathematics competencies. This research study provided information that served as a basis in the creation of a program aimed to create a better understanding about mathematics teaching. Rather than studying the products of learning, it focused on the process or (mechanism) of teachers' learning and teaching practices – learning that occurs through their teaching preparation in the context of their personal experiences.

The majority of the significant predictors of arithmetic proficiency and academic performance that have been discovered through research fall into one of five broad categories: learner factors, parental variables, instructor factors, the learning environment and educational variables, and factors related to policy (Maamin et al. 2021). Many schools around the world do adopt a predominantly formalist method of teaching and learning, despite this not being explicitly stated. English and mathematics are both frequently characterized by process rather than experience, that is, teacher instruction rather than student learning, even though there may be some weakening of such procedures in other areas built by students. Given that it has been stated that the process of learning mathematics is primarily operational in character, the purpose of this research is to examine specific areas of instructors' techniques in doing so. Through examining teachers' methods for teaching mathematics at public and private institutions, researchers hope to find clues that may identify vulnerable learners who may be the subject of interventions. Early interventions focused at enhancing students' mathematical skills and ultimately preventing failure may be beneficial for math-struggling students.

FRAMEWORK

Over the years, mathematicians have used a variety of methods to explore the nature of mathematics, including those developed by researchers, teachers, and theorists. However, this study is anchored on the theory of fallibilism and absolutism which are the two main schools of thought that can be connected to the nature of mathematics (Ernest, 1996). According to the absolutist viewpoint, mathematics is an objective, unalterable body of knowledge that was created based on the ideas of inductive reasoning. The fallibilist philosophy, on the other hand, views mathematics as

a social construct that is open to revision and interpretation with relation to its ideas and justifications. 2015's Fredua-Kwarteng.

The Personal Construct theory, which investigates how current and future educators construct mathematics, is another theory that was employed in this study (Horley, 2012). Using the personal construct theory, researchers examined typical notions, ideas, or assumptions about mathematics education that aspiring mathematics teachers bring to their teacher training program.

METHOD

Research Design

The descriptive sequential mixed-method technique was used in this study to provide a thorough analysis of the issue at hand. Additionally, the researcher first conducts qualitative data and analysis before applying the findings to a second quantitative phase (Creswell, 2007). This approach aims to enhance measurements with particular samples of populations and explore the applicability of data from a small sample of people (gathered during the qualitative phase) to a large sample of that population (gathered during the quantitative phase).

The exploratory sequential mixed approach was employed in this study. This strategy began with the collection and analysis of qualitative data. The second step entails gathering and analyzing quantitative data and expands on the previous qualitative phase's conclusions. Since the collection of quantitative data and the analysis of qualitative data are related, the first phase is often given more weight, and the data are integrated.

Respondents

Ten (10) teachers from chosen secondary schools in Kidapawan City Division and North Cotabato Division were invited for in-depth interviews for the preliminary (qualitative) portion of the study, and seven (7) participants were selected for the Focus Group Discussion. Purposive sampling was used in the quantitative measurement to distribute the survey questionnaire to 150 school teachers in Kidapawan City Division and North Cotabato Division for Exploratory Factor Analysis and 150 for Confirmatory Factor Analysis.

Instruments

The study used an interview guide that included questions regarding the real-world experiences of math teachers during the qualitative phase. The interview revealed a variety of viewpoints and ideas about students' progress, as well as similarities and differences in their beliefs, experiences, and practices at learning centers. It also revealed how a group of teachers thinks about the methods they used to teach mathematics. As a result of focus group discussions, the frequency of occurrence was used to design the questionnaire's items. Five experts reviewed the tools' content authenticity before a pilot test was conducted to determine their dependability.

Statistical Tools

The Factor analysis was employed in this study for quantitative data. The number of constructs, latent variables, or components that underlie a set of items were empirically determined. Using the Kaiser-Meyer-Okin (KMO) measure of sampling adequacy, which indicates in advance whether the sample size is large enough to accurately extract variables, the data were tested for suitability during the preliminary phase. Additionally, Bartlett's Test is used to determine whether a correlation matrix's overall significance (Hare, 1998). The next phase involved extracting the data using principal axis factoring of exploratory factor analysis (EFA) and determining the dimensions of the unrotated factors. In this stage, the first half of the data was used. Lastly, a confirmatory factor analysis (CFA) was employed to corroborate the factor structure of a set of observed variables. The second half of the responders was used in this step.

RESULTS AND DISCUSSION

Emerging Themes of Teachers' Practices in Teaching Mathematics

From the data collected on the experiences of the teachers in the *practices of mathematics teachers*, essential themes generated as presented in table 1. These themes are *confidence focused practices, engagement focused practices, lesson preparation practices, and progress and intervention practices.*

Table 1. Emerging Themes of Teachers' Practices in Teaching Mathematics

Confidence Focused Practices	
1	Student's perception that learning mathematics is difficult should be dealt with.
3	Student's confidence in learning mathematics should be prioritized.
8	It is important for teachers to instill students' with positive attitudes towards learning mathematics.
23	It is important to get to know each student first on an individual level and engage in their stories.
24	I serve as a counselor and performs as confidence-builder to my students with math anxiety problem.
26	Students should be able to self-reflect on their progress and set attainable and specific goals
29	The way the instructor teaches mathematics has a great impact on the level of mathematics anxiety in students
Engagament Focused Practices	
2	The value of learning mathematics in real life should be introduced in class.
4	The lack of interest and motivation affects students' learning.
6	ICT integration and the use of other online learning materials will help increase students' engagement.

12	The use of mathematics drill either for individual or group work will improve students' engagement in learning mathematics.
13	Students attitude greatly affects learning progress.
14	Instructional materials should be available for use to set an engaging learning ambiance.
16	Parental support is necessary in the learning process of students.
18	Introducing fun and interactive games is helpful to increase students interest in learning mathematics.
20	Teachers' competency affects students' learning progress.
22	Organizing mathematics clubs that will introduce interactive learning activities will help promote engaging learning progress.
30	Teachers should be provided with special learning programs regarding mathematics teaching techniques and strategies
Lesson Preparation Practices	
5	Preparation and thought must be taken into account when planning how lessons are delivered and how students will feel during each lesson.
7	Preparation of differentiated learning strategies is an effective practice to meet student's various learning styles.
28	Preparation of visual representations of the mathematics are critical in laying a strong foundation of mathematical ideas.
Progress and Intervention Practices	
9	Remedial classes will help students improve learning progress in mathematics.
10	Peer tutoring is an effective practice to improve students' learning progress in mathematics.
11	One-on-one tutoring is an effective practice to improve students' learning progress in mathematics.
15	Teachers should monitor class learning progress regularly and ensure strategies implemented best suit students' learning styles.
17	Encouraging students to exert more effort and constantly practice their numeracy skills will help improve their mathematics ability.
19	Breaking down concepts into easily understandable steps is helpful when teaching complex mathematics problems.
21	It is necessary to ensure students understand the basic concepts of mathematics prior to introducing complex mathematical problems.
25	Student performance and progress should be reviewed on a regular basis and in a systemic manner to identify students who are making adequate progress.
27	Students struggling with mathematics may benefit from early interventions aimed at improving their mathematics ability and ultimately preventing subsequent failure.

Confidence Focused Practices. One practice mentioned by most of the respondents is related to how teachers help build students confidence in learning

mathematics. Most of the teachers revealed that oftentimes, they encounter students with math anxiety problem. With these, teachers mentioned during the interview that being a math teacher does not just have limited functions and responsibility that is purely instructional but also extends towards understanding students' personal issues and concerns. As a teacher, one should check on students' personal preparations and struggles that may generally affect their disposition towards learning mathematics this generally include mathematical students' math-anxiety problem.

Literatures presented various views related to Math-Anxiety, in the study of Ramirez, Gunderson, Levine, and Beilock (2013), authors came to the conclusion that it is crucial for instructors and schools to address math anxiety in students when they are young. Furner (2017) added that collaboration between educators and certified school counselors is encouraged to prevent and reduce anxiousness in math. All pupils must have confidence in their mathematical aptitude in order to succeed in a time when is so dependent on technology, science, math, and problem-solving. Schools actually have a duty to make sure that their student's value and feel confidence in their abilities to do arithmetic because, in the end, all of a child's decisions and career choices may be built on their attitude toward mathematics.

Students' Engagement Focused Practices. Participants of the Focus Group Discussion (FGD) and In-Depth Interview (IDI) provided inputs regarding their personal experiences as mathematics subject teach schools actually have a duty to make sure that their students value and feel confidence in their abilities to do arithmetic because, in the end, all of a child's decisions and career choices may be built on their attitude toward mathematics.er. Most of them responded that students view mathematics as a difficult subject which led to teachers struggling in terms of searching for best instructional method fit for varied learning styles of multiple learners. Due to students not able to understand the value of learning mathematics and its application in real life, they lack interest and motivation to learn the subject. This low comprehension makes teachers experience difficulty in teaching complex mathematical problems since students do not portray the right level of basic skills in mathematics. Aside from focusing on learners need for academic competency, respondents of the study revealed that programs to improve teacher's proficiency to teach are another area of consideration.

Meanwhile, practices of teachers to improve students' engagement comes in various forms, teachers revealed that they prepare mathematics drill to awaken students' interest to get involved in the process of instruction. Aside from drills, teachers also incorporate fun and enjoyment through facilitating interactive games and incorporating ICT in the discussion process. Teachers also understand that having the right attitude directly affects the ability to learn mathematics as some respondents mentioned that students' understanding of the relevance of mathematics in real-life application greatly affects learning progress.

Recent literature highlights the significant impact of improved engagement and learning progress in the process of teaching mathematics. Under this focus, teachers may provide emphasis on ways to improve students' motivation and interest in learning mathematics. According to Alrajeh and Shindel (2020), student engagement is characterized as students' willingness and effort to participate successfully in classroom

activities that lead to positive outcomes. It is crucial to the development of learning. Students who are actively paying attention, participating, motivated, and interested in their studies.

Interviews reveal various methods teachers may practice as part of their mathematics instructional methodology in order to develop engaged students such as incorporating ICT, inculcating the real-life application of the subject, and improved teacher's competency. According to Schuetz et. al (2010), incorporating educational technology into classrooms in ways that sustain student engagement is one practice teachers may consider in teaching mathematics. According to Eberly Centre (2014), students may not be motivated to put effort into an activity or topic if they do not see its value. However, students are more likely to value course work if they can relate it to their objectives, areas of interest, and issues. They will be more inclined to put up the time and energy. Alexander (2010) mentioned that another method teacher can use is to take what students have learned from their mathematics textbooks and apply it to new situations in order to help them understand the relevance of the subject. This relays to teachers' providing emphasis on the application of mathematics learning. Campilla and Castañaga (2021) added that teachers may engage students, encourage higher-level thinking, and help them acquire important skills they will need in the future by adopting multimedia as a learning tool. They claim that games can foster students' imagination, creativity, and critical thinking, which will help to foster a positive learning environment and meaningful classroom interaction. Providing fun and interactive games are also strategies integrated by instructors to help enhance student engagement. On the other hand, Callaman and Itaas (2020) noted that teachers could make opportunities for children to develop and improve their mathematics skills. It could be taken into consideration to solve actual arithmetic problems and play games with math themes. Games can stimulate students and encourage them to participate in mathematics, according to Taylor (2017). Games should, and frequently do, include other educational objectives. At the middle school level, they have historically been used primarily to review mathematical ideas.

One thing that administrators of schools should take into account is the establishment of training programs for teachers to raise their awareness of understanding the distinctions to the needs of diverse pupils with diverse genders and stressing differentiated ways to satisfy those needs (Alrajeh and Shindel, 2020).

Lesson Preparation Focused Practices. Participants also provided their insights as to how they prepare their lesson prior to going to class. Most teachers revealed that as teachers, it is essential that they should be equipped with both the strategies and instructional materials needed to facilitate productive learning inside the classroom. Planning is a fundamental step.

Existing researches provided a notion about the mathematics contextualization, preparation and teaching methodologies impact on student outcomes. According to Borabo (2015), being unprepared for class results in a loss preparation is of crucial instructional time. It also suggests unfavorable behavior. A teacher should always be ready for her students' needs and questions in the class. Students' academic achievement and outcomes depend on the effectiveness of their teachers. Today, almost everyone agrees that teachers have an impact on the journey of their learners.

Instructors always bring preconceived notions about what mathematics is about, how to teach and learn it, to their professional preparation program. Combes (2013) furthermore suggested that the only time that teaching mathematics is actually useful is when it positively affects the learning of students.

Progress and Intervention Focused Practices. Many of the participants revealed that providing interventions tailored to ensure that every student understand lesson one at a time should be considered as one essential consideration in teaching mathematics. Respondents revealed that students should have the basic knowledge as to the foundation of mathematics prior to introducing complex mathematical problems. Remedial classes, tutorials (peer or individualized), and home visitations are some interventions teachers implement to ensure that appropriate support is provided to students with difficulty in terms of understanding class lessons. In addition, it is also provided that teachers track students' progress regularly to have an ongoing assessment of students' progress.

Recent literature highlights one effective teaching practice which is to give students opportunity to practice or rehearse strategies and to justify the steps in their reasoning and answers. These experiences help students connect problem-solving procedures with the underlying concepts. Fluency-building practice is crucial, but it should be brief, engaging, purposeful, and distributed. A child's base level can be more accurately identified by educators using the development progression model for number operations. According to the available statistics, a significant percentage of American youngsters do not enter school with the solid mathematical foundation necessary for a seamless transition into class-based learning. Young children can more easily adapt to formal lesson plans by following the teachers' suggested order of learning (Bowness,2020).

To encourage deep learning of mathematics, a variety of teaching tactics and methods are required (Coe, 2019). One is encouraged to assume that learning can be improved by adapting the way learning material is presented to a student's chosen learning style, despite the fact that there is a shortage of high-quality research to support the significance of identifying learning styles (Coffield et al., pp. 42, 2004, for example).

Construction of the Factors Related to Teachers Practice in Teaching Mathematics

Table 2 displays the instructors' methods in teaching mathematics scale items based on participant narratives, which are chosen based on their frequency of occurrence from the responses in qualitative interviews. The exploratory factor analysis (EFA) was used as a data reduction approach on this 30-item survey. Accordingly, the a priori qualitative analysis dimensions were used to determine the number of components, which was set at four (4).

Table 2. Factors Related to Teachers Practice in Teaching Mathematics

FACTORS RELATED TO TEACHER'S PRACTICES IN TEACHING MATHEMATICS	5	4	3	2	1

1	Student's perception that learning mathematics is difficult should be dealt with.					
2	The value of learning mathematics in real life should be introduced in class.					
3	Student's confidence in learning mathematics should be prioritized.					
4	The lack of interest and motivation affects students' learning.					
5	Preparation and thought must be taken into account when planning how lessons are delivered and how students will feel during each lesson.					
6	ICT integration and the use of other online learning materials will help increase students' engagement.					
7	The use of differentiated learning strategies is an effective practice to meet student's various learning styles.					
8	It is important for teachers to instill students' with positive attitudes towards learning mathematics.					
9	Remedial classes will help students improve learning progress in mathematics.					
10	Peer tutoring is an effective practice to improve students' learning progress in mathematics.					
11	One-on-one tutoring is an effective practice to improve students' learning progress in mathematics.					
12	The use of mathematics drill either for individual or group work will improve students' engagement in learning mathematics.					
13	Students attitude greatly affects learning progress.					
14	Instructional materials should be available for use to set an engaging learning ambiance.					
15	Teachers should monitor class learning progress regularly and ensure strategies implemented best suit students' learning styles.					
16	Parental support is necessary in the learning process of students.					
17	Encouraging students to exert more effort and constantly practice their numeracy skills will help improve their mathematics ability.					
18	Introducing fun and interactive games is helpful to increase students interest in learning mathematics.					
19	Breaking down concepts into easily understandable steps is helpful when teaching complex mathematics problems.					
20	Teachers' competency affects students' learning progress.					
21	It is necessary to ensure students understand the basic concepts of mathematics prior to introducing complex mathematical problems.					
22	Organizing mathematics clubs that will introduce interactive learning activities will help promote engaging learning progress.					
23	It is important to get to know each student first on an individual level and engage in their stories.					
24	I serve as a counselor and performs as confidence-builder to my students with math anxiety problem.					

25	Student performance and progress should be reviewed on a regular basis and in a systemic manner to identify students who are making adequate progress.					
26	Students should be able to self-reflect on their progress and set attainable and specific goals					
27	Students struggling with mathematics may benefit from early interventions aimed at improving their mathematics ability and ultimately preventing subsequent failure.					
28	Visual representations of the mathematics are critical in laying a strong foundation of mathematical ideas.					
29	The way the instructor teaches mathematics has a great impact on the level of mathematics anxiety in students					
30	Teachers should be provided with special learning programs regarding mathematics teaching techniques and strategies					

Dimensions of Factors related to Teachers Practices in Teaching Mathematics

Testing a 30-item Factors hindering teachers' instructional effectiveness in secondary schools' scale. The Kaiser Meyer-Olkin Measure (KMO) of Sampling Adequacy and Bartlett's test of sphericity were conducted to make sure the construct may be examined for factor analysis. Table 3 reveals that the KMO value is.907, which is higher than the recommended value of.5, proving that the sample is deserving of factor analysis and is sufficient. According to Kaiser (1974), values greater than.5 should be accepted. Additionally, numbers between.7 and.8 are good, values between.8 and.9 are excellent, and values between.5 and.7 are poor (Kaiser, 1974).

Table 3. Kaiser Meyer-Olkin Measure (KMO) of Sampling Adequacy and Bartlett's test of sphericity

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.907
Bartlett's Test of Sphericity	Approx. Chi-Square	2351.568
	Df	435
	Sig.	.000

The 30-item factors relevant to teachers' practices in teaching mathematics are sufficient and adequate for factor extraction, as demonstrated in the preliminary analysis, and are thus ready for factor analysis.

Derivation of the Number of Factor Structure. The derivation of factor structure was determined through a priori results of qualitative data analysis wherein there are three dimensions of practices of mathematics teachers. Hence, the three-factor model exhibit clean patterns as shown in Table 4.

The factor loading below table 3.4 are reduce from the model and based on the results only 16items where accepted and passed the criteria then subjected for rotation and analysis.

After which, the 16 – item construct is then subjected for rotation. The promax rotation was used since the factors seem to be correlated with a coefficient above .50 which reflects that the data is not assumed as orthogonal.

The pattern matrix created by principal axis factoring and rotating it using the Promax method with Kaiser normalization is shown in Table 4. The results show that the loading of the three factors' items is greater than.4. Filed (2005) provides evidence that.4 is both advised and required in order to achieve the desired parameters. Additionally, it is evident that there is either no item cross-loading or no loading at all, indicating that the items accurately reflect their components. The degree of connection between the variable and the factor is shown by loadings, with larger loadings indicating that the variable is representational of the factor (Hair et al., 1998).

Table 4. Pattern Matrix Three Factor Model

		Factor		
		1	2	3
1	Student's perception that learning mathematics is difficult should be dealt with.			.592
2	The value of learning mathematics in real life should be introduced in class.	.534		
3	Student's confidence in learning mathematics should be prioritized.			.554
4	The lack of interest and motivation affects students' learning.			
5	Preparation and thought must be taken into account when planning how lessons are delivered and how students will feel during each lesson.			
6	ICT integration and the use of other online learning materials will help increase students' engagement.	.519		
7	The use of differentiated learning strategies is an effective practice to meet student's various learning styles.			
8	It is important for teachers to instill students' with positive attitudes towards learning mathematics.			
9	Remedial classes will help students improve learning progress in mathematics.			
10	Peer tutoring is an effective practice to improve students' learning progress in mathematics.			
11	One-on-one tutoring is an effective practice to improve students' learning progress in mathematics.		.554	
12	The use of mathematics drill either for individual or group work will improve students' engagement in learning mathematics.	.628		
13	Students attitude greatly affects learning progress.			
14	Instructional materials should be available for use to set an engaging learning ambiance.	.651		
15	Teachers should monitor class learning progress regularly and ensure strategies implemented best suit students' learning styles.		.565	
16	Parental support is necessary in the learning process of students.	.605		

17	Encouraging students to exert more effort and constantly practice their numeracy skills will help improve their mathematics ability.			
18	Introducing fun and interactive games is helpful to increase students interest in learning mathematics.	.641		
19	Breaking down concepts into easily understandable steps is helpful when teaching complex mathematics problems.		.663	
20	Teachers' competency affects students' learning progress.	.542		
21	It is necessary to ensure students understand the basic concepts of mathematics prior to introducing complex mathematical problems.		.640	
22	Organizing mathematics clubs that will introduce interactive learning activities will help promote engaging learning progress.	.621		
23	It is important to get to know each student first on an individual level and engage in their stories.			
24	I serve as a counselor and performs as confidence-builder to my students with math anxiety problem.			.534
25	Student performance and progress should be reviewed on a regular basis and in a systemic manner to identify students who are making adequate progress.			
26	Students should be able to self-reflect on their progress and set attainable and specific goals			
27	Students struggling with mathematics may benefit from early interventions aimed at improving their mathematics ability and ultimately preventing subsequent failure.			
28	Visual representations of the mathematics are critical in laying a strong foundation of mathematical ideas.			
29	the way the instructor teaches mathematics has a great impact on the level of mathematics anxiety in students			
30	Teachers should be provided with special learning programs regarding mathematics teaching techniques and strategies	.592		

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.
a. Rotation converged in 13 iterations.

Each item can be regarded as a component of the factor since the item loadings of each item to its factor show a sufficient amount of connection between factors and variables. the three-factor model of teachers' approaches in teaching mathematics using the EFA with 16 items was developed as shown in Table 4, Engagement Focused (1), Progress and Intervention Focused (2), and Math-Confidence Focused (3).

Final Version of Factors hindering teachers' instructional effectiveness in secondary schools. The product of this study, the final version of the instrument, is shown in the form given in Table 5. Based on factor loadings on the items and a study of 30 items, many difficulties with face validity are suggested. Things with a modest coefficient of less than.40 are eliminated. According to Hair et al. (2010), the

components in the model that make no sense and are not indicative of the factor can be eliminated. Additionally, the researcher can choose the loading coefficient to only include the items that best reflect the factor, therefore items with low loading coefficients might not be included in the factor structure.

A questionnaire about instructors' methods for educating students in mathematics in secondary schools was created using EFA. This utility has 16 components in total, divided into three categories. The qualitative findings led to the discovery of these three themes. Three themes in total were developed: engagement focused (9 items), progress and intervention focused (2 items), and confidence focused (3 items). Engagement focused: nine (9) items. Progress and intervention focused: four (4) items. Confidence focused: three (3) items. Below is a graph of the 5-point Likert scale, which ranges from 5-stronly agree to 1-stronly disagree.

Table 5. Teachers' views on the Teachers' Practices in Teaching Mathematics Questionnaire

Items	
ENGAGEMENT FOCUSED PRACTICES	
1.	The value of learning mathematics in real life should be introduced in class.
2.	ICT integration and the use of other online learning materials will help increase students' engagement.
3.	The use of mathematics drill either for individual or group work will improve students' engagement in learning mathematics.
4.	Instructional materials should be available for use to set an engaging learning ambiance
5.	Parental support is necessary in the learning process of students.
6.	Introducing fun and interactive games is helpful to increase students interest in learning mathematics.
7.	Teachers' competency affects students' engagement towards learning progress.
8.	Organizing mathematics clubs that will introduce interactive learning activities will help promote engaging learning progress.
9.	Teachers should be provided with special learning programs regarding mathematics teaching techniques and strategies.
PROGRESS AND INTERVENTION FOCUSED PRACTICES	
10.	It is necessary to ensure students understand the basic concepts of mathematics prior to introducing complex mathematical problems.
11.	Breaking down **concepts** into easily **understandable** steps is helpful when teaching complex mathematics problems.
12.	Teachers should monitor class learning progress regularly and ensure strategies implemented best suit students' learning styles. .
13.	One-on-one tutoring is an effective practice to improve students' learning progress in mathematics.
MATH CONFIDENCE FOCUSED PRACTICES	
14.	I serve as a counselor and performs as confidence builders to my students with math anxiety problem.

15.	Student's confidence in learning mathematics should be prioritized.
16.	Student's perception that learning mathematics is difficult should be dealt with.

CONCLUSION

Based from findings of the study, the following conclusions are generated. With regard to lived experiences, the participants have concerns on the practices which will lead to learners' improved level of self-confidence and increased level of engagement. In addition, participants of the study revealed that essential practices also include lesson preparation and integration of activities for improved learning progress through intervention and monitoring.

On the integration of quantitative and qualitative results, the participants confirm the applicability of the three themes that emerged in the qualitative aspect. Three themes are confirmed by the participants in the qualitative results namely, confidence focused, engagement focused, and progress and intervention focused practices.

REFERENCES

Belvez, M. Paz. (2002). The art of teaching science and math (Ang Sining at Agham ng Pagtuturo). Quezon City: Rex Bookstore Company.

Bernardo, A. B. I., II, M. O. C., Lapinid, M. R. C., Teves, J. M. M., Yap, S. A., & Chua, U. C. (2022). Contrasting Profiles of Low-Performing Mathematics Students in Public and Private Schools in the Philippines: Insights from Machine Learning. Journal of Intelligence, 10(3), 61. MDPI AG. Retrieved from http://dx.doi.org/10.3390/jintelligence10030061

Bingham, T. (2017). Writing Activities to Conceptualize Math Concepts. *Texas Association for Literacy Education Yearbook*.

Blömeke, S., Olsen, R.V., Suhl, U. (2016). Relation of Student Achievement to the Quality of Their Teachers and Instructional Quality. In: Nilsen, T., Gustafsson, JE. (eds) Teacher Quality, Instructional Quality and Student Outcomes. IEA Research for Education, vol 2. Springer, Cham. https://doi.org/10.1007/978-3-319-41252-8_2

Coe, K. (2019). *Mathematics: Menu of Best Practices and Strategies.*

Creswell, J (2007). Qualitative Inquiry and Research Design. SAGE Doronila. http://www.ceilconicet.gov.ar/wpcontent/uploads/2018/04/CRESWELLQualitative-Inquary-and-Research-Design-Creswell.pdf

Department of Education. (2019). PISA 2018 National Report of the Philippines. Retrieved from https://www.deped.gov.ph/wp-content/uploads/2019/12/PISA-2018-Philippine-National-Report.pdf.

Dizon,et. Al (2019). Perspectives on the Implementation of the K to 12. Program in the Philippines: International Journal of Innovation and Research in Educational Sciences Volume 6, Issue 6, ISSN (Online) : 2349–5219 Studies (IJSMS), v2(i2), 77-80. https://www.ijsmsjournal.org/ijsms-v2i2p110.html

Fredua-Kwarteng, E. (2015). How Prospective Teachers Conceptualized Mathematics: Implications for Teaching . *International Electronic Journal of Mathematics Education*, 77-95.

Hooley, Neil (2005) Pragmatic mathematics : representations of thought and action. Journal of Australian Indigenous Issues, 8 (1). pp. 12-23. ISSN 1440 – 5202. https://vuir.vu.edu.au/378/2/Neil_JAIIApril05.pdf

Horley, J. (2012). Personal Construct Theory and Human Values. *Journal of Human Values*, 161-141.

Kalkowski, P. (2021) Peer and Cross-AgeTutoring. School Improvement Research Series.http://educationnorthwest.org/sites/default/files/peer-and-cross-age-tutoring.pdf

Maamin, Martina, Siti M. Maat, and Zanaton H. Iksan. 2021. Analysis of the factors that influence mathematics achievement in the ASEAN countries. Cypriot Journal of Educational Sciences 16: 371–88.

Magayon, V. C. & Tan, E. B. (2016). Learning Mathematics and Differentiated Instruction in the Philippines: A Phenomenographical Study on Struggles and Successes of Grade 7 Students . International Journal of Educational Studies in Mathematics, 3 (3),1-14. Retrieved from https://dergipark.org.tr/en/pub/ijesim/issue/33760/373898

Pacaol, N. (2021). Teacher's workload intensification: A qualitative case study of its implications on teaching quality. International Online Journal of Education and Teaching (IOJET), 8(1). 43-60.

Porter, A.C.; Garet, M.S.; Desimone, L.; Suk Yoon, K.; and Birman, B.F. (2000) Does Professional Development Change Teaching Practice? Results From A ThreeYear Study. Prepared for the U.S. Department of Education, Planning andEvaluation Service by the American Institute for Research. Washington: D.C

Robinson, D.R., Schofield, J.W. & Steers-Wentzell1, K.L. Peer and Cross-Age Tutoring in Math:Outcomes and Their Design Implications. Educ Psychol Rev 17, 327–362 (2005). https://doi.org/10.1007/s10648-005-8137-2

Sherrington, Tom (2019). 7 Significant and Common Challenges in Teaching. Teacherhead. Wordpress. Retrieved from https://teacherhead.com/2019/12/10/7-deadly-difficulties-in-teaching/

Simon,M. (2011). Studying Mathematics Conceptual Learning: Student Learning Through Their Mathematical Activity.https://files.eric.ed.gov/fulltext/ED585966.pdf

Taylor, S. (2017). Successful Teacher Practices for Reducing Mathematics Anxiety in Secondary Students. TIMMS (2021). https://www.iea.nl/sites/default/files/2021-01/TIMSS%202019-International-Results-in-Mathematics-and-Science.pdf

Zambo, R.A., & Zambo, D. (2008). The Impact of Professional Development in Mathematics on Teachers' Individual and Collective Efficacy: The Stigma of Underperforming. Teacher Education Quarterly, 35, 159 168.https://files.eric.ed.gov/fulltext/EJ810663.pdf

Alangari, Tahani & Shindel, Beth. (2020). STUDENT ENGAGMENT AND MATH TEACHERS SUPPORT. Journal on Mathematics Education. 11. 167-180. 10.22342/jme.11.2.10282.167-180.

Bowness (2020). Teaching Math Along a Developmental Progression Can Help Improve Early Math Skills.Regional Educational Laboratory Program.

Campilla , J. ., & Castañaga , V. A. . (2021). Teaching Strategies Utilized by Mathematics Teachers in the 21st-Century. International Journal of Sciences: Basic and Applied Research (IJSBAR), 59(2), 140–160. Retrieved from https://www.gssrr.org/index.php/JournalOfBasicAndApplied/article/view/12854

Furner, J.M. (2017). Teachers and Counselors: Building Math Confidence in Schools. European Jourrnal of STEM Education, 2(2),https://doi.org/10.20897/ejsteme.201703

National Council of Teachers of Mathematics. (2014). Principles to actions: Ensuring mathematical success for all. Reston, VA: Author. www.nctm.org/principlestoactions

Schuetz,R.L, Biancarosa G. and Goode, J (2018): Is Technology the Answer? Investigating Students' Engagement in Math, Journal of Research on Technology in Education, DOI: 10.1080/15391523.2018.1490