

Outstanding Mathematics Teachers' Teaching Practices: A Collective Case Study

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Abstract

This collective case study explored the teaching practices of outstanding mathematics teachers who were purposely chosen using a selection guide by a team of mathematics administrators in Panay Island, Philippines. Researcher-made classroom observation tools (COT), interview protocols, field and reflection notes, lesson plans, and focus group discussions from students were used to gather multiple sources of data. Analyses of pedagogical strategies, including the interactive classroom collaborations, and explanations for those decisions from the teachers were included in the within-case analysis and cross-case analysis. The study depicted detailed verbatim interactions between the teachers and the students during actual teaching episodes to give the reader naturalistic examples of the explanation patterns and strategies that the outstanding teachers used to further students' understanding of mathematical concepts and procedures. The Philippine Professional Standards for Teachers (PPST) framework was used as guide in the analysis, interpretation, and presentation of the results. These outstanding teachers were noted to be exemplary in planning the teaching and learning process, proficient in using teaching and learning resources including ICT, and excellent in managing the classroom; applied successful teaching strategies in the development of critical and creative thinking as well as of higher-order thinking skills; used appropriate formal and non-formal assessment tools; provided feedback to their learners to rationalize and to improve learning; and constantly communicated their learners' progress and achievements to parents.

Keywords: teaching practices, outstanding mathematics teachers, collective case study

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1. Introduction

Teacher effectiveness impacts student learning (Habib, 2017; Maina, 2010). Aside from this, teachers play a crucial role in nation-building, having the capability to drive the country to development and progress as agents of the holistic development of learners equipped with modern skills (Department of Education [DepEd] Order No. 36, s. 2013). However, there has been difficulty in defining teaching effectiveness due to a lack of consensus as to the standards in measuring teaching quality and the manner of measuring such (Stronge, Ward, & Grant, 2011).

Researchers have defined teaching effectiveness as a multilevel task passionately performed by teachers (Timperley, 2008), the captivation of distinguished knowledge linked to previously known ones and used to arrive at new generalizations (Khan, 2012), the most important objective of every educational institution (Seah, 2017), the means of the exchange of ideas between teachers and their learners as aligned with students' welfare (Habib, 2017), and the practices of productive classroom management (Khalid, 2009). Nonetheless, despite the definitions and characteristics of teaching effectiveness in general, observable results have revealed that teaching continues to be unproductive (Hattie, 2015). The International Association for the Evaluation of Educational Achievement (IEA, 2019) reported about the Philippines' very low performance in mathematics through the 2019 Trends in Mathematics and Science Study (TIMSS), which was reportedly lower than the deteriorating performance of students in TIMSS results from 1999 to 2003.

Globally, the 2003 TIMSS revealed a very unsatisfactory ranking, with the country ranking 23rd out of 25 countries in Grade 4 and 41st out of 45 countries in Grade 8 (Bautista, 2009). This was further espoused by the 2004 Executive Report on the country's performance in TIMSS, stating that within 5 years since 1999, only 7 of the 15 Philippine regions demonstrated improvements on skills and competencies in mathematics. On the other hand, this poor performance in TIMSS was contradicted by the performance of high school students from the provinces in Panay Island, Philippines in the Mathematics Teachers Association of the Philippines (MTAP)-DepEd Math Challenge. High school students in the island have shown commendable performances in mathematics competitions in the national and international levels (Metrobank Foundation Inc., 2018; Mathematics Trainers' Guild [MTG] Philippines, 2018).

Another significantly low performance of Filipino students in standardized mathematics assessments was in the Philippines' National Achievement Test (NAT), which evaluates the performance of Grade 6- and fourth-year high school (Grade 10) students from public schools in five subjects — Mathematics, Science, English, Filipino, and Social Studies. In the implementation of NAT 2005–2006, records show that almost all fourth-year high school students exhibited a deficiency in the mastery of mathematics (National Statistical Coordination Board, 2007).

Contrary to the NAT 2005–2006 report, Region VI or Western Visayas — specifically Iloilo Province and the other provinces in Panay Island — displayed commendable development in mean percentile score (MPS) in mathematics both in the elementary and secondary levels (DepEd Iloilo, 2005). Observable developments in MPS were also recorded in the performance of students from Panay Island in the NAT in secondary-level mathematics from 2005 to 2018.

Moreover, the Mathematics Framework for Philippine Basic Education has stated that mathematics is not an easy subject as it “demands theoretical information, procedural information, and a connection between existing knowledge and previous knowledge,” and with this, “any poor domain of knowledge can cause the problem in the learning of mathematics” (Mathematics Teachers Educators [MATHTED] & Science Education Institute [SEI], 2010). Despite this perceived difficulty of mathematics as a subject, the country has won in various international mathematics competitions, defeating some countries that are known to excel in the field of mathematics. To mention a few, MTG Philippines recorded that in the China Primary Mathematics Olympiad on July 26–31, 2019, Philippine delegates won 16 gold medals in 16 individual contests, 25 silver medals, and 34 bronze medals against more than 500 participants. Likewise, competing against more than 500 participants from 12 countries around the world, the Philippine delegation bagged 6 gold medals, 6 silver medals, and 6 bronze medals in both individual and team contests in the 8th International Youth Mathematical Convention on December 1–7, 2018 at Seoul, South Korea. Furthermore, the country’s delegation won 2 gold medals, 5 silver medals, and 4 bronze medals in the 14th International Mathematics Olympiad held in Singapore on November 20–24, 2017, which was participated in by 21 countries around the world, and bagged outstanding performance in the 2016 International Mathematics Wizard Challenge held in India, and many more (MTG Philippines, 2018).

Amid deteriorating results in mathematics on a global scale, the researcher aimed to know if the chosen outstanding mathematics teachers possess the characteristics of effective teachers when it comes to their actual teaching and learning of mathematics. This paper also investigates the best teaching practices of these outstanding mathematics teachers to serve as benchmarks or models for other mathematics teachers.

2. Literature Review

Inspired teaching is undoubtedly the key to the quality of the educational system and to the increase of student interest to more acceptable levels. It is the most common thread running through the responses in every country where the issue has been assessed in detail (Office of the Chief Scientist, 2012). As teaching is a multifaceted activity, teachers’ decisions are also affected by various factors such as their knowledge and beliefs on the things to teach and on the manner of transferring learning, managing learners’ behaviors inside the classroom, and meeting external demands (Timperley, 2008). Moreover, teacher effectiveness has been observed to be productive in all educational systems by means of the following domains: a safe and stimulating learning climate, efficient classroom management, clear instruction, active learning, adaptation to students’ learning needs, and teaching learning strategies (Van de Grift, 2007, 2014; Van de Grift, Helms-Lorenz, & Maulana, 2014; Van der Lans, Van de Grift, & Van Veen, 2018). These productive teaching styles provide more learning opportunities to learners both in their academics and personality (Muijs et al., 2004; Sykes & Kuyper, 2013; Sykes & Musterd, 2011).

Aspects of teaching practice such as pedagogical practices, mathematical knowledge, and beliefs about teaching and learning have often been central to studies related to student engagement and achievement (as cited in Charalambous et al., 2012). Nash and Harker (2002), in their New Zealand Progress at School study, illustrated the extent of the effect of profoundly inequitable pedagogical attention to students. They found that teachers who distribute their attention differentially tend to offer less encouragement to students whom they have stereotyped as “not mathematical.”

Best teaching practice is typically thought of as the teaching approach that generates desired results and promotes deep student understanding. Various teaching roles have been named for teachers’ functions inside the classroom. Successful teaching of mathematics involves a teacher with both purpose and effect of assisting learners to make sense of mathematical topics. Seah (2017) presented that in terms of mathematics education, a school’s most significant objective must be on the manner by which teaching is effectively delivered to students; hence, teachers must instill and draw out from their students a practical, meaningful, and application-oriented learning outcome. The way teachers present mathematics is also an indicator of the things they believe to be the most essential, which in turn influences the way students understand and learn the subject (Cai, 2004).

Outstanding teachers have been observed to use the class discussion technique frequently in their day as compared to other teachers. For the discussion to be effective, it needs to be carefully prepared. Therefore, the teacher needs to give learners clear guidelines on the contents of the discussion and to summarize and review such during and toward the end of the lesson (Johnson & Radebaugh, 1969; Sieberer-Nagler, 2016). This research has identified factors related to teaching practices that appear to leave an impact on student engagement and achievement (Hattie, 2015 as cited in Danielson, 2013) within a specific school context. Furthermore, Seah (2007) stated that effective teaching and learning take place due to various factors such as the interaction between the teachers and the students, among the students themselves, and the students and their environment.

Questioning should also take up a large part of the lesson as it is one of the most important elements of effective instruction (Muijs & Reynolds, 2011), in which the importance of asking high-level questions, not low-level ones, is emphasized whenever possible to develop learners' thinking skills. It is also affirmed that teachers' basic management skill, specifically in understanding the nature of the classroom, is a factor for a teacher to effectively teach (Orji, 2014). Large-scale empirical studies of educational change in the U.S. also link significant achievement gains to changes in classroom practices that are centered on inquiry-based problem-solving approaches (Balfanz, MacIver, & Byrnes, 2006).

In addition, research has shown that teachers who create effective communities in classrooms have done so through their belief in the right of all students to have access to education in a broad sense — the understanding of the big ideas of the curriculum and the appreciation of its value and application in everyday life (Richardson, 2001). Rimm-Kaufman, La Paro, Downer, and Pianta (2005) found that high classroom quality was most consistently related to a low number of management problems whereas research indicates that classroom climates which are characterized by high rates of positive and supportive teacher-student interactions foster the development of self-regulation and conflict management skills, which then reduce student aggression (Wilson, Pianta, & Stuhlman, 2007 as cited in Hamre & Pianta, 2005).

A positive classroom climate feels safe, respectful, welcoming, and supportive of student learning. To achieve good classroom climate, it is also important to promote positive relationship (Sieberer-Nagler, 2016). Maintaining a positive environment for learning such as managing the classroom well is the responsibility of the teacher as the ability of teachers to organize classrooms and manage the behavior of their students is central to achieving good educational outcomes (Oliver & Reschly, 2007). According to La Paro and Pianta (2003), an ideal classroom climate is “characterized by low levels of conflict and disruptive behavior, smooth transitions from one type of activity to another, appropriate expressions of emotion, respectful communication and problem-solving, strong interest and focus on task, and supportiveness and responsiveness to individual differences and students' needs.” Therefore, it is important to note that a conducive learning environment is one important factor to consider in attaining the desired learning outcomes for the students.

Adaptation is an instructional interaction where teachers adjust their instruction in response to student needs (Mascarenhas, Parsons, & Burrowbridge, 2010), promoting student engagement, processing, and critical thinking (Darling-Hammond & Bransford, 2005). Because classrooms are dynamic, adaptations are sometimes more desirable than a well-written lesson plan (Stronge, 2007). Teachers then develop adaptability through experience and awareness, and experienced teachers are more likely to demonstrate adaptability as compared to beginners.

The way in which students take responsibility for their relationship with mathematics is also significantly influenced by the practices that are validated in the classroom. Whitenack, Knipping, and Kim (2001) have reported the way a teacher communicated the value of student effort and knowledge generated in individual, paired, or whole-class activity. The teacher used students' ideas to shape instruction and to enhance particular mathematical understanding in the classroom.

Furthermore, assessment and feedback are very important to student learning. Aina and Adedo (2013) found that feedback is very important in teaching and learning as it improves student learning. Every effective teacher should know the manner of giving assessment and feedback, the time when these are given, and the type that is needed in the lesson. Assessment, whichever form it might take, takes much of the teachers' time and has an important place both in teachers' and students' lives (Ceyhum & Erodogan, 2013).

Additionally, feedback, which can be in the form of verbal exchanges, written responses, tests, or assessments, gives a firm basis on which to correct students' misunderstandings — without which there is little basis on which to steer students' progress (Sieberer-Nagler, 2016). Wiseman and Hunt (2008) also reported that teachers who regularly provide feedback to their students regarding the accuracy or appropriateness of their responses and their work have higher achieving students. The most effective feedback provides constructive information, praise, and encouragement as appropriate and is immediate and specific. Pertinent individual feedback that is aimed at constructively correcting errors made during learning positively affects student performance and attitude.

Outstanding teachers demonstrate higher-order reflection skills such as evaluating ideas and implementing change rather than simply describing events (Nolan and Sim, 2011); are rated by the extent to which they address inequalities in education and promote anti-discriminatory practices (Sachs, 2003); and are charismatic, skillful, reflective, committed, and conscientious in their outlook (Grigg, 2015). They are also aware of controversial issues and know the importance of establishing clear ground rules, such as: allowing only one person to talk at a time with no interruption; showing respect for the views of others; challenging ideas, not people; using appropriate language — that is, no racist or sexist comment; allowing everyone to express their views to ensure that every one is heard and respected; and analyzing the way students should give reasons for a particular view (Oxfam, 2006). Catinan (2015) further stated that these outstanding teachers exhibited innumerable teaching practices to accommodate their students' needs despite the observance of heterogeneity inside their classroom, exemplarily showing that they know the discipline of effective teaching. They have developed a classroom climate that is conducive for learning, with which lively student engagements were observed. Catinan (2015) also speculated that

these outstanding teachers have always monitored their students' learning by employing formal and non-formal evaluations and have developed rapport with their students by catering to their needs through individual consultation.

3. Methodology

The collective case study design was based on the study framework that surrounds the research question, stemming from the exploratory perspective of the attributes and dispositions that the participants have which support the phenomenon of teaching excellence. The researcher was the main instrument in data collection and analysis — immersing in the natural setting, conducting interviews, and observing actual classes. The researcher's goal was to see outstanding mathematics teachers in action as if his presence was unnoticed and whose role was to experience and to describe the real-life operation of teaching mathematics for an understanding of such. The researcher acted as interpreter, evaluator, and observer, refraining from being an advocate or a teacher as he understood the participants and their teaching practices.

This study conducted a search for possible participants (teachers) by asking for nominations from multiple reputable mathematics education leaders. Selected participants were contacted through the bureaucratic system of letter permissions from the regional director, to the divisions schools superintendents, to the education program supervisor, to the district schools supervisor, to the school principals to whom the participants were connected, and to the participants themselves whose consent to participate in the study was secured. Each participant was closely studied, taking at most two straight weeks for each teacher.

This study occurred only in secondary mathematics classrooms and focused only on the best teaching practices of the outstanding mathematics teachers. Participation was voluntary, and giving consideration to the participants' rights, interests, and sensitivities, they were allowed to discontinue their participation at any time without prior notice. These volunteer participants were asked to sign an informed consent form. Participants remained anonymous with the use of pseudonyms, and data was treated with utmost confidentiality. Data collected from one participant were not made available to the other participants.

Data was collected using three semi-structured interviews and at least six consecutive classroom observations of each teacher using interview protocols, classroom observation tools, lesson plan evaluations, and field and reflection notes. Each participant was scheduled on their preferred two weeks' time to give them some period to prepare and to reflect on their teaching practices in mathematics. Data analysis included comprehensive detailed portrayals of the cases and their setting. Audiotaped and videotaped observations were transcribed, translated to English, analyzed, and coded and were used to complete the classroom observation tool by way of reexperiencing the actual events inside each participant's classroom.

Students' responses in the focus group discussion were translated and analyzed as supporting data. Field and reflection notes were used in the analysis, providing additional meaning to it. Lastly, the researcher used multiple verification techniques that included member checks, triangulation, and external audit.

4. Results

Danilo de la Cruz is a mathematics coordinator of the regular class, classroom adviser, mathematics club adviser in their school, and organization officer in the junior high school. He teaches grade 10 students in the regular class and chose to be observed in his homogenously below-average class. He has been teaching grade 8 mathematics in the regular class for seven years and has been teaching grade 10 mathematics in the regular class for not less than three academic years.

Alberto Sumagaysay is also a classroom adviser, mathematics club adviser in their school, and district coordinator of mathematics in their locality. He has been teaching grade 7 mathematics for seven years and is teaching grade 10 mathematics. He opted to be observed in his grade 10 class with section 1 students.

Antonio Santos is also a classroom and mathematics club adviser and mathematics coordinator in the senior high school department of their school. He has been teaching mathematics for more than 35 years, wherein he was assigned in the special science class in the junior high school since he started teaching but transferred to senior high school when the K to 12 programs started. He has been handling grade 11 students ever since. He chose to be observed in his STEM-A class.

Francisca Tolentino is also a classroom and mathematics club adviser and mathematics coordinator in their school where she has taught mathematics for more than 15 years. She taught grades 7 and 8 mathematics until the K to 12 program started when she started teaching grade 11. She opted to be observed in her homogenously below-average class taking automotive and cookery.

4.1. Curriculum and planning

Dimension 1. Planning of teaching and learning process.

The outstanding teachers in this study had planned and prepared their mathematics class using specific, realistic, and contextualized objectives that are relevant to the curriculum goals. Their lesson plans were observed to have

professional layout, bearing evidence of careful planning; to clearly identify stages with logical progression and sufficient details; and to contain thoughtful and appropriate variety of interaction patterns (individual, pair, and group work as well as teacher-student and student-teacher interaction). Their lesson preparations were based on their personal and professional reflections and were aligned with the students' context. As Danilo mentioned:

"I usually reflect on what happened before and on what I should do next to improve my teaching... It's more of a reflective thing. Say, for example, I did this particular activity this week, or on this day, or maybe in the past year. What should I do next time to make it more effective? Every year I experiment on my own teaching styles. I usually don't repeat all of what I do. There are times when I scrap my strategies because I feel that they are not really effective."

These outstanding teachers have prepared classroom activities that are aligned with the learning standards, competencies, and educational frameworks prescribed by the DepEd. They have known their students' capabilities to learn and have used contextualized lessons to support and help their students cope, understand, and enjoy the learning of mathematics. They have seen to it that they have variations of teaching strategies in dealing with their students. Danilo also mentioned:

"I see to it that there is contextualization... We follow the learning theories... We try to follow and suit our lessons based on the principles of teaching... Based on the framework of K to 12 mathematics, experiential learning... we are required to have contextualization, individualization as much as possible, cooperative learning, and other things which should be considered."

Furthermore, Alberto stated:

"... we must follow the curriculum guide that was provided by the DepEd — the content standards, performance standards, as well as the competencies in every quarter... We must follow the content stated in the curriculum guide."

Francisca also commented:

"My style of preparing my lesson depends on the specialization of my students... For my STEM class, they are already advanced; my TVL class focuses on automotive; and I also have agriculture class. I usually adjust my content based on their level of understanding."

Dimension 2. Teaching and learning resources including ICT.

The outstanding teachers in this study have incorporated the advantages of using innovative ICT tools in their teaching and learning of mathematics. These teachers have encouraged their students to use internet sources as supplemental sources of knowledge aside from their actual teaching. Danilo and Antonio have reminded their students to use internet sources of information related to their lesson. As Danilo said in the interview:

"I always encourage my students to go to the library, could go to the internet and learn online to supplement what I have discussed inside the classroom."

Antonio also said:

"Another thing is I would remind my students to search the internet for different worksheets related to the lesson and practice answering those instead."

Francisca has used millennial stuff (gadgets) since almost all students have the mathematics app in their cell phones. So she grabbed the opportunity to let students discover the ease and efficiency of the app related to their mathematics lessons. As she explained:

"... I also allow my students to use their cell phones since their generation right now is fond of using gadgets... I let them use their gadgets for the application, GeoGebra, which they use for our statistics class... I only allow them to use their gadgets if our lesson requires the use of the app, but if not, I don't allow them."

The outstanding teachers have experienced that ICT tools play a big factor in the teaching and learning of mathematics. They used PowerPoint presentations or even online mathematics sources to supplement their classes. They created teaching lessons out of such to help solve the scarcity of mathematics teachers. They have found it very time-efficient especially in assessing and reporting students' mathematical performance. As Antonio mentioned:

"... since using PowerPoint presentations are on trend, I just make one for each of my lessons ahead of time. When I enter the classroom, all I have to do is click from one slide to another..."

Alberto also stated:

"... I also use PowerPoint presentation at least three times a week. Since we are catering millennial learners, who become motivated when technology is used, I use an ICT-integrated learning... I made this flipped classroom approach, a strategy that I use whenever I am absent. I make videos which I record using my own voice and put it in a PowerPoint presentation..."

4.2 Content knowledge and pedagogy

Strategies for developing critical and creative thinking as well as higher-order thinking skills.

The outstanding teachers in this study have based their teaching on their students' learning capabilities. They have

used different teaching approaches for different sets of students. As Danilo and Francisca emphasized, mathematics teachers should motivate lower-section students and progressively introduce problem-solving to them whereas students who belong to higher sections should be exposed to more rigid problem-solving activities and encouraged to create their own problems and multiple solutions based on a given set of problems and situations. They have also emphasized that grouping has an impact on the development of students' creative and critical talents as well as higher-order thinking skills. As Danilo mentioned:

"I have to make something that they find easy at first and later on... it's just gradual that they can get the lesson. I make my own worksheets. I consider the capacity of my students because they are in the lower section... I try to inject sometimes. When I feel that the lesson is understood by almost everybody already, I try to give some problems which are of higher-order..."

Francisca also mentioned:

"... Since some of my students have difficulty in reading or can hardly understand, grouping them with those who can help them in solving the problems... I have to make sure that my problem-solving preparations are appropriate and involve higher-order thinking skills because it will be very useless if the students cannot answer them."

This was further supported by Antonio who stated:

"If my students have group work inside the classroom wherein I give problems that they need to analyze... I ask them to give their own solutions to the problem. I would also require them to create problems which requires higher order thinking skills."

4.3 Diversity of learners

Learners' needs, strengths, interests, and experiences.

The outstanding teachers in this study created classroom activities aligned to their students' needs, interests, and strengths. They have been sensitive and adaptive in their teaching, for they have the capacity to switch planned lessons to suit their students' level of understanding. As Alberto explained:

"I lower the level of difficulty especially to learners who belong to the lower sections... I also adjust it to learners in the higher section since a higher thinking skill must be involved in such group... It's mainly because of their level of understanding, specifically... Since they vary in terms of understanding, varied teaching styles should be employed as well."

Antonio supported this with his claim:

"... if I were to teach in the extremes I would create activities that are also appropriate to their capabilities although the competencies would still be intact..."

4.4 Learning Environment

Management of classroom structure and activities.

The outstanding teachers in this study have shown confidence and mastery in their teaching and learning of mathematics. They were observed to be organized and have prepared everything before their mathematics classes. Francisca said:

"Before I start my class, what I commonly do is that I prepare and arrange everything inside the classroom for my lesson on that day."

Antonio also mentioned:

"The first thing I do when I enter the class is to review them of our previous lesson. If there is an assignment, we discuss it. After that, I will introduce the new lesson through a PowerPoint and other activities that I have. Afterwards, I will give them a formative test."

The outstanding teachers were observed to be creative in their teaching of mathematics for they have created a variety of classroom activities ("karetela", game activities, peer facilitator, peer teaching, workshop model, mathematics quiz bee, etc.) that would help students boost their interest, enhance their mathematical abilities, and enjoy their mathematics class experiences. As elaborated by Alberto:

"We do peer teaching by grouping the students... peer teaching helps them as the leader [who is a fast learner] guides the slower ones so they can cope with the lessons..."

Francisca also mentioned:

"I usually request those top-performing students to help me assist their classmates who have some difficulty in the lesson. At least by doing that, they get to experience individualized instruction from their classmates..."

The outstanding teachers were perceived by their students as effective, organized, enjoyable, caring, fair, intelligent, and proficient, for they cared for their students' welfare and practiced fairness and equality dealing with them. Francisca explained:

"... I make my students understand their equality as a human person. It doesn't mean that if they have different skin color or status in life, they should be... I value my principle in teaching which is to give fair

judgement and treatment to my students... I don't want to give them unjustified grades."

The outstanding teachers have set guidelines and policies at the beginning of the school year and have maximized their class periods to make their mathematics teaching more productive and effective. As Francisca explained:

"When it comes to my practices, as a math teacher, I really prepare everything I need inside the classroom. I use different techniques like cooperative learning to address the different learning styles of my students."

Danilo also stated:

"... at the beginning of the class we set rules... at the beginning of the school year, rules are emphasized and then the effects of doing good."

4.5 Assessment and reporting.

Dimension 1. Formal and non-formal evaluation.

The outstanding teachers in this study have created various types of classroom activities as forms of their non-formal evaluations such as "karetela", game activities, workshop model, classroom mathematics quiz bee, etc., that helped them assess and improve their students' mathematical ability. They also used formative and summative test in the form of paper and pencil test as their formal evaluations to enhance students' mathematical mastery. As Antonio mentioned in the interview:

"We usually measure that in the form of formative and summative tests. This is where you'll know if the students have learned the lesson or not. That's it, most of the time, we use tests as our basis."

Alberto followed through by saying:

"... through assessment — through the formative and summative. In terms of formative, I can see achievements among the students... I do an assessment based on the activity and I follow it up through discussion. And I can see students interacting in our discussion. As for the summative assessment, most students — if not all — also get high scores... because of the assessment that you give to the students, you can now decide on what to do such as to re-teach the lesson or to have an intervention..."

The outstanding teachers have created their assessment tools based on their students' recent performances, in which they are very particular of the students' tangible scores. They have emphasized the effectiveness of individual and group activities in assessing their students. As explained by Danilo:

"I actually see to it that the scores that I receive are coming from them... I have four sets of test. It's A, B, C, D, so I form a square ABCD... I give them exercises and then reflect on the results based on the quiz. During the quiz, I also am strict, although I don't give a quiz that requires them to be one seat apart or quizzes which are in four sets..."

The outstanding teachers emphasized the effectiveness of individual and group activities in assessing their students. As Francisca explained:

"After I use cooperative learning, I give them individual assessment. By that, I will know if my students were able to understand the topic and if grouping them together is really effective."

Dimension 2. Feedback to improve learning.

The outstanding teachers in this study emphasized the importance of giving feedback in their teaching and learning of mathematics. They have practiced regular monitoring of students' strengths and weaknesses that helped them prepare authentic activities which would help their students master their mathematical talents and abilities. They emphasized that students' wrong notions about concepts and mathematical ideas should be corrected outright to avoid recurrent mistakes. They have used feedback to enhance the teaching strategy they were practicing, the ICT tools they were using, and their overall teaching performance. According to Alberto:

"... if students become used to the wrong statements while they are in lower grades, it will definitely continue in the higher grades. So, we must correct them as early as they have committed the mistake."

Antonio also mentioned:

"I encouraged students to do mathematical investigation for them to explore and formulate their own mathematical concepts. In such cases, their false statements can be corrected directly and misconceptions are being avoided."

Francisca also explained:

"I also do feedback... I ask them (students) if they were able to understand the lesson... when I used ICT or video presentation for my lesson about graphing rational functions, my students said, 'Ma'am, it is a bit fast and in pure English, we can hardly understand...' From these feedbacks, I am able to develop my way of teaching... If I use a specific teaching style, it is usually followed by feedbacking..."

Dimension 3. Communication of learners' progress and achievement to parents.

The outstanding teachers in this study emphasized the importance of parents in the teaching and learning of mathematics. They claimed that parents are the important persons who should be informed about students'

strengths, weaknesses, and achievements as they know their children and spend the most number of hours with them. The outstanding teachers also claimed that communicating with parents regularly helps teachers improve student personal and academic development. As Francisca asserted in the interview:

“I give importance, first and foremost, to the parents... I talk to the parents almost all the time since we only live in one community — we always see each other. I also update them about their child’s improvement in school, not just about their child’s shortcomings or misbehavior... I believe they are the best people to tap if I have concerns regarding my students because they are the immediate family. They know their children better than me.”

Danilo also expressed:

“I tried that at least every two weeks the parents will sign so that they will be updated of the scores. Same with summative and periodic. So that’s my way that the parents are informed of the progress of the child.”

5. Discussions

The outstanding teachers were described to be flexible, very keen in observing their students’ performance, and able to switch the planned lesson to fit to the needs of the learners (Hattie, 2012). They are good in designing effective and learner-centered instruction, which is attributed to their being outstanding in terms of pedagogical practices (Tan, 2017). These teachers are important factors in the promotion of learning and motivation, and it is their openness toward bringing innovation into the lesson that made their teaching and learning of mathematics productive (Hoy & Woolfolk, 2000). Therefore, these teachers must have knowledge about new, innovative teaching methods, which can lead to educational achievements.

The importance of knowing innovative and effective teaching methods can help teachers teach effectively (Österholm, 2009). Outstanding teachers have already embraced technological advances and have creatively integrated them to enhance learning (Aina, 2013; Mahil, 2014). Mathematics teachers must thus improve their pedagogical skills. These improved pedagogical skills can help them explain terms and concepts to students, interpret students’ statements and solutions, and engage students in critical, in-depth, and higher-order thinking (Copeland, 2003).

Best practice is typically thought of as the teaching approach that generates desired results and promotes deep student understanding. Successful teaching of mathematics involves a teacher with both purpose and effect of assisting learners in making sense of mathematical topics (Stanford, 2001). Creative mathematics teachers use their students’ thinking to formulate the best strategy for the enhancement of instruction (Franke & Kazemi, 2001). These teachers challenge their students intellectually, motivates them, sets high standards for them, and encourages self-initiating learning (Darling-Hammond, 2010). They create best learners with their professional guidance (Habib, 2017).

Moreover, these mathematics teachers have been flexible to students’ needs. They have created classroom interactions where mathematics lessons are adjusted to students’ learning capabilities (Mascarenhas, Parsons, & Burrowbridge, 2010). They have promoted engagement, processing, and critical thinking among their students (Darling-Hammond & Bransford, 2005). With this, outstanding teachers have to be well-prepared, well-versed, and thoroughly supported in case of changes in the curriculum and instructional strategies (Stronge, 2010).

Teachers are the main factors of effective teaching and learning (Khalid, 2009) for they have mastered their subject matter and have possessed good communication skills (Seah, 2007). They are considered the masters of their craft whose primary concerns are ensuring the holistic growth of their students, teaching them to think, touching their hearts, and inspiring them to reach their peak and achieve their goals. They confidently impart knowledge to ensure that students are engaged in learning and generate high levels of commitment to learning across the school (Office for Standards in Education, Children’s Services and Skills [OFSTED], 2014). Outstanding teachers are always in search of classroom activities that help them make mathematics learning more comprehensive and effective for them and for their students (Ansari & Malik, 2013). They must be competent in the subject content knowledge, possess good pedagogical skills — especially questioning — and maintain a good relationship with their students (Kani et al., 2014 as cited in Omar et al., 2014).

In addition, they tend to be self-critical, always eager to improve their practice, and open to advice that they do not take as personal criticisms (Grigg, 2015). They use informative, procedural, and systematized teaching strategies (Barnes, 2005). These teachers have communicated the value of student effort and knowledge generated in individual, paired, or whole-class activity (Whitenack, Knipping, & Kim, 2001).

This line of research has also revealed that reliance on classroom grouping by ability (Zevenbergen, 2005) may have detrimental effects on the development of a mathematical disposition. Outstanding teachers establish organizational structures with a view toward their potential to enhance students’ mathematical identity and constantly monitor, reflect upon, and make necessary changes to those arrangements on the basis of their inclusiveness and effectiveness for the classroom community. They always monitor their students’ learning by employing formal and non-formal evaluations and develop rapport with their students by catering to their needs

through individual consultation (Catinan, 2015). These teachers are unbiased, challenging, engaging, supportive, and clear; monitor learning activities, and are equipped to meet the needs of diverse students including those from disadvantaged backgrounds (Cruickshank & Haeefe, 2001).

With this, these outstanding teachers are able to identify and apply the most effective and the most appropriate teaching methods by organizing the learning process and updating interdisciplinary linkages because they believe that students' productive performance is vital (Hattie, 2012). They are concerned with the importance of a positive learning environment because they know that this atmosphere is a place where learners develop trust and confidence in learning and develop personality traits that are highly acceptable in society (Hattie, 2012). These teachers can best prepare and plan for their student's welfare because they know their students and have full knowledge of their students' learning needs (NRC, 2001). These teachers improve their lesson preparations and delivery based on student mistakes and level of difficulty, which they use it as a springboard to cater to students' needs and as an opportunity to improve learning (Empson & Junk, 2004).

Thus, mathematics teachers must understand and fulfill their obligations in upholding professional ethics, accountability, and transparency to promote professional and harmonious relationships with learners, parents, schools and the wider community. They should promptly and clearly communicate the learners' needs, progress, and achievement to key stakeholders, including parents/guardians. Teachers should see the importance of parents in their children's learning. As stakeholders, parents are the best persons who can help improve students' academic performance and personality (Results-Based Performance Management System [RPMS], 2018).

Conclusions

Conclusion 1: Exemplary role models.

Outstanding teachers have shown exemplary performance in their teaching and learning of mathematics. They are perceived by their students as knowledgeable for they are effective communicators and can deliver their lesson with ease, confidence, and clarity. They have become teacher trainers, presenters, and teacher facilitators on various mathematics-related activities. They have also been module writers and researchers who created contextualized teaching activities that helped students enhance their learning of mathematics.

Conclusion 2: Masters of their craft.

Outstanding teachers are perceived by their students as equipped with knowledge. They are willing to continuously learn and refresh their knowledge so that they are presenting to their learners the most up-to-date, current thinking surrounding the subject that they are teaching. They are equipped with up-to-date content knowledge and the best pedagogical practices, hold superb art and proficiency in teaching so as to mold the heart and mind of their students, positively convey information to ensure that students are engaged in learning and generate high levels of commitment to learning across the school, and see to it that students' preferences are considered in planning classroom activities and assessment tools. Their students are given opportunities to develop self-confidence and a balance of freedom and restricted activities. They have also prepared activities that are in the level and context of their students, inspiring, motivating, and encouraging the latter to do more in mathematics.

Conclusion 3: Creative and innovative.

Outstanding teachers have created motivational activities that their students enjoyed while learning mathematics using innovative teaching tools such as ICT. They use games and viral videos to enhance student participation and created the following: classroom activities like "karetela", workshop model, mathematical investigation to improve students' critical thinking and higher-order skills; various assessment activities to let students contemplate on their outlook of mathematics; contextualized teaching strategies like flipped classroom to help students and other teachers learn mathematics even outside the mathematics classroom; and modules to help students who are behind in class and other teachers who need additional reference materials. Their best teaching practices, mainly creating lessons that are in the context of the learners, separate them from other mathematics teachers.

Conclusion 4: Demonstrated leadership skills.

As compared to regular mathematics teachers, outstanding teachers have been assigned to various designations to help and guide students in academic competitions as well as other teachers in the advancement of mathematics teaching. They have been assigned as coaches in various mathematics contests and have been recognized as winning coaches in their respective localities even until the national level. They have always led their learning action cell (LAC) sessions and have been assigned as resource persons in several mathematics seminar and workshop. They have always been members or officers of various mathematics organizations and facilitated various mathematics gathering.

Conclusion 5: Created a positive learning environment.

Outstanding teachers have created learning environments that cater the need of diverse students. They have created context in their classrooms, developing trust and confidence within their students. They have set verbal and nonverbal rules at the start of the semester to make students aware of the things that are good for them and those that the class need to learn. They have also maintained a balance in being strict and being lenient to students and have handled their students in such a way that they are not given excessive pressure. They have shown respect and

care to their students, have understood their student's preferences, have corrected their students' mistakes immediately to avoid misconception, have provided contextualized instructional materials and have integrated ICT into their lessons, and have set clear ground rules and policies at the beginning of the school year.

Conclusion 6: Committed.

Outstanding teachers have been noted for their commitment in the field of teaching, having shown persistence in their teaching of mathematics, attending their classes every time, and monitoring their students' progress every now and then. They have exceeded the performance of a regular mathematics teacher, holding designations and fulfilling obligations beyond their responsibilities as mathematics teachers and even putting in extra time in holding classes to ensure that their students are progressively learning. They are keen in observing their students' performance and lives, even using their personal money, time, and effort to help their students succeed in learning mathematics and going far from the school locality to send modules for their students who are about to stop attending school. They have never stopped reminding, motivating, and inspiring their students to finish their education, telling them that education is life and that if they do not make it their lives will be affected.

Conclusion 7: Effective teachers.

Outstanding teachers possess the characteristics of effective teachers. These teachers are knowledgeable and have mastered the subject matter content and, in turn, have produced prolific learners through their own way of teaching. They have used effective teaching strategies, making their teaching more effective; maximized their time to look after their student's welfare; and used their students' previous performances to create new interesting and effective lessons. They have prepared well-planned lessons and integrated the use of ICT in their teaching, have created a learning environment that practices care and respect and that gives students chances to raise questions, clarify things, and express their thoughts. Moreover, they have created formal and non-formal evaluations for their students and created consultation hours for giving feedback.

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