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EXPLORING THE PERSPECTIVES OF PRESERVICE FILIPINO MATHEMATICS TEACHERS: BASIS FOR A PROPOSED EDUCATIONAL BELIEF MODEL

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Abstract

This research explores the educational beliefs of select fourth-year preservice Filipino mathematics teachers enrolled in the Bachelor of Education major in Mathematics program in the second semester of the 2022–2023 academic year in a state university in Bulacan, Philippines, via qualitative-exploratory research. Three qualitative tools were used: a metaphor construction task, unstructured questions, and a drawing task. Thematic analysis and intercoder reliability checking were implemented. Based on the findings, the first theme, the teacher as a knowledge dispenser belief, features the imperative conduct of the dispensation of knowledge; the second theme, the teacher as a reliable improver belief, highlights the formation of space for student participation after dispensing knowledge; the third theme, teacher as an equity promoter belief, highlights the significance of addressing the needs of the students while dispensing knowledge; and the last theme, teacher as a strategic scaffolder belief, highlights combining, extending, and maximizing all knowledge, experiences, and learning opportunities to align with and attain learning objectives. The teacher-as-knowledge dispenser belief is more teacher-centered, the teacher-as-reliable improver and teacher-as-equity promoter beliefs are mixed teacher-centered and student-centered, and the teacher-as-strategic scaffolder belief is more student-centered.
Keywords: *educational belief model, mathematics teaching, preservice teachers, student-centered, teacher beliefs, teacher-centered*

Introduction

Mathematics is a course that stresses the building of new knowledge over previous knowledge. Mathematics teachers would all agree that they put some order into their mathematics teaching. In several mathematics classrooms, it is believed that learning includes grasping specific procedures and a body of knowledge. Similarly, it is thought that the task of teachers is to communicate the material in simply practicable parts, preferably from easy to challenging levels, and to do the accurate technique, after which students work on practice drills individually (Goos et al., 2007). This 'school mathematics' culture is labeled as information transfer or transmission. Barr and Tagg (1995) have connected this scenario of information transfer to what they call the instruction paradigm, which has the mission and purpose of providing students with instructions that aim to transfer knowledge. This paradigm asserts to be more teacher-centered than student-centered in its form.

However, a contrasting 'inquiry mathematics' culture believes that knowledge cannot be transmitted directly from teacher to student. That is, educators have long identified the advantage of active student participation in supporting deep learning of key mathematical ideas and procedures (Ignacio, 2024). Here, students learn by joining in math tasks, asking queries, suggesting assumptions, and solving new or unfamiliar problems. Barr and Tagg (1995) have attached this scenario of deep learning support to what they called the learning paradigm, which establishes itself as producing learning by creating powerful learning environments. This

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learning paradigm asserts to be student-centered. In mathematics education, student-centered learning, which is undeniably rooted in the very notion of constructivism, pays attention to how observations, informal experiences, and patterns can be changed into stronger illuminating ideas via encounters with thought-provoking tasks (Ignacio & Paras, 2024). "Excellent mathematics teachers are responsive to all aspects of the context in which they teach—learning environments they establish, lessons they plan, their uses of technologies and resources, their teaching practices, and the ways in which they assess student learning" (Goos et al., 2007, p. 3).

Accordingly, mathematics teachers perform teaching based on a diverse set of professional and/or personal beliefs and values (Clemson & Clemson, 1994). All the behaviors that teachers take are built on models/principles. In some instances, they embrace the theories of others, e.g., colleagues or writers, but in all cases, they fit them to their own beliefs and preferences, those ways of operating which they feel good about and those which they think worthwhile. On the other hand, it is one of the central pieces of educational thinking that equal opportunities for learning should be offered to all students. To deliver to all the students these opportunities in mathematics, teachers need to evaluate their beliefs about how students learn. Teachers can then employ theoretical perspectives that are appropriate for learning situations. These beliefs must be carefully explored as early as their preservice teaching years. However, for preservice teachers, the pressures of restructuring are heightened by the learning demands of first-time teaching (Lloyd, 2006). Their personal experiences in conventional mathematics classrooms affect their teaching and learning views. Due to the potential reported advantages of operating in a learning paradigm, the tendency to employ student-centered classrooms encourages not only Western nations but also some countries in the East, like the Philippines.

As a consequence, as a Filipino teacher-researcher in the field of mathematics teaching, it is my responsibility to explore this issue. Hence, the present research is interested in exploring and outlining patterns of educational beliefs of preservice Filipino mathematics teachers in mathematics teaching, reflecting teacher- and student-centered notions.

Rise of Western Student-Centered Learning

Early pursuit of learning concentrated on behaviorism (Thanh-Pham, 2011). For behaviorists, teachers convey the material to the students to transmit knowledge. Students must get all the pieces of information the teachers would like to communicate, attend, and listen to them as this is a way to acquire knowledge. "Perception became discrimination, memory became learning, language became verbal behavior, intelligence became what intelligence tests test" (Miller, 2003, p. 141). As stated by Boghossian (2006), for behaviorism, "Often, the form of conditioning used to achieve desirable behavior is a lecture-based pedagogy. [It] rejects a dialectical process and does not actively involve the learner" (pp. 716–720). As a response, cognitivists have taken into attention what occurs within the brain of a learner, the cognitive processes that are fundamental to learning processes. Learning is a cognitive process where learners find the crucial parts to solve a problem and, eventually, connect them (Bélanger, 2011; Gardner, 1985). Meanwhile, the world was branded by capitalism (Thanh-Pham, 2011). Hence, development and support for a skills agenda came out of the private sector. There was a large interest in 'big-tech' companies seeking to take advantage of skills development. This compelled the academic world to outcomes known as 21st-century skills. The 21st-century skills are proxy terminologies that imply abstract future skills. This required a skilled workforce and a new school curriculum to prepare such a workforce (Kennedy et al., 2023). Education is seen as a way to achieve social benefits, have an open supply of marketable workers, and be able to pass wealth and job-related positions (Engel & Rutkowski, 2008; Woodford & Quiles, 2019), producing learners that can satisfy the demands of capitalists (Peters, 2001).

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Thus, behaviorism became outdated. This leads to the spread of Western student-centered teaching and learning (SCTL) practices. Western countries have transformed the means of spreading knowledge (Lin, 2016). Western SCTL acknowledges process-oriented, student-centered approaches and concentrates further on learning from experiences, activities, and collaboration (Chang, 2021; Jacobs & Renandya, 2019; Thanh-Pham, 2011). Student-centered learning (SCL) approaches are often described by comparing them with traditional instructional methods, which are distinguished by more teacher direction (Pedersen & Liu, 2003). Student-centered teaching is about optimizing students' learning possibilities (Doyle, 2011). Western SCL was sustained by constructivism. In constructivism, prior knowledge is essential in constructing new knowledge. Assisting students to construct understanding in a learning situation can be realized via the lens of a scaffold, i.e., building on students' ideas. Undeniably, the tendency to copy and enforce Western traditions on non-Westerners has been anticipated as globalization—i.e., cross-border trade and accessibility of resources of various countries via interdependence of economies, cultures, and populations—upholds those Western practices, e.g., teaching-learning, is freely offered in the East, e.g., Asia (Engel & Rutkowski, 2008; Thanh-Pham, 2011).

On Asian Education Reform

"The last two decades have witnessed 'a global wave' of large-scale educational reform as influenced by globalization" (Lou & Restall, 2020, p. 113). The realization of Western SCTL has shown challenges in global contexts (e.g., from Western to non-Westerners) as it involves the intersection of its underlying idea with the established values and culture of non-Western schools, the related reality and boundaries, and the beliefs adopted by teachers. While values refer to something desirable that is culture-bound (Jocano, 2008), beliefs shape the implementation of a learning approach (Pedersen & Liu, 2003). Reportedly, researchers cited that Western SCTL practices caused difficulty for both Asian instructors and students to rebuild their thinking concerning teaching and learning and share control for the learning course as co-partners, e.g., those with Confucian heritage backgrounds (Chang, 2021; Phuong-Mai et al., 2005; Van Schalkwyk, 2015). Asian learning values uphold hierarchy. Thanh-Pham (2011) called this situation to have a high power distance. In an Asian learning culture, high power distance stresses hierarchical relationships, which teaches students to obey and listen to teachers. As stated by Van Schalkwyk (2015), "It is a fallacy to think that Asian students automatically know how to collaborate toward successful completion of a learning task … [Asian] prefers a high amount of structure, well-structured tasks, and linear thinking, limiting creative efforts" (pp. 33–35). While a small power distance in a Western SCTL culture spreads the power among the members, favors individualism or independent thinking, and is inclined to prioritize cognitive competence, Asians observe conflict avoidance significantly as they manage to prioritize friendships over cognitive expertise (Chang, 2021; Phuong-Mai et al., 2005; Thanh-Pham, 2011). Some of these Asian practices are not different from the Filipino traditional value system. Values refer to something desirable, and desirability is culture-bound. In the ethnographic research done among the diverse ethnolinguistic groups in the Philippines since 1967, Felipe Landa Jocano (2008), an Anthropology Professor Emeritus at the University of the Philippines, said, "Individualism is not part of our traditional culture. It is from Western-influenced formal education. Group activities are more productive when leadership is done with a personal touch … Communication tends to bog down unless it projects a personalized attention" (pp. 63–64).

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Some Reported Asian Teacher Educational Beliefs

At the class level, SCL pertains to students being the center, enthusiastically included in the learning process, as they are in charge of their own learning processes, plans, and decisions, while instructors increase chances for interaction and learning (Lou & Restall, 2020). But to make this happen, as mentioned by Filipino authors Alonzo et al. (2021), to change teachers' practices for a more SCL practice, teacher beliefs are needed to be reviewed, as they note, "One of the most cited and well-argued factors that hinder teachers' ability to change their practices is the failure to change their belief system" (p. 36). It considers teacher beliefs (or educational beliefs) as an independent construct (Mo, 2020). As a working definition, from a sociocultural perspective, teacher beliefs denote "individual, subjectively true and value-laden mental constructs that are of relatively stable results of substantial social experience and that have a significant impact on one's interpretations of and contributions to classroom practices" (Skott, 2015, p. 19).

This highlights that teachers and their educational beliefs are vital to any educational reform. Teacher beliefs involve mental patterns in social and cultural settings where individuals gain experiences. Hence, teacher beliefs are confined to cultural and social perspectives (Wang & Hsieh, 2014). Through this lens, we say that teachers' beliefs are interconnected with what they have experienced. For instance, regarding the impact of teacher beliefs on practices, although teachers had strong beliefs about SCTL, some may return to more traditional ones, both pedagogy and assessments, due to a lack of experience and knowledge (Cunningham, 2021). Teacher beliefs and experiences support teachers' adoption and realization of their educational-related practices. In a Vietnamese context, it seems that once teachers have shaped solid beliefs about the profits of SCL, both for students and themselves as good teachers, they will be more ready to modify their teaching practices, a move from lecture-based teaching to a more constructivist one (Nguyen et al., 2019). In a Taiwanese context, most teachers supposed that although usual lecture-based practices were helpful, they were ineffective in developing creativity, logic, and necessary analysis skills (Huang & Asghar, 2016). In a Chinese context, technology use was still restricted to teacher-centered principles instead of SCL practices (Li & Ni, 2010). In a Turkish preservice teachers' context, most participants' espoused beliefs tended to be blended, combining teacher-centered and student-centered approaches. Their beliefs are more traditional since they have been taught more traditional practices since primary school (Sendurur, 2018). In another study, they might favor constructivist beliefs but exhibit traditional teaching since they have not acquired the crucial skills and knowledge for constructivist practices. They had struggles making student-centered approaches (Kaymakamoğlu, 2018). Their beliefs and experiences play a large part in successfully fulfilling SCL (Aslan, 2022). In a Korean context, it has been labeled that Korean schools' teaching practices blend teacher-centeredness and student-centeredness; SCL is penetrated by Confucian cultural beliefs and practices, e.g., observing high power distance (Yang & Tan, 2019). In a Singaporean context, the strengthened extent of SCTL was frequently tied in with issues related to the teachers' earlier beliefs about pedagogy. That is to say, the changes in beliefs can be described by encounters in the teachers' beliefs about pedagogy that led to shifts in practices in the classroom (Tan & Nashon, 2013). In an Omani context, teacher beliefs shape the realization of student-centered curricula. Teachers who hold optimistic assumptions linked to SCL but face challenges in performing these practices in university have been noted as substantial obstructions to espousing SCL (Ambusaidi et al., 2021).

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On Preservice Mathematics Teacher Educational Beliefs

The primary researcher deems himself to have a social constructivist worldview and a critical realism research philosophy. As per Creswell (2009), social constructivists seek an insight into the realm where they work and live, dependent on the participants' opinions of the situation being explored, to make a sound judgment of the meaning others say about the world. On the other hand, a critical realist argues that, as researchers, what occurs in the social sphere can be known if they know the social forms that offer growth to the experiences they seek to comprehend–i.e., what people see is only a piece of the broader picture (Saunders, 2019). While the present researcher believes in subjectivity and the fluidity of the truth of the world around us, in this study, they are concerned with recognizing a certain context to generate an empirical and realistic truth from them.

Beliefs in mathematics instruction are more connected directly to genuine daily teaching (Burroughs & Schmidt, 2014). Explicitly, while teachers with traditional foundations in the form of beliefs and experiences are assumed to use didactic teaching practices, teachers with constructivist beliefs and experiences are more expected to use SCTL practices. Teacher beliefs and experiences must be considerably explored before supposing any modifications in teacher practices. As per Stebbins (2008a), "Researchers explore when they possess little or no scientific knowledge about the group, process, activity, or situation they want to examine but have reason to believe contains elements worth discovering" (p. 327). This should be considered as early as their university years in the teacher-education. As educators of various mathematics courses, this is crucial to us. Teacher beliefs are vital in mathematics teaching (Tang & Hsieh, 2014), are central to mathematics teachers' professional capabilities, and are critical to perceiving circumstances as they influence the adoption of behaviors (Felbrich et al., 2014). As per Blömeke (2014), in line with mathematics education, "… [teacher] beliefs are thought to guide perceptions and actions, they can be regarded crucial for the application of knowledge in classroom situations, and they can be conceptualized as a bridge between knowledge and teaching" (p. 9).

Future [preservice] teachers' beliefs can be fundamental to their view of situations in the classrooms and judgment on what sort of knowledge to use or in what way to react (Felbrich et al., 2014). As a socioculturally shaped mental construct, the teacher beliefs may serve as a means for understanding why and how things are done and should be. In light of the working definition of teacher beliefs offered by Skott (2015), the present researcher is interested in exploring and outlining patterns in preservice teachers' educational beliefs in mathematics teaching, taking into consideration teacher-centered and student-centered teaching-learning notions. As a Filipino mathematics educator and researcher, this study sought to address one issue: the educational beliefs of the preservice Filipino mathematics teachers in mathematics teaching.

Research Methodology

Research Design

Qualitative-exploratory research design was used in this study (Stebbins, 2001). It explored and outlined the teacher beliefs of Filipino preservice teachers in mathematics teaching. It started when the data were examined. As the data are being gathered, ideas emerge and are documented. The records were analyzed to refine usual properties into generalizations and concepts on the subject in consideration.

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Participants

The participants of this study were fourth-year teacher-education students enrolled in the Bachelor of Education major in mathematics program at a state university in Bulacan, Philippines, in the second semester of the 2022–2023 school year. This study used purposive sampling (Fraenkel & Wallen, 2009). The participants should be enrolled in a teacher-education institution. This study concentrated on the Bachelor of Education major in mathematics students with preservice teaching experiences. And so, only the available fourth-year mathematics preservice teachers were selected purposively from the mathematics program ($N = 28$). Of these participants, 10 (36%) were males and 18 (64%) were females. As for the ethical issues, respect for anonymity, informed consent, and voluntary participation were observed. An identification number was assigned to each participant.

Data Collection and Procedures

The researcher asked for consent from the Dean of the College of Education to administer the study and, after getting permission, started with the data collection. To generate meaningful patterns, three (3) tools were used patterned from the study of Yesilyurt (2022)—a metaphor construction task, a drawing task, and unstructured questions. The participants were requested to complete a metaphor construction task (e.g., A teacher is like __ because __. A student is like __ because __.). Next, they were requested to draw a classroom scenario associated with mathematics teaching-learning. Lastly, they were asked to explain their drawings, specifically the teaching-learning process and the keys and hindrances to success in schools. The preservice teachers were given sufficient time to complete the metaphor construction task, draw a classroom scenario of an ideal mathematics teaching-learning, explain their drawings, and share their insights on possible keys and hindrances to success in the school. The data were gathered in the second semester of the school year 2022–2023. The data were subjected to qualitative analysis.

Data Analysis

To analyze data, and since the study is exploratory, thematic analysis was implemented. "Thematic analysis is a method for identifying, analyzing, and reporting patterns (themes) within data" (Braun & Clarke, 2006, p. 79). Accordingly, there are six phases of thematic analysis: familiarize oneself with the data, generate initial codes, search for themes, review potential themes, define and name themes, and produce the report. While coding is a way of indexing or categorizing the text to establish a framework of thematic ideas (Gibbs, 2007), the themes capture something important about the data concerning the research objectives (Braun & Clarke, 2006). The researcher wrapped himself with the data, identified the set categories, and then tried to search for themes within each category (Efron & Ravid, 2013). Intercoder reliability checking was employed to substantiate how the data needed to be coded, i.e., measures of agreement between coders assessed through percent agreement (O'Connor & Joffe, 2020). The data are each categorized by the researcher and an external coder from the College of Education. From the first intercoder reliability check, the percent agreement obtained was 16 out of 28 (57%). The researcher notified the external coder of the results and settled possible differences before doing the second intercoder reliability check. From the second intercoder reliability check, the percent agreement was 26 out of 28 (93%). The researcher resolved the remaining differences with the external coder until the codes were settled.

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Research Results

To explore and outline the teacher belief patterns of preservice teachers in mathematics teaching in a Filipino context, at first, the participants were asked to complete open-ended metaphor construction tasks, i.e., "A teacher is like ... because ..." and "A student is like ... because ...". The researcher reads the responses several times to familiarize themselves with the data. Accordingly, the metaphors were coded as teacher-centered, student-centered, or mixed. The researcher, afterward, searches for initial themes. Based on thematic coding, four (4) themes emerge from the metaphors constructed by twenty-eight (28) participants. Teacher-centered beliefs referred to the metaphors, drawings, and unstructured data responses that implied teachers were *knowledge dispensers;* mixed beliefs indicated teachers were *reliable improvers* and *equity promoters*, and student-centered beliefs referred to implied teachers as *strategic scaffolders*. Of the teaching metaphors, eight (8) metaphors show the teacher as a knowledge dispenser, seven (7) metaphors as a reliable improver, eight (8) metaphors as an equity promoter, and five (5) metaphors as a strategic scaffolder (See Table 1).

Table 1
Themes Distribution of Teaching Metaphors from the Metaphor Construction Task

Teacher Beliefs	Main Themes	Metaphor Samples	Highlights
Teacher-centered	Teacher-as-knowledge dispenser belief (8)	knowledge dispenser, compass, library, book, writer, hero, actor	This theme highlights the imperative conduct of the dispensation of knowledge.
Mixed	Teacher-as-reliable improver belief (7)	smith, sharpener, chalk, sculptor, cookie mold, legacy	This theme highlights the formation of space for student participation after dispensing knowledge.
	Teacher-as-equity promoter belief (8)	gardener, water and sun, water sprinkler	This theme highlights the significance of addressing the needs of the students while dispensing knowledge.
Student-centered	Teacher-as-strategic scaffolder belief (5)	puzzle solver, artist's materials, open water, lighthouse, torch	This theme highlights combining, extending, and maximizing all knowledge, experiences, and learning opportunities to align with and attain learning objectives.

Teacher-as-Knowledge Dispenser Belief

From the first main theme, *knowledge dispenser*, preservice teachers holding teacher-centered beliefs viewed the teacher as a dispenser of knowledge that fills young minds with concepts they need to learn. Like a compass, the teacher leads students on the right path by giving them direction, motivating them to learn things they do not know, and showing them how to walk through. One must recognize that in this belief, without the teacher, no exact direction and instruction will help students achieve their desires. Like a library full of books, they bring knowledge and information to students to acquire new ideas and eventually change their views and behaviors. Just like a writer, the teacher is the one who writes and inputs knowledge to students until they become individuals full of wisdom and knowledge. Since the teacher teaches all that students need, students must be willing to listen and pay attention, i.e., absorb and attain new knowledge, skills, and behavior. The teacher views students as people with the potential for sufficient feeding. The teacher greatly influences student development, i.e., students who are willing to learn can learn, as many opportunities can be realized. Like a

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hero, the teacher performs the profession no matter how difficult. And like an actor, the teacher must appropriately uphold an image that society wants. Teachers must be cautious of their actions inside and outside school and be careful in dispensing knowledge via curricula and tasks (See Table 1 and Figure 1a).

Table 2 shows that the lack of confidence and support, fear, and high expectations from others believably contribute to accepting the teacher-as-knowledge dispenser belief among this group of students, i.e., heavily relying on teachers for knowledge by readily listening to and absorbing each lesson taught and resorting to working passively to acquire information and knowledge. In this belief [in students' perspectives], students give almost all their trust and confidence in acquiring and developing learning to substantially competent teachers. As an expectation, [in teachers' perspectives], students are assumed to obtain all the required information the teacher would like to dispense. *This theme highlights the imperative conduct of the dispensation of knowledge*.

Table 2
Some Responses that Show a Teacher-as-Knowledge Dispenser Belief

ID	#1	#24	#9
On Teaching-Learning Process	"The teacher provides knowledge that the learners acquire … [Learning] is obtaining new knowledge, skills, or ability that will bring change to the person acquiring it."	"For me, the teaching-learning process is a combined process where teacher assesses understanding needs, formulates teaching, and memorizing strategies and assesses the outcomes of instruction … Successful students always focus on the tasks at hand and always listen to the teacher."	"Teaching-learning process is a give-and-take process. The teacher gives knowledge to students while students take this knowledge … Learning is acquiring new knowledge."
On Hindrances to Class/School Success	"The following things hinder me from being successful in class … Lack of [teacher] support … low confidence."	"Expectations and fears that I might not be able to do my best in what I am asked to do in school … Expectations of other people …"	"Lack of confidence. I am sometimes afraid to try new things or showcase my talent or knowledge."

The teachers are the ones who prepare and teach the lesson. [Teachers] make sure that students understand and acquire new information. Students are the learners of the lessons that are prepared and taught by the teachers. They are expected to obtain the objective[s] … I don't have enough confidence to believe in my skills. Sometimes, I doubt myself. Even if I know that I can do it, there is something that makes me step back. (ID#26)

It is assumed that when an environment where no one is judged or criticized for committing mistakes, especially on complex concepts, is formed with a culture of appreciative individuals, i.e., it is well known to all that they are surrounded by people that will keep showing support and help, serving each one in reaching goals, assisting each other to go outside their boxes of comfort zones, just decreases students' pressures, turning a different perspective on academic failure, forming an extra level of a willingness to explore and learn among students.

I entered this school and class because I believe it will help me to grow and prosper as a future educator … I am afraid to go outside the box because I fear failing. I always work inside my comfort zone. I am worried that people will judge me when I commit mistakes. Then, I realized we would not learn if we didn't fail. If I fail, at least I try and learn something from it. (ID#8)

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Teacher-as-Reliable Improver Belief

From the second main theme, *reliable improver*, preservice teachers holding mixed teacher-centered and student-centered beliefs viewed a teacher as a reliable improver shaping, molding, and honing students towards becoming successful members of society. With this belief, students might not be ready to face life without teachers' assistance, support, and direction. By showering students with knowledge and honing their skills, the teachers can turn them into wonderful human beings, confident in showing the world how beautiful they are, and turn them into excellent obra maestras via their innovative, artistic, and creative imagination. Like smiths who derust and sharpen blunt swords, teachers are bound to their duties, though, at times, they are probably underrated and underappreciated as they work behind students. The teacher influences students through mind, heart, and soul. Like a sharpener, the teacher is the one who hones students' education. With the teacher, a generation will sprout from their innocence. Although students might be hardheaded and erratic, the teacher should not be annoyed because it is their role to cure ignorance. Like chalk, the teacher instills in the students with appropriate skills. Like a sculptor and a cookie mold, the teacher is the one who shapes students, identifying their strengths and weaknesses based on the tasks they have been given, forming consistency, infusing creativity, building their personalities to be good and acceptable in society, and developing them to know what is right and wrong, seeing them becoming more refined. As a comfort, good teachers are legacies that cannot be easily forgotten (See Table 1 and Figure 1b).

Table 3 shows that the lack of support, inspiration, and self-motivation believably contribute to accepting the teacher-as-reliable improver belief. As teachers strategize the class operations through various methods and follow stated class objectives, students undeniably desire some support that may help them stir their minds, e.g., through thought-provoking questions and tasks, with an amount of lightness, evident through the word 'smile.' Students appreciate the accommodating atmosphere that is established within the class. They desired teachers not to direct the floor constantly but, at some point, to let them explore and construct their own knowledge, i.e., letting teachers initially discuss related topics but allowing them to explore afterward. In this belief [in students' perspectives], students are assumed to analyze and construct knowledge, which will later be improved and refined through student participation after the teacher has dispensed necessary information. As an expectation [in teachers' perspectives], students are supposed to improve as teachers become reliable and consistent in safeguarding student participation. *This theme highlights the formation of space for student participation after dispensing knowledge*.

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Table 3
Some Responses that Show a Teacher-as-Reliable Improver Belief

ID	#7	#6 and #15
On Teaching-Learning Process	"… teacher makes a lesson plan according to a curriculum. [Teacher] has objectives meant to be achieved at the end of the lesson … the teachers will utilize methods to achieve the listed objectives … Teachers must not always be on stage. The students must be allowed to construct their own knowledge … I [as a student] best learn when reading a book or getting taught by a teacher wherein he/she provides thought-provoking questions. In short, I mostly learned when my metacognition skills were triggered by the lessons."	"Learning is gaining new knowledge from others and also from self … The teacher teaches, and the student listens first, then, exchanging ideas will be provided." "In teaching-learning process, a teacher and students are involved. In order for a student to understand the lesson, as a teacher, I let them answer on their own understanding after discussing the lesson … with a smile."
On Hindrances to Class/School Success	"I hate to say this because it is personal, [but] most of our family members are not the sort of people you can find some inspiration from. They are people who break the castle of success and confidence that I am slowly building … To the matter of financial support, I get no reason of becoming more contented in studying. It is because if I receive the things I want from them, there is no debate that I would have been more successful."	"[Pessimism] Being optimistic [helps] because there are problems, [and we must] learn to smile and face the other day … Laziness." "In my own opinion, I will be more successful in class or school by setting motivation. Another is creating my main goal to have a guide on what to do next to become successful … For me, procrastination hinders me from being more successful because every time I have something to pass, I always do it the night before. But I am now knowledgeable enough to leave that kind of trait."

I learn mathematics by writing lectures, listening to the teacher, answering math problems, and following the teacher when answering the examples … For me, it is important to praise the students so that they will be encouraged to answer … it is important that they [teachers] will have [safeguard] student participation in the class and will not bore the students. Also, having the participation of the students, it will help them [students] to follow what is being discussed, and they can know immediately where they are having difficulties, and they can ask their teachers to repeat the discussion or give tips on how to remember it easily. (ID#15)

To deal with student self-motivation issues, it is vital to highlight the value of discipline and focus on studies and its objectives among the students by having winning study habits. Giving tasks and activities with a particular goal may be considered to students requiring peer-to-peer interaction or, at least, teacher-student interaction, i.e., with a teacher beside them ready to check and facilitate learning processes during class exploration and discussion when deemed necessary. Lack of self-motivation seems to exist when they are alone, with a long due, without someone to check on them.

By paying attention to the ideas and objectives, it encourages us to improve our own quality of life and feeling of self-worth … There are barriers to being successful in school, such as lack of motivation, barriers in social, cultural, and beliefs. If students are not motivated in their studies, they tend not to be able to focus on school. In the 21st century, peer-to-peer learning in schools is now more important than ever. That's why interaction is important in every classroom … I realize that successful students are not [merely] smarter than other students. They're just more disciplined and focused, and they've developed winning study habits. (ID#16)

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Teacher-as-Equity Promoter Belief

From the third main theme, *equity promoter*, preservice teachers holding mixed teacher-centered and student-centered beliefs viewed the teacher as a promoter of equity, i.e., by being patient and persistent. Like a gardener who maintains the beauty and health of a seed and plant, a teacher sees potential in every student, especially those struggling, and helps them develop and grow. With this belief, teachers do not just blame the students if they are not growing well; i.e., they think of ways to help them grow. Students, like a sponge, have the potential to expand their understanding and skills by soaking up all the learning opportunities around them. The teacher selects and prepares the course lessons and tasks, deals with diverse students, and nurtures student academic growth through constructive feedback to ensure they develop a strong substance of knowledge and skills. The teacher provides the essential tools and resources to help them grow and develop. Although teachers wait patiently and sometimes experience struggles and difficulties in planting wisdom and knowledge in students, they experience joy and fulfillment when their students reach their full potential. Like water and sun, the teacher provides for the needs of the students by accommodating them with equity and not just equality, i.e., not just giving equal opportunities and resources to all students but varying support levels based on the need to reach a fairer result, acknowledging each has different circumstances, e.g., by considering assessing students through observation to be able to give them what they need. In time, students will eventually become fruitful trees the teachers have planted (See Table 1 and Figure 1c).

Table 4 shows that the manifestation of a willingness to participate can still be altered when, e.g., pressures triggered by fear and nervousness follow. These cases believably contribute to accepting the teacher-as-equity promoter belief. Given the imperative conduct of knowledge dispensation and the formation of space for student participation, if there are instances that they don't know what to do, the teacher must intentionally guide them. It is vital that teachers are ready to accommodate all potential queries of students during class discussions. The teacher must be prepared to move and provide for students needing individual support, guidance, or extra help. Teachers need to see the whole picture as composed of diverse students with different needs. While the students are being cooperative by participating in the discussion, it is crucial that the teacher is aware of how the students can understand the idea easily, i.e., they must be ready to clarify students' confusion in a more detailed manner when necessary. In this belief [in students' perspectives], students are assumed to seek help from teachers to address individual needs, i.e., answer their queries while the teacher dispenses knowledge when deemed necessary. As an expectation [in teachers' perspectives], students are assumed to receive equity from positive, patient, and passionate teachers. *This theme highlights the significance of addressing the needs of the students while dispensing knowledge*.

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Table 4
Some Responses that Show a Teacher-as-Equity Promoter Belief

ID	#28	#13
On Teaching-Learning Process	"It is important as a teacher to discuss and explain every single detail of a specific topic to a student, especially when it comes to mathematics. At first, the teacher will discuss the topic and then give examples … The next step is to make the students answer on their own. If there are instances that they did know what to do, the teacher will guide them to the correct answer. Like what we see in the drawing, the student wonders and does not know how to solve it, the teacher immediately guides the student to answer the problem, and if the student already learns the process of how to solve the problem, that's the time when the teacher will give their [recorded] activity in order to assess the students' learnings."	"In the drawing, the teacher is likely explaining a math concept to the students, possibly using visual aids or examples to help them understand. The students actively listen, take notes, ask questions, and clarify their understanding when necessary. The teacher may also be walking around the classroom, providing individual support and guidance to students who need extra help … The goal is to provide students with the knowledge and skills they need to succeed in math and help them develop a deep understanding of mathematical concepts they can apply to the real world."
On Hindrances to Class/School Success	"If myself is a great help for me to succeed in something, it is also a hindrance. I am the type of person who wants to try something, to do a lot, but I can't because I am always led by fear and nervousness. Like in math class, there are times that I know the answer, but I can't share it. I can't raise my hand to answer because I might make a mistake and be judged by others. But now, I think I can say that I have improved a lot. I gained more courage now to answer and share my thoughts with others though there is still a slight fear or nervousness, unlike in the past."	"Overall, I've learned that success in school requires effort, commitment, and self-discipline, and addressing these hindrances is essential to achieving my goals … I try my best to participate actively in class, ask questions, and take notes to ensure that I understand the concepts being taught. Building positive relationships with my teachers has been very beneficial for me. Collaborating with my classmates has also been helpful in my academic journey … Studying with classmates allows me to learn from others and gain different perspectives on the material."

As a mathematics teacher, the teaching-learning process involves assessing prior knowledge, setting clear objectives, using various instructional strategies, assessing students' understanding, and providing feedback. The goal is to facilitate student engagement, participation, and learning in a positive and supportive environment. The teacher also adopts the teaching approach to meet the needs of the diverse learners … provides resources and support to help students achieve their learning goals. (ID#3)

Teacher-as-Strategic Scaffolder Belief

From the fourth main theme, i.e., *strategic scaffolder*, preservice teachers holding student-centered beliefs viewed the teacher as a strategic scaffolder of learning, facilitating student learning and advocating student metacognition. Even though there are a lot of sources of information online, teachers, as puzzle solvers, fix and put away the student misconception. With this belief, students are responsible for their own learning, and both teachers, as coparticipants in the discussion, and students attempt to scaffold disconnected information, building ideas from it. Like an artist's materials, the teacher allows students to achieve their goals via scaffolding. Students are free to explore and swim in the vast area of education like a fish in open water. Like a lighthouse in a stormy sea, teachers serve as guides toward the safe harbor of knowledge and lead students in proper navigating through the rough waters of education. This indicates that teachers are believed to be advocates of metacognition. With patience and in the right

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conditions, not pressuring them to bloom, students will emerge from their cocoons as beautiful and confident butterflies, ready to take flight and face the reality of the world. Like a torch, the teachers distinguish themselves to guide others. Being a good teacher is quite challenging, as teaching entails assisting students in discovering the mysteries of the world. The role of the teachers extends beyond merely imparting knowledge (See Table 1 and Figure 1d).

Table 5 shows that the lack of will, drive to succeed, and lack of diligence believably contribute to accepting the teacher-as-strategic scaffolder belief. As a strategic scaffolder, the teacher inspires, motivates, supports, and, ultimately, educates students. This belief not just highlights the significance of addressing the needs of the students while dispensing knowledge by keeping an eye out for the warning indications of student troubles and concerns, but teachers allow students to discover things on their own from substantial learning opportunities. Teachers let students combine all the information and experiences to create and verify new knowledge and skills, trying to connect all disconnected concepts from the mind of the students, advocating metacognition. Teachers allow the students to develop the ability to make sound judgments. Teachers [possibly peers] provide temporary support like a scaffold, are sensitive to the strengths and weaknesses of students, and align with the learning intentions and given tasks. It assumes students learn more when working together with others who have a broader range of knowledge and skills than the student now does, i.e., it can be the teachers themselves or their peers. In this belief [in students' perspectives], students are free to express what they want, as errors and failures are not seen as hindrances but rather as a gateway and a scaffold to reaching next-level learning opportunities. As an expectation [in teachers' perspectives], students are assumed to be diligent in exploring unfamiliar things, learning in their own way, and maximizing learning opportunities, as each student is seen as unique and capable of learning. *This theme highlights combining, extending, and maximizing all knowledge, experiences, and learning opportunities to align with and attain learning objectives*.

Table 5
Some Responses that Show Teacher-as-Strategic Scaffolder Belief

ID	#17	#22
On Teaching-Learning Process	"In the teaching and learning process, both the teacher and the student play important roles. A teacher's job is to inspire, motivate, support, and educate students. They establish and create a welcoming environment, mentor and care for students, serve as role models, listen, and keep an eye for warning indications of problems. Students' roles are to learn the material being taught to them and, more crucially, discover methods to apply it outside the classroom … Learning is a lifelong process that involves converting knowledge and skills from information and experience … We develop the ability to assess information and make judgments based on it."	"When students are free to express what they want, this is a conducive classroom. Letting them learn in their own way because every child is unique."
On Hindrances to Class/School Success	"[Lack of will to succeed] is a significant obstacle for me because I frequently perform the bare minimum amount of work in the classroom … A lack of drive can frequently lead me learning merely for the sake of it.	"Not every time I'm diligent because [there are times that] bad habits are visiting me … They say that being diligent [masipag] is more essential than being wise [mahusay] … So being diligent will get you into anything."

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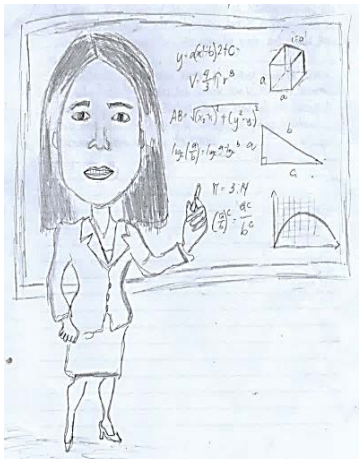
Learning for me is the process of gaining insights, abilities, attitudes, or behaviors through a combination of practical experiences, academic study, or guidance … A student is like a butterfly in a cocoon because they are still undergoing a transformational journey of growth and development. With time, patience, and in the right conditions, not pressured to bloom, they will emerge from their cocoon as beautiful and confident butterflies, ready to take flight and face the reality of the world. (ID#2)

Figure 1
Sample Drawings from the Drawing Task

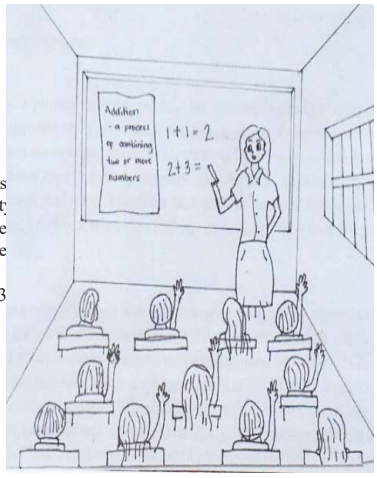
(a) Teacher-as-Knowledge Dispenser Belief

(ID#24)



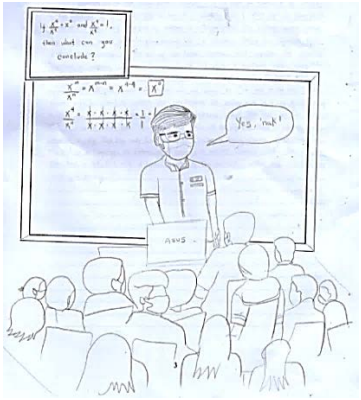
(c) Teacher-as Equity Promote Belie

(ID#13



(b) Teacher-as-Reliable Improver Belief

(ID#15 and ID#17)



(d) Teacher-as Strategi Scaffolde Belie

(ID#22

Discussion

Based on the study's results, teacher-centered beliefs referred to the metaphors, drawings, and unstructured data responses that implied teachers were knowledge dispensers; mixed beliefs indicated teachers were reliable improvers and equity promoters, leading classroom actions and students as active participants, although limited in learning processes; and student-centered beliefs implied teachers were strategic scaffolders. The teacher belief patterns are organized

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into several themes. From the first theme, the teacher-as-knowledge dispenser belief, preservice teachers holding teacher-centered beliefs viewed the teacher as a dispenser of knowledge that fills young minds with concepts they need to learn. In this belief, students give their trust and confidence in acquiring and developing learning to substantially competent teachers. As an expectation, students are assumed to obtain all the required information teachers would like to dispense. As stated by Ihedioha (2012) in her paper titled "Effectiveness of Transmitter of Knowledge and Conventional Teaching Models on Secondary School Students' Achievement on Circle Geometry and Trigonometry,"

> Teaching, as conventionally understood by a [traditional] teacher, is the act of disseminating information to the learner in the classroom. If we observe traditional classroom teaching, we find that either the teacher is delivering information or one of the students is reading from the textbook, and other students are silently following him in their own textbooks. [Conventional] teaching is simply chalk-talk approach in which students remain passive learners … *Transmitter of knowledge model* emphasizes the need to give pupils basic facts and information *before* they can be expected to think for themselves. They must learn what is already known before they can come up with any new ideas that might fit in with the existing knowledge. *The main characteristic of this model is the high degree of structure employed* … In short, the teacher views that it is the teacher that causes learning to occur, and classroom discipline is based upon *fear (*pp. 36-39).

From the second theme, the teacher-as-reliable improver belief, preservice teachers with mixed teacher-centered and student-centered beliefs viewed a teacher as a dependable improver shaping, molding, and honing students to become successful society members. In this belief, students are assumed to explore and construct knowledge and later be improved and refined through participation after the teacher has dispensed necessary information. As an expectation, students are supposed to improve as teachers become reliable and consistent in safeguarding student participation. As said by Ing et al. (2015) in their research paper titled "Student Participation in Elementary Mathematics Classrooms: The Missing Link between Teacher Practices and Student Achievement"

> First, student participation positively predicted student achievement. The more actively students participated, by explaining their own thinking and engaging with the ideas of other students, the higher were their achievement scores. Second, *teacher support of student participation* (TSSP) positively predicted student participation. The more frequently teachers supported students' participation, the higher were students' levels of participation. More specifically, the extent of TSSP directed to a specific student was related to the level of participation of that particular student. Third, the link between TSSP and student achievement is best understood as an indirect relationship through the mediating effect of student participation. Rather than impacting student achievement outcomes directly, *TSSP was related to student participation which, in turn, was related to student achievement* (p. 353).

From the third theme, the teacher-as-equity promoter belief, preservice teachers holding mixed teacher-centered and student-centered beliefs viewed the teacher as a promoter of equity by being patient and persistent. In this belief, students are assumed to seek help from teachers to address individual needs and answer their queries while dispensing knowledge when necessary. As an expectation, students are assumed to receive equity from positive, patient, and passionate teachers. As mentioned by Zevenbergen and Ortiz-Franco (2002) in their editorial titled "Equity and Mathematics Education" on the significance of addressing the needs of students,

> *Some students do not have the same access, success, participation, or retention in mathematics as some of their peers* … The practices of mathematics education come under scrutiny in terms of how they are implicated in the construction of different outcomes for different students. Thus, mathematics education is seen to be a 'political' act through which some students are more likely to be seen as successes

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and others not. By better understanding how [hegemonic] practices work to support particular ideologies of mathematics teaching and learning, *the mathematics education community is better positioned to develop practices that are more inclusive*. By shifting the focus of analysis to social practices in terms of how these are implicated in the construction of different outcomes for learners of mathematics, *mathematics educators are better able to understand and develop more socially-inclusive practices* (p. 151).

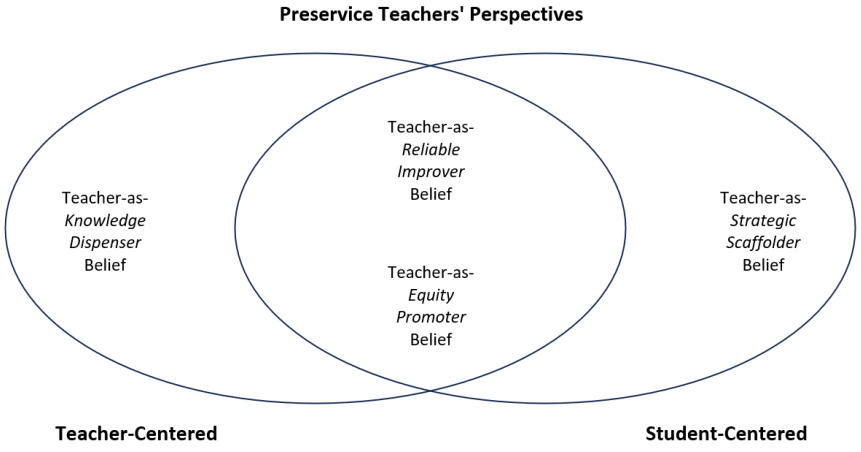
From the fourth theme, the teacher-as-strategic scaffolder belief, preservice teachers holding student-centered beliefs viewed the teacher as a strategic scaffolder of learning, facilitating student learning and advocating student metacognition. In this belief, students are free to express what they want, as errors and failures are not seen as hindrances but as gateways and scaffolds to reaching next-level learning opportunities. As an expectation, students are assumed to be diligent in exploring unfamiliar things, learning in their own way, and maximizing learning opportunities, as each student is seen as unique and capable of learning. As mentioned by Anghileri (2006) in her manuscript titled "Scaffolding Practices that Enhance Mathematics Learning,"

> Mathematics teaching is informed by the social constructivist paradigm for the teaching–learning process in which students actively construct meaning as they participate in increasingly substantial ways in the re-enactment of established mathematical practices. Marked changes from traditional teaching approaches are needed as the role of the teacher changes from 'showing and telling' to responsive guidance in developing pupils' own thinking. This guidance requires a range of support for pupils' thought constructions, in a way that develops individual thinking as well as leading to the generation of mathematically valid understandings … The notion of scaffolding also presupposes that learning is hierarchical and built on firm foundations (pp. 33-47).

Accommodating student participation and addressing student needs did not directly indicate outright student-centeredness. SCL demands the sharing of control from the teacher to the students, allowing them to operate on their own, enabling them to manage their own learning, and intentionally interconnect situations, experiences, and their prior knowledge in the construction of new knowledge through appropriate scaffolds and/or methodology until they reach the intended learning outcomes. For a visual account, based on the conceptualized teacher belief patterns organized through themes, a representation of educational beliefs of preservice Filipino mathematics teachers is presented (See Figure 2).

Figure 2

A Visual Representation of Preservice Filipino Mathematics Teachers' Educational Beliefs



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Conclusion and Implications

The first theme, teacher-as-knowledge dispenser belief, features the imperative conduct of the dispensation of knowledge; the second theme, teacher-as-reliable improver, highlights the formation of space for student participation after dispensing knowledge; the third theme, teacher-as-equity promoter belief, highlights the significance of addressing the needs of the students while dispensing knowledge; and the last theme, teacher-as-strategic scaffolder belief, highlights combining, extending, and maximizing all knowledge, experiences, and learning opportunities to align with and attain learning objectives. This emphasizes that the teacher-as-knowledge dispenser belief in mathematics teaching is more teacher-centered, the teacher-as-reliable improver and teacher-as-equity promoter beliefs in mathematics teaching are mixed, and the teacher-as-strategic scaffolder belief in mathematics teaching is more student-centered. It has been found and established in this research that focusing on the structure of accommodation for student participation as well as addressing the needs of the students did not imply outright student-centeredness. Student-centeredness requires the sharing of control from the teacher to the students, allowing them to operate on their own via scaffolds until they reach the intended learning outcomes or objectives. This study has some limitations. First, it only considered a small sample size, and second, the research locale of the study was within the Philippines.

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