Reading and Reflecting: Elementary Preservice Teachers' Conceptions about Teaching Mathematics for Equity

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Teaching mathematics for equity is critical because it provides opportunities for all students, especially those who have been traditionally marginalised, to learn mathematics that is rigorous and relevant to their lives. This article reports on our work, as mathematics teacher educators, on exposing and engaging 60 elementary preservice teachers (PSTs) in readings and reflection on various perspectives on teaching mathematics for equity. We drew on Brookfield's (1995) four critical lenses for reflection framework to select readings and create questions that required PSTs to critically reflect upon teaching mathematics for equity. An analysis of the reflections revealed a variety of responses as the PSTs critically reflected on equity, culture, and race in the context of mathematics teaching and learning. While some PSTs expressed teachers should be cognisant of equity when teaching mathematics, others were uncomfortable discussing equity related topics in the classroom. After critically reflecting on the readings and class discussions, the PSTs wanted to learn more and research different cultures so they would have a better understanding on how to integrate equity in their mathematics lessons.

Keywords · preservice teachers · critical reflection · equity · elementary mathematics methods course · conceptions

Introduction

For the past two decades, mathematics educators have conceptualised what it means to teach mathematics for equity (Gutiérrez, 2002; Gutstein, 2006) and ways to include cultural diversity in one's instructional practices. However, this conceptualisation has not fully filtered to what preservice teachers understand about teaching for equity. Teaching mathematics through an equitable lens provides access and opportunities for students to learn rigorous and challenging mathematics, while disrupting structural norms that occur in the teaching and learning of mathematics in the classroom and the community (Diversity in Mathematics Education Center for Learning and Teaching, 2007; Gates & Jorgensen, 2009). Teaching mathematics for equity is critical because it provides opportunities for all students, especially those who have been traditionally marginalised, to learn mathematics that is rigorous and relevant to their lives (Leonard & Evans, 2012; Rousseau & Tate, 2003). It has only been in recent years that mathematics teacher educators have documented efforts to prepare preservice teachers (PSTs) to teach mathematics with an eye toward equity (de Freitas, 2008; Koestler, 2012). Recently, Wager and Stinson (2012) edited the book, *Teaching Mathematics for Social Justice: Conversations with Educators*. While the authors of this book describe important approaches to guide teachers to teach mathematics for social justice, they also make it clear that "more work is needed in

understanding how to best support preservice teachers and in-service teachers in the endeavour of learning and teaching mathematics for social justice" (Koestler, 2012, p. 91).

This article reports on our work, as mathematics teacher educators, on exposing and engaging preservice teachers, through readings and reflection, to various perspectives on teaching mathematics through an equity lens. Our guiding research question was: How do two purposefully selected readings elicit preservice teachers' conceptions of equity in mathematics education?

Related Literature

Over the years, scholars have argued that reflection plays a critical role in the development of preservice and in-service teachers (Bjuland, Cestari, & Borgersen, 2012; Brookfield, 1995; Collier, 1999). Howard (2003) asserts, "Critical reflection requires one to seek deeper levels of self-knowledge, and to acknowledge how one's own worldview can shape students' conceptions of self" (p. 198). Critical reflection is prominent in culturally relevant teaching literature, where teachers analyse and reflect upon the influence of culture, race, and power in their teaching (Gay & Kirkland, 2003; Sharp, 2003). We conceptualise culture as shared patterns of behaviours, interactions, and ideas that are learned through socialisation. In the context of mathematics, Rousseau and Tate (2003) recommend teachers reflect upon how students' backgrounds influence their learning of mathematics and the role of mathematics in society. For example, Fernandes (2012) conducted an intervention with preservice teachers that supported them in developing strategies to instruct English Language Learners (ELLs) in an English-only mathematics classroom. The intervention focused on task-based interviews and the utilisation of Mason's (2002) noticing framework. The PSTs interviewed intermediate students (fifth and sixth graders) on four National Assessment of Educational Progress (NAEP) measurement tasks that potentially had linguistic challenges for ELLs. At the conclusion of the interview, the PSTs provided a detailed reflection paper based on Fernandes' guiding prompts. The PSTs recognised and discussed some of the linguistical challenges faced by ELLs in an English-only mathematics classroom.

There is a dearth of research specifically on examining the role of written reflections, especially in mathematics methods courses, which are courses focused on the pedagogical instructional practice that facilitate students' learning and understanding of mathematics. One exception is research on autobiographies, which have been used in mathematics content and methods courses (Drake, 2006; Ellsworth & Buss, 2000; Harkness, D'Ambrosio, & Morrone, 2007; Koestler, 2012). The purpose of autobiographies is for PSTs to reflect upon: their own experiences as mathematics learners, the influence of their past mathematics teachers, and their own conceptions about how mathematics should be taught.

Teachers' Understanding of Equity

Mathematics teacher educators have noted tensions that exist among preservice and in-service teachers who engaged in explicit equity-based experiences in mathematics (Bartell, 2013; de Freitas, 2008; Koestler, 2012; Rousseau & Tate, 2003). For example, (preservice) teachers struggled to adopt a non-neutral view of mathematics, and thus, found it challenging to create a mathematics lesson that integrates a social justice component (Koestler, 2012; Bartell, 2013). At the secondary level, de Freitas' (2008) PSTs observed three mathematics lessons and completed discourse analyses to develop a critical awareness of teacher-student classroom dynamics, but the PSTs had difficulty connecting their analyses to their own experiences and privilege.

Similarly, Bartell (2011) found that the in-service teachers who were enrolled in a graduate course focused on teaching mathematics for social justice experienced tension negotiating mathematics and social justice in their instructional practice.

Moreover, Bartell (2012) asked 13 preservice teachers' to critically reflect on two mathematics teaching vignettes and respond whether the vignettes centred on what is meant by teaching mathematics for social justice. The preservice teachers critically questioned the perspectives in the vignettes. For example, one vignette focused on the teacher telling the students in the class that they needed to design a wheelchair ramp for their high school. While many of the preservice teachers discussed how the vignette incorporated aspects of teaching mathematics for social justice, some of the preservice teachers critically questioned the need for the wheelchair ramp if the school did not have any students who needed the access. In addition, some of the preservice teachers critically questioned the fact that the students did not come up with the topic – instead it was imposed on them by the instructor. The vignettes allowed a space for the preservice teachers to critically reflect on whether the given scenarios were representative of teaching mathematics for social justice.

Rousseau and Tate (2003) found that many in-service secondary teachers also had narrow views of equity, which stemmed from a colour-blind perspective of students in mathematics. Teachers who assume the colour-blind stance indicate they do not "see" colour, and thus ignore students' racial identities. In fact, Rousseau and Tate argue, "a colour-blind approach requires a wilful ignorance of the impact of racism" (p. 213). Moreover, teachers who have a colour-blind mindset do not acknowledge racial patterns of achievements, particularly with students of colour. Rousseau and Tate claim there is a strong need to develop mathematics teacher reflections in relation to equity. We believe there is great value in creating practice-based experiences grounded in equity within mathematics education; therefore, we implemented readings and written reflections focused on equity-related issues in mathematics education in our methods course.

In this article, we argue that written reflections based on meaningful readings in mathematics methods courses can be used as springboards to discuss important topics, such as equity in mathematics education. In our experience, we found that PSTs are more open and honest in written reflections than in whole group discussions alone. There is less pressure in written reflections because PSTs have an opportunity to take their time to think about a topic and record their thoughts. PSTs also tend to be more honest if there is an open environment that invites answers that do not simply seek to present the "right" perspective. Written reflections provide insights for teacher educators to learn about PSTs' conceptions and build upon those pre-existing ideas.

Conceptual Framework

To elicit preservice teachers' perceptions of teaching mathematics for equity, we drew on Brookfield's (1995) four critically reflective lenses. The purpose of Brookfield's framework is for teachers to examine their own actions and assumptions through different lenses as part of the critical reflection process. The framework was primarily intended to realise a democratic education with in-service teacher development over time. Considering the preservice teacher stage of development, we adapted Brookfield's original lenses to apply to a teacher education context. The following four lenses were used to critically reflect on one's conceptions about teaching: self as a teacher and learner; theoretical literature; students' perspective; and classroom context. Figure 1 shows the interrelated nature of the four lenses and how examining one's conceptions about teaching through these lenses can help (preservice) teachers be more

critically reflective. Our goal was for PSTs to write about their conceptions of equity in mathematics education while taking the four lenses into consideration.

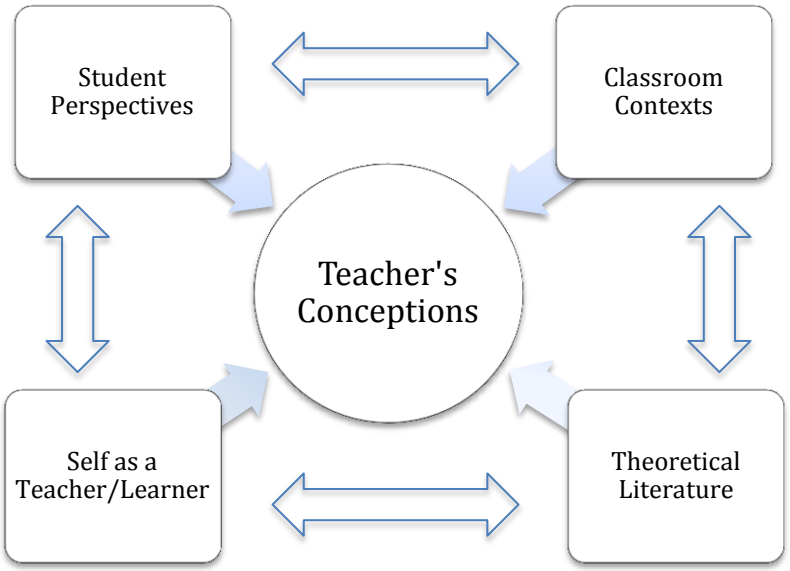

Figure 1. Four Reflective Lenses to Examine Teachers' Conceptions (adapted from Brookfield, 1995)

Self as a teacher and learner. Considering one's experiences and perspectives about teaching is an important aspect of becoming a teacher and recognising conceptions and actions that need to be examined. In their written reflection, PSTs were specifically asked to critically reflect on personal experiences and perspectives on teaching mathematics for equity.

Theoretical literature. Literature can provide multiple interpretations about a variety of situations and highlight important aspects of teaching. We selected two articles to provide a common context for PSTs to reflect upon and illuminate important aspects of teaching mathematics equitably.

Students' perspective. Considering students' understanding and views brings an awareness of one's conceptions and actions as a teacher. Students' perspectives should also be taken into account when making instructional decisions. For example, one article we selected on integrating culture and mathematics highlighted students' diverse views; thus, our goal was for PSTs to be able to consider students' perspectives, as presented in the article.

Classroom contexts. Considering various school and classroom contexts grounds one's conceptions and actions in a concrete setting. By taking colleagues, administrators, and curriculum into account, one is able to make more informed decisions. In their written reflection, PSTs were asked to consider their own practicum experiences and future classroom. The assigned readings also presented classroom scenarios.

Brookfield's conceptual framework has rarely been used as a central structure in mathematics education research. However, educational researchers have used it extensively to inform studies on and experiences in professional development (Webster-Wright, 2009), online learning environments (Bruning, 2005; Whipp, 2003), and mathematics methods coursework

(Ellsworth & Buss, 2000; Tait, 2006). It has also been used internationally to examine teachers' perspectives in terms of attitudes and beliefs (Ryan, Fraser, & Dearn, 2004; Ward, Clarke, & Horton, 2014), and critical educators who have an orientation toward equity (Brown, 2004; Florian & Rouse, 2009). The framework is not only applicable to a variety of educational contexts, but relevant for our teaching and research goals.

Methods

Context and Data Collection

Participants included 60 undergraduate preservice elementary teachers enrolled in a mathematics methods course the semester prior to full-time student teaching, which takes place during the final semester before graduating from the program. Among the 60 PSTs, there were 26.7% special education majors (n=16), 13.3% students of colour (n=8), and 6.7% males (n=4). The majority were white females, typical of elementary education majors in the programme at the university. We, the instructors, both identify as women of colour. More specifically, one of us is African American and the other is a Latina Asian.

As instructors who individually taught a section of the elementary mathematics methods course at a large public university in the southeast region of the United States, we came together to design an assignment with the goal of engaging PSTs in critical reflection on issues of equity in mathematics. Keeping Brookfield's (1995) framework in mind, our aim was to select readings that were not only theoretically grounded but also integrated classroom contexts and student perspectives. We selected two readings that would serve as an introduction to teaching mathematics for equity and created reflection questions to accompany the readings. The readings included: a) Secada and Berman's (1999) chapter titled *Equity as a Value-Added Dimension in Teaching for Understanding in School Mathematics*, and b) McCulloch, Marshall, and DeCuir-Gunby's (2009) article titled C*ultural Capital in Children's Number Representation*s. We purposefully chose these readings and asked the prompts in Figure 2 to learn about PSTs' conceptions of equity in relation to teaching for understanding and the role culture has in mathematics instruction. Moreover, the questions incorporated Brookfield's fourth lens by focusing on PSTs' reflections on themselves as future teachers and learners.

1. Read the *Equity* chapter. Reflect upon the following: The authors argue that teaching for understanding promotes greater equity. Do you agree or disagree with this argument? Why or why not? Please include a classroom example to support your response.

2. Read the *Cultural Capital* article. Reflect upon the following: In your classroom, what do you foresee as potential benefits and challenges of incorporating students' cultural and diverse backgrounds when teaching mathematics?

3. What new thoughts/ideas/questions did the readings raise for you in regards to teaching mathematics? OR In what ways did the readings build upon existing ideas you had about teaching mathematics?

Figure 2. Critical Reflection Questions

Prior to administering the assignment, the PSTs completed a five-week practicum experience where they were in elementary classrooms full-time. Although the overall practicum experience did not focus on issues related to equity in the mathematics classroom, we thought the practicum would provide the PSTs with more concrete experiences to draw upon and critically reflect within the *classroom context* lens of our conceptual framework. In their practicum, PSTs typically interacted with students who came from different cultural backgrounds than their own; thus, we wanted the readings and discussions to bridge the experiences in practicum with the mathematics methods course. Our aim with the cultural capital reading was for PSTs to develop an asset-based perspective about the students with whom they taught. In addition, *teaching mathematics for understanding* was a central topic throughout the course. By framing this topic within an equity perspective (Secada & Berman, 1999), we intended for PSTs to develop a stronger rationale for and solidify their commitment to teaching mathematics for understanding. After PSTs completed their written reflections, we followed up with a class discussion about the readings to allow for questions and further exploration of equity in mathematics education. While the classroom discussions were not an explicit part of the data collection or analysis, they were central to our mathematics methods course context. It was important for us to facilitate a discussion on the readings for PSTs to take multiple perspectives into account and connect the ideas to classroom experiences. Thus, we later provide more details about the classroom discussions in relation to the readings and reflections.

Analysis

The 60 written reflections, approximately two double-spaced pages each, served as our data. To analyse the written reflections, we used open coding by taking an inductive approach to discover themes that directly emerged from the data (Strauss & Corbin, 1998). To do so, we first read through all 60 reflections separately and wrote notes on the type of responses made and grouped them together. Then we came together to discuss the way the responses were grouped and created themes based on the data. We reread the reflections, added more detailed notes about the themes selected, and included additional quotes to support each theme. As another layer of analyses, we noted areas in which the four lenses of the conceptual framework were exhibited. For example, reflections often highlighted the "students' perspectives" lens presented in the readings along with observations in practicum experiences. Once we had a draft of our themes, two additional mathematics teacher educators reviewed the themes and supporting data to add clarity and content validity to the themes. In this review process, important questions were raised about the appropriateness of the themes and whether they were well supported with the selection of quotes. All discrepancies were resolved during the development of the overall themes.

After the PSTs completed their written reflections, we engaged them in a whole class discussion where they had the opportunity to share their thoughts and ideas from their written reflections with their peers. No additional prompts were given to the PSTs beyond what the PSTs responded to in their written reflections. During and after the discussion, we wrote analytic memos (Maxwell, 2005) on what the PSTs shared and how it did and did not correlate with the themes that emerged from their reflections. We discussed our analytic memos and agreed on the additional insight they provided into the PSTs' conceptions of equity in mathematics education.

Results

> True understanding allows students to take the knowledge gained and continue to think about and reflect on it in the years to come (Elementary PST, 2012)

The purpose of this study was to examine how two assigned readings elicited preservice teachers' conceptions of equity in mathematics education. The data analysis revealed three prominent themes: (a) making mathematics relevant for students; (b) focusing more on "mathematics" and not on students' culture; and (c) broadening perspectives on mathematics instruction. It is important to note that the PSTs' responses were not necessarily the desired or ideal responses, but they provided a lens into how the PSTs were critically thinking about and reflecting on issues of equity in the mathematics classroom.

Making Mathematics Relevant to Students

Eighty-five percent (n=51) of PSTs agreed with Secada and Berman's (1999) assertion that teaching mathematics for understanding promotes greater equity and claimed it could be achieved when teachers differentiate instruction.

> You can only have equity, or fairness, when you differentiate instruction. Yes, all students need to understand concepts that are taught to them, but all students are not on the same level…Students come from various backgrounds and cultures, and also from various socioeconomic backgrounds. A student's experiences vary from student to student…to be fair; students need differentiated instruction that is designed to meet the individual student's learning needs.

The PSTs further articulated that a mathematics class is equitable when *all* students understand the mathematical concepts. Although they realised it may take an extended amount of time, they expressed it was their responsibility that *every* student understood the mathematical concepts. It is interesting to note that while the PSTs stated that all students would be at different ability levels, some claimed students would learn the same content at the same time as it was taught. However, they further expressed that in order for all students to learn, they, as teachers, needed to allow students to use and share multiple strategies when solving mathematics problems and ensure the content was "relatable and relevant" to students. For instance, one PST provided an example about a class of inner city students and stated she would have a "difficult time answering questions in relation to savings bonds, or hired help because they are inexperienced in those areas. When the students cannot relate to the problem they are less likely to be able to solve it."

On the contrary, not all of the PSTs agreed all students should and can be taught for understanding. "I feel that in the general education classroom it may promote more fairness, but not amongst the at-risk and special education students. I feel that teaching for understanding isn't possible with all students." Another PST stated, "I will be teaching students with learning disabilities. I will not expect them to think on a higher level than what is needed to understand the basics of what is being taught to them." It is interesting to note that some of the PSTs expressed that students who received special education services cannot learn mathematics with understanding. Instead, the instruction needed to be explicit and focused on procedures. This deficit perspective of who can and cannot learn mathematics with understanding is alarming, and the PSTs claimed it was up to the educators to "decide what is best for ALL individuals." While this was well intended, it is important to consider the criteria or standard used to judge whether students can learn mathematics with understanding.

The sentiment of over half of the PSTs was that all students should be taught for understanding. They defined *all* to include students from different socio-economic backgrounds

and students with disabilities. A PST remarked, "Math activities and lessons should not just focus or be applicable to white, male, and middle to upper class families. Cultures and backgrounds of other groups of students need to be focused on just as often." Thirty percent (n=18) of the PSTs argued if teachers do not consider students' socio-economic background and culture when designing and teaching mathematics lessons, the instruction will "limit…[and] create less equity for students." One PST expressed the general consensus of the thoughts of his/her peers:

> Your background shapes how you think and how you view the world. Each individual's experiences create different understanding and a different way to see things. If we do not teach for each student's understanding, then we are leaving students out. If we leave students out, we are making public education unfair…We as teachers must cater to each of our students by getting to know them a[nd] becoming aware of their learning needs. This article made me realise that math is definitely something that students learn differently because of their background. Experiences shape understanding of numbers, and therefore everyone might not think of numbers the same way.

As a result, the PSTs expressed that they should not use the same approach to teach mathematics to all students. If they did, they realised they would lose over half of their students because students have different abilities and learn at different rates. One PST provided an example from her field experience:

> I was in practicum there [sic] was a Hispanic child who struggled with math and never truly grasped concepts. From analysing that information, one would believe that he had some sort of special need but in reality, it was his background that challenged him. If a teacher would have focused on that, they would realise that the boy just needed individualised help.

Although the PST was able to distinguish the differences between the Hispanic student potentially being viewed as having a "special need", it is unclear what the PST meant when she stated it was the background of the student that provided the challenge in understanding mathematics. Was the PST assuming a deficit perspective of the Hispanic student's background? Or, perhaps, the PST was implying the teacher should use the student's funds of knowledge to help the student understand the mathematical concepts. One PST explained it this way, "It will be beneficial to incorporate students' diverse backgrounds into teaching math because it will help the teacher understand how the students learn mathematics, which will then help them learn how to teach the students better." More specifically, 45% of the PSTs (n=29) claimed students would understand mathematics better when their culture was included. They further asserted that as teachers make connections between mathematical concepts and students' culture, students would be more motivated to learn the mathematical content. They would be engaged and participate more in the mathematics classroom. Students would be more apt and comfortable to share and discuss their mathematical strategies with their peers.

The PSTs realised they must be open and comfortable discussing issues of diversity in their mathematics classroom.

> Cultural identity is very important to everyone and to incorporate that into your mathematics instruction is to engage students on their own personal level. It allows students to think about mathematics in a context that makes sense to them and make it relevant to their lives. To acknowledge and embrace the diverse cultural backgrounds of students is to validate the concerns and thoughts that they already [have] regarding race, ethnicity, socio-economic differences and more. Diverse cultural identities are a basic part of living in our society and students need to be accustomed to that on many different levels, including mathematics.

One PST remarked that teachers who associate race with culture foster separation among groups of students, but later acknowledged, "I feel…when students come in your class, they don't leave their culture at the door, they bring it in with them. I feel that I would have a lot I could learn from them as well as their peers." The PSTs expressed that as they feel comfortable, their students will feel more comfortable and realised it strengthens "teacher-student and student-to-student relationships in [the mathematics] classroom," as well as help students learn the mathematical concepts. One PST admitted, "Math was a subject that I thought did not need cultural material because it was all about numbers," but now she realised that including culture in mathematical lessons may help eliminate some barriers students may have when learning mathematics. While 75% of the PSTs (n=45) made a connection between the two readings and wrote that the integration of culture in the mathematics classroom was another way for students to access and understand mathematics, some did not share this perspective. The reflections data within this theme primarily overlapped with the conceptual framework lenses of *student perspectives* and *classroom contexts*.

Focus More on Teaching "Mathematics"

Some PSTs stated that mathematics teachers should not focus so much on students' culture and background because "it may take away attention from the subject, math." Instead, teachers should be concerned about how they would accommodate students in the mathematics classroom. "I think that teachers should mostly worry about accommodations as far as students' understanding needs rather than their cultural needs."

The PSTs emphasised that one should not just include a student's culture for the sake of including it in the mathematics lesson. Instead, if a student's culture is included, it should be included with a purpose in mind. The inclusion of students' culture needs to be well thought out and meaningful to the mathematics lesson, which was a challenge for some PSTs because linking culture and mathematics was not the norm for them.

> After spending some time thinking about it, I can only think of a few ways to incorporate the two. Culture and diversity could be tied in to math when using word problems and data, but how could this be used when teaching concepts in algebra and geometry?

Moreover, 12% of the PSTs (n=7) wrote about the practical struggle of considering an additional factor when planning their lessons because they were used to their traditional routine of writing the objectives, procedures, and assessments. "I'm so used to doing things one way; it might be hard for me to adjust to doing this."

Other PSTs expressed that if they focused on a particular culture during their mathematics instruction, some students may feel singled out, embarrassed, isolated, or detached from the subject matter. For example, a PST stated, "It might benefit students if their culture is represented in the lesson, but it might also hurt or confuse other students if they are also being asked to learn about elements of someone else's culture." In fact, 30% of the PSTs (n=18) remarked that incorporating culture in mathematics might create misconceptions and stereotypes. For example, an African American PST stated her culture did not play a role in how she learned mathematics. Instead, she learned mathematics from her teacher as she was taught the step-by-step process for solving problems. She mentioned that although her culture was not incorporated in the mathematics lesson, she still felt she was a part of the class. She further elaborated,

> I don't like when people point out that I am different from Joe and therefore think differently than Joe because often they think ONLY Joe can think that way and that I'm incapable of that.

> This isn't true of course. I think too much culture may end up bringing stereotypes in your classroom. I think it's more important to stay away from this aspect.

It appears the PST claims that if teachers incorporate students' culture and background it could lend itself to essentialising a student's cultural background because teachers may have to make a lot of assumptions about the student. Similarly,

> If you assume all African American students will understand the connections you are trying to make in your lesson, it can lead to a misunderstanding because they may not; this goes for all cultural accommodations teachers may try to make in their classroom.

Another PST stated that when teachers focus on students' backgrounds, it "hinders teaching" because "teachers get caught up on where the child came from [and] may overlook the student's capabilities." Instead, teachers should primarily focus "on the curriculum and effectively teach that in a way that will engage the students and allow them to learn."

Fifteen percent of the PSTs (n=9) argued that incorporating culture within mathematics instruction would take a lot of time and effort to plan and implement effectively because they may not know enough or have correct information about a student's background to adequately use it in the classroom. Consequently, 10% of the PSTs (n=6) acknowledged that it is their "natural tendency to look at everything from [their] cultural perspective" because they are not knowledgeable or open minded about their students' culture. It would be challenging for them to extend themselves to teach "outside" of their cultural norms. "It may be difficult for teachers to leave their OWN opinions and cultural background from influencing their students." A PST elaborated,

> It is hard not to be narrow minded into your own cultural background and teach only in a way that makes sense to you. You have to open up your mind and try to understand other cultures and what other students might be experiencing. It will be hard to understand the learning needs of students from diverse backgrounds and to teach in ways that they might understand…All I know are my own experiences.

In some reflections, PSTs expressed mathematics instruction should focus only on mathematics content, and others argued that culture and mathematics should be separate because it was not the teacher's role to integrate the two.

Although 85% of the PSTs (n=51) agreed that culture and students' background (i.e., socio-economic status) are important, some PSTs contended that these issues should not be discussed in the mathematics classroom. Instead, they argued that

> We should leave it up to the parents and other people outside of the school to teach the low-income students about the social service agencies and other things they may find necessary to fit their lifestyle, just like we should leave it to the upper class parents to teach their children.

Not only did some of the PSTs suggest these types of discussions should take place at home, they also mentioned that if they did incorporate their students' culture and background, some parents may "question" their teaching of mathematics. One PST stated, "I honestly could see someone saying that I am being racist by catering solely to the students' culture and diversity." Furthermore, another PST acknowledged, "It [students' culture] may be a challenging concept to teach because there may be some parents who teach their children to be stereotypical or racist towards a certain group of people." Not only did the PSTs comment that parents influence students' stereotypical views, but they also remarked that movies and video games play a role on how individuals are perceived. Sixteen percent of the PSTs (n=10) argued that the mathematics classroom is not an appropriate place to spend time incorporating students' cultural background, but articulated it is more appropriate in other subjects.

> In this article, the teachers encouraged creativity while doing the math assignments and students were able to bring their own cultures and lives into the classroom. While this may be excellent for other school subjects, I feel that it is not necessarily important to be done in during math.

While some PSTs resisted the notion of integrating students' background in their mathematics instruction, the majority showed an appreciation for equity-related topics in mathematics they had not previously considered. The *self as a teacher and learner* lens was prominent within this theme as PSTs negotiated the tension between teaching mathematics and including culture when teaching mathematics.

Importance of Broadening Perspectives

Prior to completing and reflecting upon the readings, 35% of the PSTs (n=21) had not thought about how to connect culture with mathematics. Although many of them were aware of the necessity to incorporate students' backgrounds in the classroom and how teachers should not be colour-blind, they did not realise the importance of doing this in a mathematics class. One PST stated, "I had not really thought about these ideas specifically in regards to mathematics before." Thirty-five percent of the PSTs (n=21) commented that they were unaware of how culture could be implemented in mathematics lessons, but after reading the articles, their perspectives were broadened. One PST remarked, "It did not cross my mind that cultural diversity and backgrounds have effects on mathematics, but when I really think about it, it makes a lot of sense." They were able to see how students were able to include their culture as they learned mathematics.

The PSTs realised that students, even at a young age, are not only accepting of differences, but they are also aware of them. The following comment expressed by one PST was a similar sentiment of several PSTs:

> These students did incorporate their class's culture into their pictures, drawings, and graphs without even being asked. It made me realise how much our students do notice things like race, ethnicity, religion, family situations, etc. between them and their classmates. They see how they are similar and different from each other because they are interacting so closely with each other every single day. They don't ignore the differences and they aren't too young to understand them, like some may think.

The PSTs realised that since students are not colour-blind or culture-blind, they should not be either. Instead, as teachers, they also need to be cognisant of students' differences.

> This article put things in perspective for me and helped me realise that since the students notice the differences among them, I also need to as well. While teaching, I need to attend to those differences and incorporate culture because it's important to them.

After reading the *Cultural Capital* article, 30% of the PSTs (n=18) realised they did not have the resources and recognised they were not equipped with the necessary knowledge to include culture in their mathematics lessons. One PST discussed her practicum experience and stated she had a difficult time incorporating diversity in her mathematics lesson. She was able to include students' names in mathematical word problems, but realised this was not enough. Yet, other PSTs stated that a good way to incorporate students' culture and diverse backgrounds was by implementing several "measurement activities and surveys of the different students in your classroom," while other PSTs stated an effective instructional strategy was to use story problems that incorporated students' interests. Forty-five percent of the PSTs (n=27) acknowledged it would be challenging to include culture in their mathematics lessons. But, if they did, it would make them "a better teacher." They expressed they needed to know the

"right kinds of questions to ask" so the questions are not controversial. A PST stated her concern:

> I just don't want to label other students by their race or background…I am nervous because this is an awkward situation to be put into, and I want to make sure that I correctly handle the situation. This is just a touchy subject.

Although 10% of the PSTs (n=6) expressed the topic of race was a "touchy" subject, it was important that we, as mathematics teacher educators disrupt this narrative. We were able to do this as we discussed the ramifications of being colour-blind. Moreover, the PSTs emphasised that they would like to extend their professional learning by investigating ways they could learn and research more on integrating culture and diversity within their mathematics lessons because they did not want to be "afraid or intimidated." Many of the PSTs were left wanting to learn more after engaging in the reading and reflecting on the articles, and we, as mathematics teacher educators, were focused on how we could disrupt the negative conceptions that were prominent in the reflections. Data in this broadening perspectives theme integrated all of Brookfield's (1995) lenses by taking the literature into thoughtful consideration.

Preservice Teachers' Class Discussion

After our PSTs completed the assigned readings and reflections, we conducted a whole group class discussion. During the discussion, all the themes presented in the results section were mentioned and additional questions were raised about how to approach issues of equity in mathematics. The PSTs who "voiced" a deficit viewpoint in their reflection were given the opportunity to listen to their peers' arguments related to how the readings positively influenced their thinking. During the discussion, both positions were discussed, and we minimally intervened in the discussion. We thought it was important for our PSTs to openly discuss these issues and share their conceptions related to issues of equity in the mathematics classroom. We empathised with some of their concerns and highlighted beginning strategies that PSTs should focus to implement more equitable practices in their mathematics lessons, such as: 1) being aware of and making an effort to understand students' diverse backgrounds; 2) taking an asset-based perspective of students' backgrounds and building on prior knowledge; and 3) providing opportunities for *all* students to use multiple strategies and share their thinking. While not all PSTs agreed with the perspectives discussed in the assigned readings, they were exposed to other viewpoints and articulated their conceptions and thoughts related to the ideas presented in the articles. Although various viewpoints were raised during the discussion, and examples considered, we do not believe the conceptions of all PSTs were changed. We do believe; however, that the open discussion challenged their beliefs and created a springboard into further critical reflection on these issues. As mathematics teacher educators, it is important to establish an environment in which PSTs feel comfortable discussing topics that are considered "atypical" in a mathematics methods course. Preparing PSTs to teach for equity in their mathematics classrooms is an important tenet to discuss in a methods course because many PSTs revealed dissociation between equity and mathematics. It is imperative that PSTs see the connections among teaching for understanding, culture, and mathematics so they can adequately and effectively teach all students from diverse backgrounds.

Discussion

Our guiding research question was: How do two purposefully selected readings elicit preservice teachers' conceptions of equity in mathematics? Eliciting such conceptions on teaching mathematics for equity provided fertile grounds to develop productive perspectives through continued discourse. The preservice teachers claimed every student had the right to learn and understand the mathematics taught in the classroom. While some PSTs thought teachers should be cognisant of equity when teaching mathematics, others were uncomfortable discussing equity related topics in the classroom. "I honestly could see someone saying that I am being racist by catering solely to the students' culture and diversity." Some PSTs were concerned that if they taught with an equity focus, they might "hurt" or "confuse" their students.

It was beneficial to take Brookfield's four critical lenses for reflection into consideration when developing this assignment and classroom experience. By doing so, PSTs' were expected to critically reflect on issues of equity from students' perspectives, the classroom context, and their own background as they read the literature. To facilitate elementary students' mathematical learning, many preservice teachers acknowledged the importance of making mathematics relevant for the students by including students' culture and background within mathematics lessons. PSTs' responses varied on the role of culture and diversity in the mathematics classroom. Although PSTs stated attending to students' cultural diversity and background was important, some commented, similar to Ahlquist's (2001) findings, it was not appropriate for the mathematics classroom. Therefore, tension existed in PSTs' reflections on teaching mathematics for equity (Bartell, 2012; de Freitas, 2008), as some PSTs viewed the two topics were disjointed and argued they must be kept separate. For example, a PST remarked, "While this may be excellent for other school subjects, I feel it is not necessarily important to be done during math." Other PSTs argued teachers should be focused on making accommodations to help students understand the mathematical content instead of focusing on students' cultural needs. Moreover, they articulated it was the responsibility of the parent(s) and "other people outside of school" to teach "low income students about the social service agencies and other things they may find necessary to fit their lifestyle." These findings show the importance of not only focusing on issues of equity in the mathematics methods courses, but aligning it with PSTs' practicum experience as well.

Although some PSTs expressed mathematics should be kept separate from students' culture, after reading and critically reflecting on the articles, many PSTs became interested in including students' culture and background in teaching mathematics. According to one PST, "I really liked the idea of teaching with culturally relevant material in math, which is not something I had previously considered. Math was a subject that I thought did not need cultural material because it was all about numbers."

After reading the articles, many PSTs realised it was necessary to incorporate students' background and diversity in the mathematics classroom.

> The biggest thing that [was] brought out of these articles was that diversity and differences should be talked about in math. We have discussed these ideas in social studies and English, but incorporating them into the math curriculum is interesting and beneficial to the learners.

The articles stimulated interest in the PSTs wanting to learn more and research different cultures to give them a better understanding on how they could integrate these topics in their mathematics lessons.

As mathematics teacher educators, we need to continue to provide opportunities for PSTs to develop and deepen their understanding of how to teach mathematics effectively to *all*

students. Our work begins to fill the gap identified by Koestler (2012) on ways we, as mathematics teacher educators, can support our preservice teachers to critically reflect on issues of equity in the mathematics classroom. Using purposeful readings that highlight classroom contexts, critical reflections, and discussions can guide mathematics teacher educators next steps in developing PSTs' ability to reflect on and integrate critical issues related to equity in the mathematics classroom. We must make a concerted effort to provide PSTs opportunities to engage in critical reflection on teaching mathematics for equity. By adapting Brookfield's (1995) four critically reflective lenses to a preservice teacher education context, we were able to create an assignment that made use of literature to build and extend PSTs' knowledge of students from diverse backgrounds and consider students' perspectives in teaching mathematics.

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