

Culturally Responsive Mathematics Teaching

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Abstract

This research project examines effective strategies for teaching students of different cultures in the mathematics classroom. As the number of students with multiple cultural backgrounds grows every year, the teacher's need to understand this and respond to it is crucial. In the literature teaching strategies that are culturally responsive are suggested to motivate and improve students' critical thinking and allow students to better solve problems. In my paper the main focus is to give the reader a better understanding of what culturally responsive mathematics teaching is, examples of how it could inform a mathematics lesson, and how the lack of these practices can limit students' learning in mathematics.

Introduction

Growing up in a middle-class environment, I was raised to be accepting of all people regardless of their background, ethnicity, or gender. I was also raised in an area where there was not much of a cultural difference in school, until I got to high school. I have never been put in a situation growing up where I felt in danger or in an uncomfortable setting. Some may think with my background and my inexperience with individuals of different cultures than mine that becoming a culturally responsive teacher may be difficult for me. However, through my research I know that learning to teach in a culturally responsive way is a necessary task. The goal of culturally responsive teaching is to create a successful learning environment for all students, no matter their ethnic, cultural, or linguistic backgrounds.

During my undergrad years in college, I took a class titled “Exploring Socio-Cultural Perspectives in Educational Contexts.” This was a required course, however I still felt like it could teach me valuable information to becoming a successful educator. Given the rapidly changing demographics in our state and country this course was intended to equip future teachers with the fundamental knowledge of understanding culture and teaching children from diverse backgrounds. In this class, we discussed different cultures and their lifestyles. I learned that it can be challenging when it comes to teaching someone of a different culture than your own. As a future mathematics educator and after taking several mathematics classes, I know how difficult it can be when it comes to teaching the subject of mathematics by itself to a student of the same culture as you, let alone a student of a different culture. This class helped spark my idea for my senior capstone project. I became excited to research and explore the idea of becoming an educator that can culturally respond to his or her students in an effective way. As a future mathematics educator, learning how to effectively teach diverse students the subject of mathematics is imperative. Students tend to feel more secure in their studies, as well as included

when they are able to learn in a culturally relevant classroom due to the teacher's acceptance of students' cultures. I think cultural differences between people helps us understand that those differences do not have to be barriers between teachers and students, but rather opportunities to learn about others and use this as a basis for building on students' knowledge and experiences.

Educational researchers have proven time and again that culturally responsive teaching methods increase student achievement. So if our teaching is not culturally relevant, then we as educators are not relevant (Chike Akua).

My goal in this Capstone project was to examine the role of culture in learning mathematics. I also wanted to identify culturally responsive teaching strategies that will help a teacher better understand culturally responsive teaching. Thus, I have built my studies and research around these main questions that I have proposed:

How prevalent is culturally responsive mathematics teaching involved in K-12 classrooms?

How do we incorporate these practices into mathematics teaching?

Literature Review

In deciding upon what literature I would read to help examine my studies, I began to search for anything in the realm of mathematics education that had been previously written about race relations and culture. I felt this would be the most relevant place to start. What I found were some very interesting ideas formed out of research that I could take and apply to my study. This was important so that I was not just doing research based on my own perceptions and feelings. Before I entered into the area of mathematics education, I wanted to specifically look at what it means to learn. I came across a theorist named Lev Vygotsky. Vygotsky helped form the foundation of much research on the theory of cognitive development. He mainly focused his studies on the connections between people and the socioculture context in which they act and

interact in shared experiences. His specific theory, also known as the Social Development Theory states that social interaction has a vital role in the cognitive development process. He places more of an emphasis on culture and how it can affect or shape the cognitive development. He also believes that social learning tends to precede development.

As I continued my research, I came across some findings heavily related towards mathematics and educational beliefs with culture reviews. On the topic of racial equity, legal notions date back to the days of Aristotle;

There are two kinds of right and wrong conduct towards others, one provided for by written ordinances, the other by unwritten... The other kind [the unwritten kind] has itself two varieties... [of which the second variety] makes up for defects in community's written code of law. This is what we call equity; people regard it as just; it is, in fact, the sort of justice which goes beyond the written law. (Aristotle 350 B.C.E)

This shows how long racial equity has been a topic of issue and still remains one as well. The National Council of Teachers of Mathematics has a set of principles and standards for school mathematics. One of those principles is the Equity principle. It states that "Excellence in mathematics education requires equity – high expectations and strong support for all students" (NCTM). So what does this mean? We want all students, regardless of their personal characteristics, backgrounds, or physical challenges, to have opportunities to study and learn mathematics with the support they need to do so. Different researchers may use alternate definitions for equity, but the central idea is how research in mathematics education can be used to help in understanding and identifying inequalities, determine possible causes for the inequities, as well as strategies to reduce the disparities and effects of these inequalities. Among all the research that I discovered, there were several definitions of how culturally responsive or

culturally relevant teaching is defined. The one I found most useful in my research was defined by Gloria Ladson-Billings in her book titled *The Dreamkeepers*. Ladson Billings defines it as “a pedagogy that empowers students intellectually, socially, emotionally, and politically by using cultural referents to impact knowledge, skills, and attitudes” (Ladson-Billings, 1994, p. 17-18). In other words, the goal of culturally responsive teaching is to create a successful learning environment encouraging to all students, no matter their ethnic, cultural, or linguistic backgrounds. Also, participating in culturally relevant teaching essentially means that teachers are creating a bridge between students’ home and school lives, while still meeting the expectations of the district and state curricular requirements. Mathematics is composed of historically, culturally, socially, and politically situated practices that are diverse as any other human activity. It is argued that this generation’s curriculum theory and practices are driven by socio-cultural pressure instead of thoughtful analysis. The term culturally relevant began to appear in the 1970s. It has been defined in different ways as of today. Some believe that culturally responsive teaching practices can only occur when the teacher and students are from the same cultural background. Some define it as having some bearing on importance issues, events, or the current state of society. The term culturally relevant has also been interchangeably used in different ways such as: culturally relevant pedagogy, culturally congruent, and culturally responsive teaching. Any of the variations are accepted. Sonia Neito, a professor that is experienced in teaching students of all levels and from many cultural backgrounds, reinforces the idea that culturally relevant teaching practices encourages and supports the student’s cultural differences. These differences that student’s bring to the classroom can also help support the daily teaching practices.

Mathematics has always been the subject that students tend to struggle with the most. A ninth grade student from Chicago stated:

I thought math was just a subject they implanted on us just because they felt like it, but now I realize that you could use math to defend your rights and realize the injustices around you... [N]ow I think math is truly necessary and, I have to admit it, kinda cool.

It's sort of like a pass you could use to try to make the world a better place (Freida, ninth grade, Chicago Public Schools).

As students go through school there tends to be a detachment with mathematics that causes them to believe that math is a miserable experience that does not make sense to them. Due to this, teachers begin to believe that culture is not something that should be integrated and applied to in mathematics teachings (Gutstein, Lipman, Hernandez, and de los Reyes, 1997). Mathematics curriculum is only relevant to those who are learning it, therefore the students. Thus we can note the importance to recognize the cultural differences of the students for whom they are and apply those teaching practices accordingly. Some say that teaching mathematics in a culturally responsive way may concern others that the controversial social issues being implemented in mathematical lessons may “take precedence over learning “rich,” rigorous mathematics” (Ravitch 2005). However, allowing these culturally relevant teaching practices in the classroom can help connect the significance of home and school experiences as well. Gutstein and Peterson stated that “Engaging students in mathematics within social justice contexts increases students’ interest in math and also helps them learn important mathematics” (Gutstein & Peterson, 2006, p. 4). The work of today’s teachers is embedded in cultural contexts that shape the way students experience schooling. There are specific teaching practices that support the inclusion of culture and include certain ways to develop a closer fit within a student’s home and the school. These

are referred to as culturally responsive pedagogy. “Teachers cannot easily do social justice mathematics teaching when using a rote, procedure – oriented mathematics curriculum” (Gutstein & Peterson, 2006, p. 4). We do not want to deposit information into student as a teacher centered approach. For it does not foster the kind of reflection we want out of the students. We want to do what we can to pull the knowledge out of the students. Let them make their connections with mathematics and use their creative minds to do that. It is imperative for teachers to use mathematics in solving real-world issues. Mathematics can be used as a tool to show the importance of issues in our society today. A good example of what a culturally responsive lesson may look like is called “Deconstructing Barbie” by Swapna Mukhopadhyay that is explained in Gutstein’s book *Rethinking Mathematics: Teaching Social Justice by the Numbers*. In this lesson, the students are given a Barbie doll and are asked: What would Barbie look like if she were as big as you? The students work in groups to construct what a real-life sized Barbie’s measurements would be so they can scale it with the measurements of the doll. Once traced on paper, the actual size a student and the scaled measurements taken from Barbie, you immediately can see the unrealistic dimensions that Barbie portrays. This activity can lead to discussions on the image that society is portraying and the several issues that come with it. When it comes to preparing teachers to teach in culturally responsive ways, it allows a connection to be made with the significance of the student’s home and school experiences. Noting the importance of culturally responsive teaching is important in the fact that as a future teacher I can apply these practices to my future teaching style.

Methods

This research study was designed to understand what culturally relevant mathematics looked like and view how teachers can become more culturally responsive to their students. My

goal in conducting this Capstone Project was to examine contemporary culturally responsive teaching in mathematics in the Georgia College Community. I analyzed my interpretations so that I could learn to be a more culturally responsive teacher to my future students. Decisions were made by me concerning how my data was going to be collected, presented, and kept confidential. My data was collected in this study by using qualitative research methods incorporating interviews of professors and written responses to questions via email. The data was intended to be collected through interviews with multiple professors from my university and in other institutions in the University System of Georgia. I supplied five interview questions pertaining to culturally responsive teaching as well as my main research question. Each interview question was carefully written to help analyze and further my research process.

Analysis

A primary goal of this research project was to examine the role of culture in the learning of mathematics and to identify strategies to better understand on how to become a culturally responsive teacher. Due to certain circumstances that I will discuss later, I was able to interview two participants that happened to be professors at Georgia College. The responses that each participant used were similar to the other. The interview questions that guided this process were:

1. What is your definition of culturally responsive teaching?
2. Does culture matter in teaching and learning?
3. How do race and culture impact your perceptions about students? And how do they impact your practice?
4. In your opinion, what are effective culturally responsive teaching practices?
5. Do you believe that today's mathematics Common Core provides opportunities for students to have cultural expression where their voices and experiences are incorporated into their daily learning? Why or Why not?
6. How prevalent is culturally responsive mathematics teaching involved in K-12 classrooms?

As said before, the responses provided by my participants in my study were consistent with much of the research I did as well as they reflected upon each others. With the first question, I

just wanted to get a sense of what the participants knew. I wanted to see what they knew about culturally responsive teaching. So I asked What is your definition of culturally responsive teaching?

- In a nutshell it is using the culture of students to situate mathematical learning.
- I would define such teaching as allowing the background and culture of a student to be a proactive or focused rather than a reactive or peripheral component of the classroom. Such practice allows for an empowerment rather than a hindrance to their learning.

After reviewing these two responses I realized that indeed these two professors had an idea of what culturally responsive teaching is. My question was whether they implemented those practices or not. My next question I examined was: Does culture matter in teaching and learning?

- When students know that you care about them as a person, including their culture, they care more about what you want to teach them.
- I believe that it does very much matter. Unfortunately many people are unwilling to address the issue or are not cognizant of its importance.

Both professors brought up very valid points with their responses to this question. When it comes to teaching mathematics or any subject for that matter, when the teacher takes the time to reach the next level of understanding in their student's cultural background, the student will become more interested and appreciative of what the teacher is trying to teach them. Also with the second response; this participant presented a very viable response that not many researchers would have thought of. Later on I will discuss more on this topic of teachers being unwilling to

address these issues. The final question that I took into consideration was my research question: How prevalent is culturally responsive mathematics teaching involved in K-12 classrooms?

- I don't have empirical data, but I fear that it is not very prevalent. ... I think many are uncomfortable even engaging in open conversations about the topics that are controversial, especially when they involve politics, race, culture or religion.

This response and the second one from the previous question were both from different participants and they both implied that it is something not many are comfortable to talk about. What I found in analyzing these responses is that culturally responsive teaching is known about in the educational world, but the matter of whether it is implemented into classrooms is the issue.

As said before when it came to collecting data for this project, I struggled. I came across the problem that the professors and other participants who I intentionally reached out to because their stance on culture and education did not want to volunteer to be a part of my study. Like I said, of the multiple potential participants asked, I was only able to receive consent from two. I had some potential participants respond with choosing not to participate where as I had others who did not respond at all. However, there was one participant that responded saying that they had provided articles to answer each of the interview questions. This person said that "the questions are great questions but require rather complex responses." In the responses I did receive from my interview questions, I think that probable reasons for this might be the language barrier. The possible participants were afraid of saying the wrong thing when it came to cultural aspects of teaching their students. Therefore, I was left to analyze and speculate about the silence when it came to evaluating my data and the data that I did not receive. In summary, these professors' educational responses reflected the needs of cultural students and their needs.

Implications

At the beginning of this research project, I was interested in knowing different cultures and how to approach them when it comes to teaching mathematics. I feel that research in the realm of culturally responsive teaching is necessary for all educators.

In general, gradually shifting toward a more culturally responsive pedagogy involves new and flexible approaches to teaching and intense personal learning. Both teachers and students need to assess such change for its genuine possibilities and to comprehend its effect of their self-interest as well as what they collectively value. Initially there may be little certainty about the kinds of processes or outcomes that may ensue and less assurance that they will be any better than the status quo. These are legitimate issues that deserve careful attention (Ginsberg, Wlodkowski, 2009, p. 69).

One critique I would have concerning this project would be the need for more time. Given my time constraints and the non-availability of participants volunteering put a hindrance on this project. However, without the lack of response from participants, I would not have discovered that this topic is a much more sensitive subject than I thought. Simple tasks that teachers can implement to develop culturally responsive teaching practices is to proceed carefully and gradually, learn with others, create an action plan, be kind to yourself but do not let yourself “off the hook,” be prepared for doubt and anxiety, be prepared to teach mathematics as more than just rote procedures and to share with others (Ginsberg, Wlodkowski, 2009, p.34-35). Overall, what I wish for teachers to know and understand about culturally responsive teaching is that they should view their students’ home cultures and languages as a strength, view their strengths as something to build on versus looking at their cultural backgrounds as something which to compensate (Gutstein, Peterson, 2006, p. 3).

References

- Aristotle. *The works of Aristotle: Rhetoric*. Translated by W.R. Roberts. Oxford University Press. Reprint. Philadelphia: Franklin, 1981.
- Gay, Geneva. *Culturally Responsive Teaching: Theory, Research, and Practice*. 2nd ed. Teachers College, 2000. 289. Print.
- Greer, Brian, Swapna Mukhopadhyay, Arthur B. Powell, and Sharon Nelson-Barber, eds. *Culturally Responsive Mathematics Education*. Routledge, 2009. Print.
- Gutstein, Eric, and Bob Peterson, eds. *Rethinking Mathematics: Teaching Social Justice by the Numbers*. Milwaukee, Wis.: Rethinking Schools, 2005.
- Ravitch Diane. "Ethnomathematics." *Wall Street Journal*, June 20, 2005. Retrieved from <http://online.wsj.com/article/0,,SB111922877339463719,00.html>.