

8-31-2023

## Examining the Change in Preservice Mathematics Teachers' Conceptions and Effectiveness of Social Justice Content

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### Recommended Citation

Downing, Gregory A. and Black, Brittney L. (2023) "Examining the Change in Preservice Mathematics Teachers' Conceptions and Effectiveness of Social Justice Content," *Journal of Research Initiatives*: Vol. 8: Iss. 1, Article 9.

Available at: <https://digitalcommons.uncfsu.edu/jri/vol8/iss1/9>

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## Examining the Change in Preservice Mathematics Teachers' Conceptions and Effectiveness of Social Justice Content

### About the Author(s)

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### Keywords

Mathematics Education, Social Justice Pedagogy, Preservice Teachers



## **Examining the Change in Preservice Mathematics Teachers' Conceptions and Effectiveness of Social Justice Content**

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### **Abstract**

This study examines preservice teachers' perceptions of teaching mathematics using social justice topics to make mathematics accessible to all students. Situated at a large, public, predominantly White institution in the southeast United States, where preservice teachers are not required to take a course on teaching diverse populations, participants were asked to respond to questions surrounding their experience with a mathematical social justice activity adapted from Gutstein and Peterson (2005). Using a mixed methods approach in analyzing data from pre-and post-surveys, researchers could compare preservice mathematics teachers' initial views of teaching mathematics for social justice after participating in an intervention/activity on world wealth and population disparity. Results showed that although preservice teachers' attitudes shifted from more general statements to somewhat more concrete ideas surrounding the classroom environment, these students are still apprehensive about using this form of pedagogy in the future.

*Keywords:* Mathematics education, social justice pedagogy, preservice teachers

### **Introduction**

Previous research has shown that students from backgrounds not within the dominant culture benefit from activities where they can relate content with the real world (Sleeter, 2012). Suppose preservice teachers have no notions or background knowledge about social justice or whose cultural sensitivity is deficient (as seen by some predominantly White institutions attempting to serve underrepresented populations). In that case, they risk entering a classroom of people who do not look like them and cannot connect with the students in these schools (Baily et al., 2014). Preservice teachers should be more cognizant of teaching a diverse population of students through social justice techniques. The purpose of this research study was to see what if any, knowledge preservice teachers had about topics within social justice and to see if they see

the importance of using social justice in their classrooms. Furthermore, this study examined preservice teachers' perceptions of using social justice content in mathematics classes. We want to target preservice teachers, and the following research questions served as guideposts for this study: (1) What are preservice teachers' initial conceptions of teaching for social justice? (2) How do preservice teachers view the concept of social justice and its role in mathematics education? (3) After the intervention, what are the changes in the initial conceptions of preservice teachers on teaching social justice in mathematics?

### **Literature Review**

#### **Social Justice**

While there is a growing body of literature that theorizes the importance of social justice in education (Ayers, 2009; Brion-Meisels, 2009; Chen & Horn, 2022; Michie, 2009; Reynolds, 2009; Torres, 2009), there has been limited understanding of how such theory translates into practice. Researchers have tried to address how teachers engage with social justice curricula in various forums and with various types of students (Dover, 2009; Hackman, 2005). Facilitating opportunities for university students to reach their full potential requires exposing them to a wide range of experiences, both in and out of the university environment. Social Justice allows students to be intellectually and sometimes politically challenged while allowing them to be creative and innovative (Carnicelli & Boluk, 2017).

#### **Equity/Diversity and Preservice Teachers**

While diversity increases among the student population in public schools, the population of preservice teachers remains homogeneous – predominantly White, female, and middle class (Carter Andrews et al., 2019; NASEM, 2020). One of the challenges for teacher education preparation programs is preparing preservice teachers to teach diverse student populations. An attitude of *naive egalitarianism* is prevalent among preservice teachers. This means that "preservice teachers believe each person is created equal, should have access to equal resources, and should be treated equally" (Causey et al., 2000, p. 34). Preservice teachers with these beliefs may lack an understanding of multicultural issues and disregard the effects of past and present discrimination (Causey et al., 2000; Finney & Orr, 1995).

To prepare preservice teachers for diverse student populations, teacher education programs develop multicultural education or diversity courses to address broadly defined issues

such as race, class, ethnicity, gender, culture, disability, sexual orientation, and so forth (Garmon, 2004). Prior literature states some challenges teacher education programs experience preparing preservice teachers to teach diverse student populations (Azano et al., 2019; Civitilla et al., 2018; Lambeth & Smith, 2016). However, there needs to be more research on teacher education programs using culturally responsive pedagogy, such as social justice pedagogy, to prepare preservice teachers to teach diverse student populations.

### **Teaching Mathematics for Social Justice**

Averill et al. (2009) argued that for teachers to engage in culturally responsive teaching effectively, they need a deep understanding of mathematics. They need to value open relationships and cultural knowledge and embrace a flexible approach to teaching that allows opportunities for implementing change. This occurs in numerous mathematical learning contexts and involves a responsive learning community. Perhaps most important is the ability to work within a cross-cultural teaching partnership (Nelson-Barber & Estrin, 1995). Having sociocultural consciousness (Villegas et al., 2017) is essential to this process. Having affirming views of students from diverse backgrounds is paramount (Gay, 2018). Once one can see themselves as responsible for and capable of bringing about change to make schools more equitable, then we can understand how learners construct knowledge and can promote knowledge construction (Villegas & Lucas, 2022).

Prior literature also tells us that if we genuinely wish to teach mathematics for social justice, we must attend to the "intersectional nature of justice itself" (Larnell et al., 2016). This is the idea that justice in one area (policing, housing, and wealth) is linked to other issues. With that, teaching mathematics for social justice cannot be scripted or packaged as something that will work for all students in all locales (Leonard et al., 2010). The effort to better equip the next generation of teachers begins with these preservice teachers becoming more "self-aware, reflective, and understanding of the future populations of children that they will be held accountable for very soon" (Sanders et al., 2014, p. 184).

As students' mathematical ability increases, their understanding of how society works increases (Gutstein, 2003; Downing & McCoy, 2021). Of the research that has been conducted, very little of it has commented on the challenges that preservice teachers face with such pedagogy and their possible reactions to it. However, studies suggest that preservice and in-

service teachers need help to enact their social justice aspirations due to multiple factors that fall outside of their wanting to do so, including strict standards-based and uniform curricula (Dover, 2013; Picower, 2011).

### **Theoretical Framework**

Moving toward critical mathematical literacy emphasizes the development of knowledge, practices, and discourses for transformative purposes (Tan et al., 2012). These transformative purposes come from Freire (1970), which tells us that education should provide opportunities to understand, challenge, and recreate preconceived understandings of the self and the world. This study utilizes the synthesized framework for Deepening Social Justice Teaching (Sleeter, 2015) as the framework in which this research is situated. This framework synthesizes the components of centering the discussion around families and communities by focusing on structural inequalities and developing relationships, teaching with high expectations by building on students' cultural backgrounds, and creating "an inclusive curriculum that integrates marginalized perspectives and explicitly addresses issues of inequity and power" (p. 3). This study explicitly focuses on the last dimension of creating such educators through social justice pedagogy. This study aims to show preservice teachers how teaching mathematics for social justice can provide rich discussions that can build a bridge between the real world and mathematics.

### **Methodology**

#### **Research Design and Context**

This mixed methods research used a convergent mixed methodological design (Creswell & Plano Clark, 2018). This approach is the most appropriate methodological design for this study because it combines qualitative and quantitative data in explaining and exploring phenomena. This design allowed for the ability to answer research questions using a variety of approaches to data collection.

#### **Context**

This research was carried out at a large public, predominantly White institution in the southeast of the United States. From Spring 2017 until Fall 2019, students were enrolled in either an introductory sophomore-year mathematics education course or a mid-level junior-year mathematics education methods course. Of 40 students who took these courses, 29 completed pre- and post-surveys. Of these students, 22 were in the sophomore course, while seven were in

the junior course. Participants included 12 males (41%) and 17 females (59%) whose ethnicities were reported as 3 African Americans (10%), 3 Asian (10%), 1 Hispanic (3%), and 22 White (76%). All students were majoring in Mathematics Education (either middle grades or secondary education).

### ***The Courses***

The introductory methods course was entitled *Introduction to Teaching Mathematics*, while the advanced methods course was *Teaching Mathematics in Senior High School*. Both courses met one day a week for 75 minutes. At the end of the class, the week before the intervention, students discussed the following two questions as a group: 1) *What is social justice?* and 2) *How do teachers teach for social justice in their classrooms?* This was done to introduce the students to the topic of social justice if this was the first time they had heard of the term.

As described above, the courses are taken during students' sophomore and junior years. The decision to collectively use the responses of both courses as a single case because students effectively have had the same number of courses that focus on diversity and equity issues – and that number is zero. There are no "diversity" courses students must take to complete their major requirements. Students are often relegated to one or two "diversity day(s)" in their courses in which some elements of diversity and equity are discussed. This was a significant part of the rationale for this study. As will be discussed later in the Results section, responses from students on both courses were consistent.

### **Data Collection**

Data collected in these courses were considered a normal part of course activities where students received a completion grade upon finishing. In the class before the activity, students were instructed to complete an eight-question open-ended pre-survey (created by the authors and one additional person who constituted the research team) that gauged students' beliefs on what they think it means to teach mathematics within a social justice context. In the survey, three of the questions were demographic. Four qualitative questions required students to explain their thoughts on social justice and social justice mathematics pedagogy. Those questions included: *What does it mean to teach for social justice?* And *How do you think teachers teach for social justice in mathematics?* The final qualitative question was a follow-up question asking students

to explain their selection from a Likert-scale agreement statement that students had to answer. *I can see myself teaching mathematics using Social Justice topics.* The pre-and post-surveys were identical, except the post-survey asked an additional question: “*How have your views about teaching mathematics for Social Justice changed since completing the pre-survey?*” with a request to explain their selection.

### **Intervention**

In the class, after completing the pre-survey, students participated in a mathematics activity within a social justice context (adapted from Gutstein and Peterson (2005)). This lesson was chosen as the intervention due to the appropriateness for this university's potential students: middle grades and high school preservice teacher candidates. Instructors of all sections of this course typically utilized several interactive and team/group activities to model in their courses. They were interested in this particular social justice activity when the researchers (carrying several options) approached them. During the lesson, students worked together (in small groups) to complete an activity utilizing proportions and ratios to explore the vast wealth differences between countries worldwide by combining mathematics, geography, writing, and social studies. The activity allowed students to describe and formulate power and wealth disparities conjectures. During the activity, students received a blank map of the world where they had to guess how many people were in each continent/region.

They then created proportions using the actual number of people in each continent/region with the number of students in the classroom to make a mathematical representation on their maps. Students then went through a similar process, but this time for wealth in the world. They represented these proportions with the number of edible treats provided (again, equal to the number of students in the class). Throughout this activity, students had to work individually and in small groups to compute the ratios and proportions and explore the vast differences between where most people live and where most wealth resides. Ultimately, through small and large group discussions, the activity connected students' feelings to the data on world wealth and whether our current world structure was “fair,” what the definition of “fair” was, and who gets to decide what “fair” is. During the intervention, the teacher facilitated the transition from one aspect of the lesson to the next by asking guiding questions that got students thinking about certain aspects of the activity. At the end of the activity, the teacher facilitated students in a more



extensive discussion about teaching mathematics for social justice. After this "intervention class," students completed a post-survey mirroring the pre-survey within three days so that the students would have ample time to reflect on the lesson and the activity.

## **Data Analysis**

### ***Research Questions 1 and 2***

Analysis of these research questions relied on qualitative data sources from the surveys. The authors analyzed data from the pre- and post-surveys. Analysis of the qualitative survey data began with theory-driven coding (DeCuir-Gunby et al., 2012), in which the authors used the conceptual framework to code each statement students made on the survey. With this, a thematic analysis revealed several themes aligning with the conceptual framework: i) General (general elements of the conceptual framework), ii) Culturally Responsive Practices: Curriculum and Skills, iii) Culturally Responsive Practices: Caring Educator, and iv) Community Partnerships. Next, the authors independently grouped the codes into these four thematic categories. To gain reliability, two members of the analysis team independently coded, and a third person familiar with the study context mediated dialogue to address the differences, after which the team agreed on the codes. Codes from these were then refined, and a codebook was created.

### ***Research Question 3***

Analysis of research question three relied upon the qualitative and quantitative questions of the pre-and post-surveys. This analysis began with analyzing the Likert question, which occurred using descriptive and nonparametric hypothesis testing via statistical software to see what, if any, changes could have occurred because of the intervention. To explore these results, a follow-up survey question was analyzed. Analyses of the qualitative question occurred similarly to research questions one and two with theory-driven coding. A second pass at this data occurred using open coding of in vivo codes because the theory-driven codes did not fully conceptualize what had been said by respondents (Strauss & Corbin, 1990). Axial coding and a thematic analysis revealed four profiles of students that aligned with the quantitative analysis that included: i) Convinced: I feel confident; ii) Willing: Without divisive topics; iii) Resistant: Too hard for math and iv) Resistant: "Inappropriate."

### ***Positionality***

As briefly explained above, one of the authors taught one section of the course in which data was collected. As a researcher and instructor, we acknowledge that the validity of this study hinges on the premise that students were not swayed or pressured into giving favorable responses during the collection of this research or its interpretation. During the intervention for this course, the primary instructor did not lead the intervention to help reduce perceived bias towards students. Students knew their responses would not be looked at after submitting their final grades to help reduce bias.

Our perspective on teaching mathematics for social justice is an important endeavor that should be pursued. Although confined by departmental common syllabi and lesson plans, this work will convince leaders and stakeholders to infuse more lessons like this to positively affect teacher candidates' dispositions that flow through this program. In our typical classes, we have not enacted such social justice pedagogy at this particular university; we have during other teaching appointments. No matter where we teach, it is crucial to utilize culturally responsive teaching practices in hopes that our preservice teachers will do the same in their future classrooms.

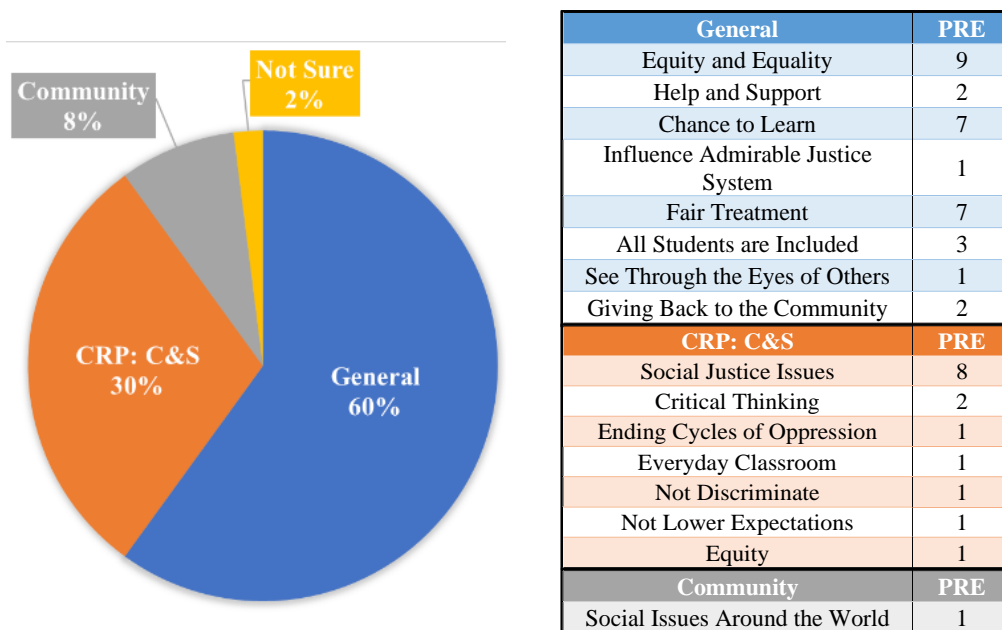
## **Findings**

### **Research Questions 1 and 2**

Preservice teacher responses were placed into three categories: General, Culturally Responsive Practices, Curriculum and Skills, and Community Partnerships (Figure 1). Initially, students needed to be more confident and knowledgeable of the question: *What do you think it means to teach Social Justice?* In the pre-survey, 60 percent of the students described general elements of the framework using statements about what it means to teach social justice related to issues of equity and equality of individuals (General). Of the remaining responses, 30 percent of the preservice teachers talked about how social justice would look within a teacher's classroom (Culturally Responsive Practices: Curriculum and Skills) (CRP: C&S), and 8 percent explained how teaching social justice would look with the community in mind (Community). [Some of the responses are included to add context.]

**Figure 1**

*Responses to question 4: What do you think it means to teach for Social Justice?*

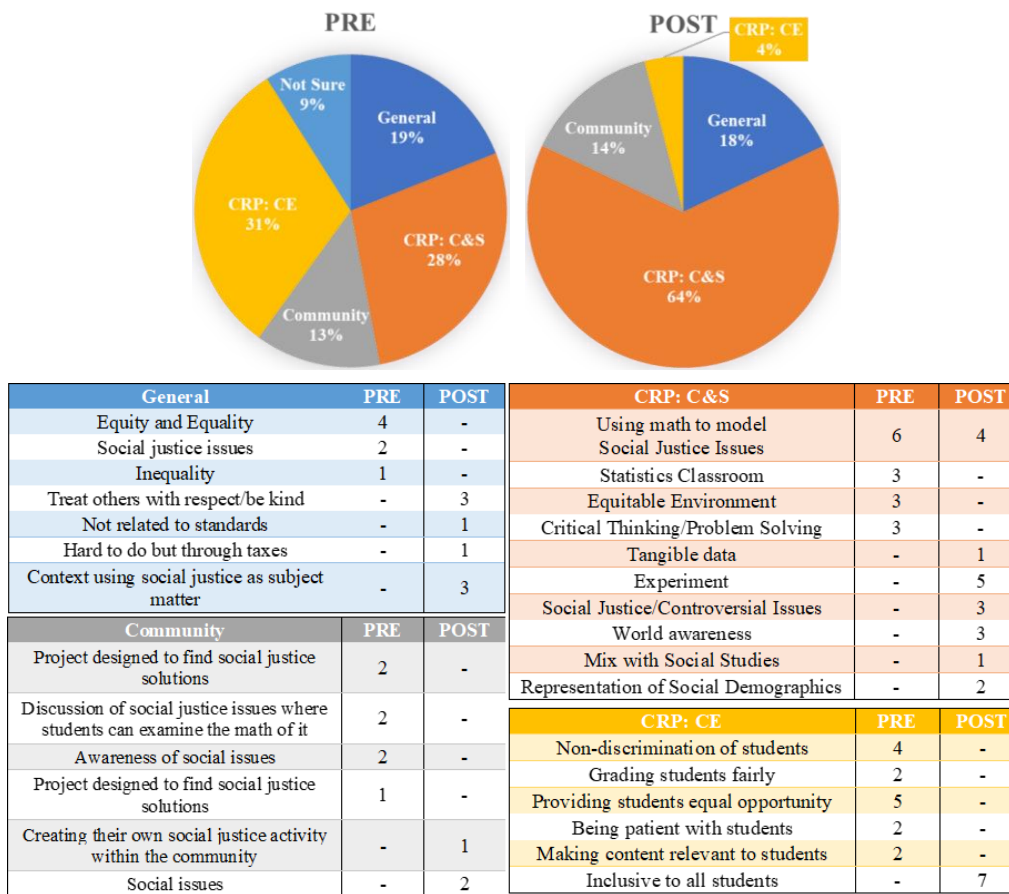


For the following question: *How do you think teachers teach for Social Justice in mathematics?* Student responses were placed into the same categories as previously mentioned, and a "Culturally Responsive Practices: Caring Educator" (CRP: CE) category was added (Figure 2). The CRP: CE category included responses where participants referred to teacher-student or student-student interactions as teaching for social justice in the mathematics classroom relies upon trust, caring, and empathy for people. For the pre-survey, 31 percent of the responses were placed in this category, followed by 28 percent of responses in the classroom category. Additionally, 19 percent were general statements again that utilized terms central to the conceptual framework that offered no context with the words).

In comparison, 13 percent highlighted interacting with the community to teach social justice in mathematics. The post-survey results for this question show a shift in the preservice teachers' responses. Of the participants' responses, 64 percent related to classroom practices and the teacher's role in creating such an atmosphere, while only 4 percent related to these caring and empathetic practices. The community and general categories were consistent with the pre-survey responses.

**Figure 2**

*Responses from question 5: How do you think teachers teach for social justice in mathematics?*



**Research Question 3**

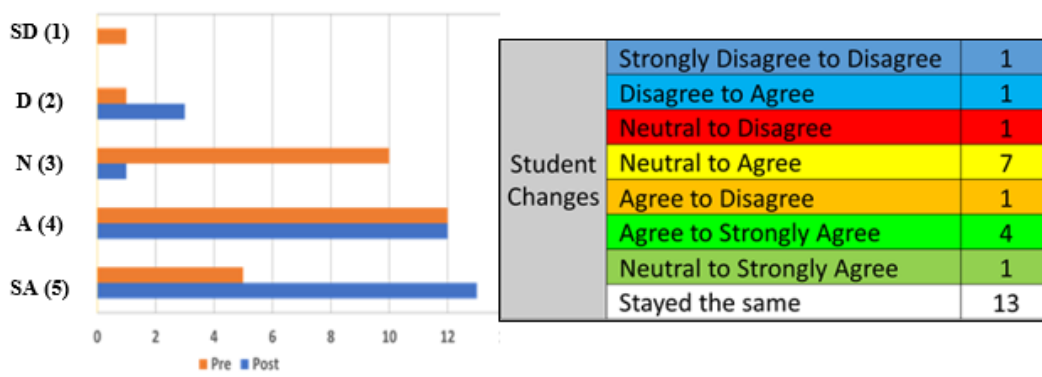
Question six was *when I could see myself teaching mathematics using social justice topics*. This quantitative question addressed research question three (left side of Figure 3). After participating in the intervention, overall, students were more positive and open to integrating social justice topics in the mathematics classroom. Most student responses on the post-survey moved from more general statements to statements that were more directed and focused on the classroom, teacher, and student. What was more interesting was the actual movement students exhibited from the pre- to post-survey (right side of Figure 3). The upward movement included seven students who shifted from *Neutral* to *Agree*. Four students went from *Neutral* to *Strongly*

Agree. One from *Neutral* to *Strongly Agree* and one from *Strongly Disagree* to *Disagree*. There were, however, two downward movements from *Agree* to *Disagree* and *Neutral* to *Disagree*. Pseudonyms for some of these students are discussed below.

A Wilcoxon Signed Rank Test was performed to see if the participants showed statistically significant movement based on the intervention. The test results indicated that the post-survey responses were statistically significantly higher than the survey responses ( $p < 0.03$ ).

**Figure 3**

*Changes pre- to post-survey for question 6: I can see myself teaching mathematics using Social Justice topics.*



To further explore these findings, we looked at the follow-up responses in question seven, which asked students to explain their selection for question six. Looking at the qualitative data, we pulled four representative participants' responses to explain the movements of participants' willingness to teach mathematics using social justice topics from pre-survey to post-survey. Four themes/profiles emerged during data analysis that includes: i) Convinced: I feel confident; ii) Willing: Without divisive topics; iii) Resistant: Too hard for math; and iv) Resistant: "Inappropriate." These profiles are described below. Each profile/theme features a participant who well represents what other students within that theme portrayed through their responses.

***Convinced: I Feel Confident***

An example of a "Convinced: I feel confident" student was one who, along with three other participants, initially agreed that they could see themselves teaching mathematics using social justice topics. After the intervention, they even more strongly agreed with this sentiment by changing to 5 on the post-survey. As can be seen by a quote in Figure 4, Samantha was initially excited about using social justice topics within a mathematics classroom. However, she and the three other students were hesitant due to their perceived ideas about social justice topics that they initially thought of, such as politically charged issues. After the intervention, these students appreciated the world wealth issue discussed (and others brought up during class discussion), which may make them more comfortable as new teachers. Samantha stated, "[I] have seen examples of the kinds of explorations that we can do in mathematics. However, the example we went through in class, as well as the discussion, further convinced me of the do-ability of this kind of teaching."

***Willing: Without Divisive Topics***

A "Willing: Without divisive topics" student was unsure if they could see themselves teaching mathematics using social justice topics before the intervention but shifted to 'agree' on the post-survey. Seven participants had similar experiences and shifted from neutral to some level of agreement. Similar to "Convinced: I feel confident," these students initially hesitated in seeing themselves as capable of teaching mathematics using social justice topics but ended with positive views about such endeavors after the intervention (see Figure 4 for a quote from Katie). These students were slightly different, for they initially saw this pedagogy as something only veteran teachers could do without fear of losing job security. After the intervention, they could see themselves teaching this way, but, again, being cautious about what topics to implement these lessons with. When discussing her pre-post-survey shifts, Katie stated that she felt more comfortable thinking about teaching social issues after seeing it implemented during the intervention. She thinks this because her "understanding of social justice is not as narrow as previously. I also now see that if I get my administration's support, I do not need to worry about my job being in peril."

***Resistant: Too Hard for Math***

The "Resistant: Too hard for math" students were initially neutral on whether they could see themselves teaching mathematics using social justice topics. Unlike the students in the "Willing: Without divisive topics" profile, the intervention caused only one student, Nancy, to shift from neutral to 'disagree' on the post-survey. This student seemed highly opposed to teaching mathematics with social justice before the intervention, and the intervention itself did not do much to change that. Nancy began to think about herself implementing a lesson like this and became reluctant to research, plan, and implement a similar lesson responsibly. When asked to elaborate further, she stated that she enjoyed the activity in class because she and her peers were college students. However, if this was "[to be done] in a middle school or lower levels, [the lesson] might not turn out so organized. The child might also not understand why they must do this."

***Resistant: "Inappropriate"***

There was only one "Resistant: 'Inappropriate'" student, Jacob, who initially agreed he could see himself teaching mathematics using social justice topics before the intervention but changed to 'disagree' on the post-survey. This was the only participant who went from agree and shifted downward to disagree, as shown by a two-point Likert scale drop. Although the student said he was hesitant, he selected 'agree' on the pre-survey because he thought it was a "very important" endeavor. The post-survey showed that the intervention caused some comfortability with this student concerning leading discussions that may bring up sensitive issues. Jacob stated: "I feel it is important, but I still do not think I can see myself doing this often."

**Figure 4**

*Preservice teachers' explanations for selections in question 6 – pre-survey responses to post-survey responses.*

Question 7: Explain your selection for Question 6				
Profile	Pre-Survey		Post-Survey	
<b>Convinced: I feel confident</b>	<i>I do agree that I will strive toward teaching mathematics using social justice topics, but I also will be cautions in how I use them. Even looking at facts in this political climate can be a controversial thing to do.</i>	<b>4</b>	<i>My precious response to this was Somewhat agree because I would like to but I wasn't quite sure how or how controversial it would be. However, I think that the example we looked at in class convinced me that it can be done more easily that I previously expected.</i>	<b>5</b>
<b>Willing: Without divisive topics</b>	<i>...Off the top of my head it sounds like something that could be politicized which could get a new teacher fired. Perhaps as a veteran teacher I would be less worried by that...</i>	<b>3</b>	<i>I would be willing to incorporate wider issues such as wealth distribution or access to clean water. Bit I may initially stay away from racial/religious issues ...</i>	<b>4</b>
<b>Resistant: Too hard for math</b>	<i>I really do not know what to expect in the classroom, it is one thing to teach the top but another for the students to actually learn. If this method is not working in my classroom then there really is no need for me to waste my time or the students time teaching something they do not learn best from.</i>	<b>3</b>	<i>I feel that it is tough to do this through mathematics and I wouldn't want to take up all of my time trying to incorporate this into my classroom.</i>	<b>2</b>
<b>Resistant: "Inappropriate"</b>	<i>I am hesitant to teach for social justice because of the current climate of the country, but I think it is very important.</i>	<b>4</b>	<i>I still feel uncomfortable bring up many of these issues. I think they can cause issues in the classroom and lead to inappropriate discussions.</i>	<b>2</b>

**Discussion**

This research highlights the importance of preservice teachers needing exposure to teaching mathematics with a social justice lens. If they are not exposed to this teaching style, they are less likely to either know how to do this effectively or not be privy to the benefits their future students could experience. Due to the homogeneity of education, it becomes challenging for preservice and in-service teachers to find a way to debate the complex issues that lie at the heart of social justice (Barnes, 2006). Focusing on strategies, content, and discipline becomes safer to avoid teachers and teacher educators encountering their understandings of power, privilege, and injustice. This narrow conceptualization of teaching limits the opportunities for teachers to be "relevant, purposeful, collaborative, democratic, and oriented toward social justice and equity" (Wiedeman, 2002, p. 205). This underscores the importance of the intervention in studies (Downing & McCoy, 2021).



The goal of this study was to study the changes that an intervention utilizing social justice pedagogy would have on mathematics preservice teachers at a predominantly White institution who, overall, exhibit traits of most teachers in America. Our results showed that these students initially viewed this pedagogy as very general (60% of responses). Most of the other 40% of the comments focused on things that happen inside the classroom (30%). This was on par with the findings of Causey et al. (2000), which labeled these views of preservice teachers as "naïve egalitarianism" in that their initial ideals, for they regurgitate popular phrases such as "everyone is created equal," or "equal access" and that everyone "should be treated equally." While they may genuinely believe this, they do not know how to model their instruction to help address the problems of inequity.

When asked about mathematics classrooms, these preservice teachers varied in their responses from the pre-survey to the post-survey. The second most enormous shift occurred when students' responses went from 31% in the "Student" category on the pre-survey to 4%. The comments on the pre-survey for "Student" are more related to how teachers should treat students. In the post-survey, the responses may have decreased because participants focused more on using social justice to teach mathematics in the classroom. Meanwhile, there was a 36% increase in student responses toward statements about the classroom and what happens inside it. Given the theoretical framing of this study and how the intervention was conceptually framed, it makes sense that respondents were more able to think about classrooms becoming more equitable for students and how those students can become empowered in mathematics through social justice than they would about the other themes (Tan et al., 2012).

Our findings also showed that 45% of students shifted from their initial responses to the question. *I can see myself using mathematics to teach social justice topics*. Students in the "Convinced: I feel confident," "Willing: Without divisive topics," and "Resistant: Inappropriate" profiles initial responses were unsure or hesitant to teach mathematics using social justice due to issues and topics such as religion and the political climate. Many of these students were also concerned about losing their job security as a new teacher. After the intervention, they discussed that they would be more comfortable discussing wealth disparities but avoid integrating topics that may include race or religion. This study exposes potential reasons beginning teachers are hesitant and unwilling to pursue social justice pedagogy lessons within their content area for fear

of backlash from parents and administrators, which could lead to them losing their jobs (Dover, 2013; Picower, 2011). This also comments on the current political climate, especially in recent years.

On the same question about students' ability to see themselves teaching mathematics using social justice topics, only two students shifted down on the Likert scale from their initial responses. Jacob was the only "Resistant: "Inappropriate" profile student who shifted from agree to disagree, two points on the Likert scale. Initially, Jacob stated he was reluctant to merge social justice issues with his mathematics lessons but thought social justice issues were important to discuss. After the intervention, Jacob did not see himself using mathematics to teach social justice topics because he did not feel comfortable teaching it and was afraid the discussions would be inappropriate for students. Nancy was the other student who shifted down and was placed in the "Resistant: Too hard for math" profile (neutral to disagree). Nancy initially wondered if using mathematics to teach social justice topics was a method students could learn from. After the intervention, Nancy felt it would take too much time to fit into her instruction and did not see herself using mathematics to teach social justice topics. This phenomenon, expressed by students like Jacob and Nancy, shows that preservice teachers' exposure to this type of pedagogy coupled with their held beliefs that their future students would benefit from seeing lessons like these are somewhat contradictory with their beliefs that this is important for students to engage in these types of discussions. This also showed up in a study of in-service teachers (Aguilar et al., 2016; Baily & Katradis, 2016). However, Jacob and Nancy were two of three students who did not see themselves integrating mathematics and social justice topics in their classrooms; 86% of the participants did agree or strongly agree that they could see themselves teaching mathematics using social justice topics. This was a potential indicator that incorporating social justice pedagogy in mathematics teacher education courses can transfer into future classrooms.

### **Conclusion**

While this study showed that exposure to and teaching for social justice within a mathematics classroom during preservice teachers' educational preparation programs could lead to a positive shifting view about being willing to teach this way in the future, this study is limited in the fact that this intervention happened at one point in their course and assessed through a

researcher-created survey within a few days after the intervention. The extent to which this intervention might influence preservice teachers' eventual classroom practice remains to be seen. Another limitation is the sample size and response rate. To mitigate this, we used parametric statistics; however, it would be ideal if the sample size increases in future study iterations. This is also a residual effect of smaller teacher preparation programs and dwindling enrollments nationwide (Wilson & Kelly, 2022).

This study lays the groundwork for following students entering classrooms and enacting such lessons. Students' personal experiences with diversity and the opportunities for appropriate processing of these experiences may be more critical to their development of multicultural awareness and sensitivity (Garmon, 2004). Further research is needed to identify the connections between social justice activities and the changes in preservice teachers' perceptions of teaching social justice in mathematics classrooms. These early results do indicate that there may be ways to implement these strategies in more teacher education courses to prepare preservice teachers to teach diverse student populations.

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