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BELIEFS ABOUT SOCIAL JUSTICE AMONG ELEMENTARY MATHEMATICS TEACHERS

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Abstract

The purpose of this study was to measure teacher beliefs about social justice over the course of an elementary mathematics teaching methods course. The participants in the study came from three unique groups of in-service and preservice teachers in a master's degrees program at a medium-size university in New York: New York City Teaching Fellows (NYCTF), Teacher Education Assessment and Management (TEAM) program, and traditional preservice teacher preparation program. Findings revealed that while there were no differences in beliefs over the course of the semester, NYCTF teachers had more positive beliefs about social justice than did TEAM teachers. Teachers felt most positively about incorporating diverse cultures and experiences into classroom lessons and discussions; self-examination of attitudes and beliefs about race, class, gender, disabilities, and sexual orientation; and teaching students to think critically about government positions and actions.

Mathematics has been called a "gatekeeper" for quality college education and higher paying careers (D'Ambrosio, 2012; Gau Bartell, 2012; Gonzales, 2012; Koestler, 2012; Leonard, 2008; Martin, 2002; Moses & Cobb, 2001; Stinson, 2004), which means mathematical literacy is a necessary, but not sufficient, condition for later success. Gonzales (2012) said that "knowledge of mathematics is often a prerequisite for full and successful participation in society" (p. 128). There is a direct relationship between success in mathematics and success later in life, and this is even more important for students of lower socioeconomic status and commonly underrepresented groups such as African American, Latina/o, and female students (Gonzales, 2009; Thomson & Hillman, 2010). The careers that offer the best working conditions and highest salaries generally require strong mathematics background such as mathematician, actuary, statistician, software engineer, and computer systems analysis (Needleman, 2009). D'Ambrosio (2012) said, "The institutions of modern civilization–mainly economics, politics, management, and social order–are rooted in mathematics" (p. 209). However, all careers require quantitative fluency to varying extents. Not only will proficiency in mathematics be necessary to help students gain acceptance into quality colleges with the financial assistance needed for them to attend, and obtain positions in desirable careers, but proficiency in mathematics will be necessary to make informed decisions required of all citizens including important economic, social, and political decisions (Gutstein & Peterson, 2005). Knowledge of mathematics is an important condition for financial literacy, and is necessary for citizen decision-making in a healthy democracy. Mathematics teachers, especially at the elementary level, must help *all* students succeed in mathematics given the subject's importance for later life satisfaction. Particularly important is the need for teachers of underserved students to have the necessary attitudes, beliefs, and dispositions toward social justice in teaching mathematics to these students.

Caution should be taken regarding the type of mathematics students need for future success given the ever accelerating changes technology and globalization have facilitated in the modern job market. D'Ambrosio (2012) said, "To prepare children to be proficient in obsolete mathematics is to prepare them to the anguish of being marginal in the future, because they will possess outdated knowledge" (p. 206). Certain types of mathematical knowledge transcend the effects of technology and globalization, namely good problem solving and critical thinking abilities. This means the mathematics envisioned for marginalized students is the type of mathematics that scholars and national organizations have promoted as best practice in mathematics (National Council of Supervisors of Mathematics [NCSM], 1978; National Council of Teachers of Mathematics [NCTM]; 2000; Schoenfeld, 1985). NCSM (1978) said problem solving is the principal reason for studying mathematics. Additionally, NCTM (2000) said, "Problem solving is not only a goal of learning mathematics but also a major means of doing so" (2000, p. 52). The important aspect to this issue is to teach this type of mathematics in a culturally responsive manner.

Social Justice in Mathematics

Stinson and Wager (2012) said that teaching for social justice in mathematics is "rooted, in part, in the belief that all children should have access to rich, rigorous mathematics that offers opportunities and self-empowerment for them to understand and use mathematics in their world" (p. 10). To facilitate this, teachers for social justice in mathematics need to be introspective toward their own identities as agents, as both individuals and teachers, for social change (Gonzales, 2009; Leonard, Brooks, Barnes-Johnson, & Berry, 2010). Gau Bartell (2012) said teachers are generally unprepared "to teach mathematics to an increasingly racially, ethnically, linguistically, and socioeconomically diverse student population with which they often have had limited previous interactions" (p. 113). Mathematics teachers must be given the opportunities to directly reflect upon their own conceptions of social justice and learn how to teach from a social justice perspective, which can be conducted through professional development and work with after school programs (Gonzales, 2009; Leonard & Evans, 2008). Leonard and Evans (2012) said, "An explicit focus on teachers' beliefs and expectations [about social justice] should be a component of (mathematics) teacher education" (p. 101).

There are two approaches to social justice considered in this study. First, a social justice perspective supports students from traditionally underserved groups to receive the quality education they deserve. Historically education in the United States developed to create a skilled and educated workforce for industry, which means that specific groups were prepared for specific roles (Gutstein, 2012; Stinson & Wager, 2012). Further, "different schooling experiences… support class division… [and] also produce and reproduce these unjust divisions through the differing… curricular that are made available" (p. 7). Culturally responsive pedagogy (CRP), which considers student backgrounds for delivering engaging and meaningful mathematics lessons based upon student needs (Gay, 2000; Ladson-Billings, 1994; Leonard, 2008), is an important component to teaching for social justice. CRP is in opposition to a "color-blind" approach and not only helps teachers to carefully consider, respect, and appreciate the various cultural backgrounds and experiences students bring to the classroom, but also helps caring teachers guide students in their developmental and academic success. Student cultural and ethnic identities should be carefully considered in order for teachers to differentiate their instruction to the students' learning needs (Gay, 2000; Leonard, 2008; Ladson-Billings, 1994; Martin, 2007).

Second, social justice is considered in terms of the mathematical content presented to school students and how the students can use this knowledge. Stinson and Wager (2012) said social justice mathematics helps to "prepare students to take action and use mathematics for social change" (p. 10). The teaching of any subject is inherently political and not neutral as many might suppose. Frankenstein (2012) said, "Reflecting on knowledge means that we understand the non-neutrality of all knowledge, and the connections between knowledge and power" (p. 58), and concluded that knowledge is not neutral. Further, Gutstein and Peterson (2005) said, "Simply put, teaching math in a neutral manner is not possible. No math teaching–no teaching of any kind, for that

matter–is actually 'neutral,' although some teachers may be unaware of this" (p. 6). For example, a mathematics problem might require students to perform basic operations on a dilemma of how much money they have and how much fast food they can purchase. However, this type of problem promotes unhealthy eating, environmental degradation instigated by the fast food industry, and animal cruelty through factory farming. A better problem would be one in which students quantitatively examine the nutritional content of fast food or the statistics on the environmental impact and animal cruelty involved in factory farming. A problem that is similar to the one in which children determine the amount of money needed for fast food purchases would require students to perform operations on funds required for purchasing healthy food from the local market, such as whole grains, legumes, vegetables, and fruits. While there may be objections that having children determine the money needed to buy fast food entertains their interests, since many children enjoy eating fast food, a similar argument could be made that many teenagers enjoy smoking. However, teachers would never consider giving students a mathematics problem that involved purchasing cigarettes. Gutstein and Peterson (2005) argued that one cannot be neutral in education because by not contextualizing mathematics in a political setting one is also making a political statement that certain issues are not important. Gutstein and Peterson (2005) said teacher

> choices teach students three things:
>
> 1. They suggest that politics are not relevant to everyday situations.
> 2. They cast mathematics as having no role in understanding social injustice and power imbalances.
> 3. They provide students with no experience using math to make sense of, and to change, unjust situations. (p. 6)

An example of empowering student decision making through high school statistics involves determining if a company employed racist policies in its selection of a committee. The problem, adapted from Larson and Farber (2006), states:

> You have been selected for jury duty. You decide to serve your civic duty and arrive at the court house. The trial involves a company being accused of racist procedure. This company has 200 employees and it claims that it chose a committee of 15 at random to represent employee retirement issues. When the committee was formed, none of the 56 employees of color were selected.

1. Find the number of ways 15 employees can be chosen from 200.
2. Find the number of ways 15 employees can be chosen from 144 White employees.
3. If the committee was chosen at random (without bias), what is the probability that it contained no employees of color?
4. Does your answer in part 3 indicate that the committee selection was biased? What is your decision regarding the accusation of racism?

This problem requires students to determine that the probability of selecting no employees of color for the committee is about 0.005832, which is very low and very unlikely to have occurred by chance. Without mathematical analysis, it would not be

possible to determine that there was a strong likelihood that discrimination had occurred in the selection of the committee.

Theoretical Framework

This study is grounded in critical race theory (CRT) in education (e.g., Ladson-Billings & Tate, 1995), which examines race and racism as it applies to education. CRT acknowledges that racism is pervasive throughout society, which means in an educational context racism affects not only children's learning, but also all aspects of the social and academic realities of schooling. Through working within a CRT framework educators have the objective, both in educational and broader contexts, of eliminating racial oppression as a subset of the goal of eliminating all types of oppression (Dixon & Rousseau, 2005; Matsuda, Lawrence, Delgado, & Crenshaw, 1993). Cultural responsiveness, a social justice orientation, and fostering of trust and care in the classroom are important components for educating students who have been traditionally underrepresented in mathematics related fields (Haberman, 1991; Ladson-Billings, 1994; Leonard, Napp, & Adeleke, 2009). While strong content knowledge is important for effective teaching, these variables are equally important in their impact on learning for underrepresented students (Martin, 2007).

This study is also grounded in Freire's (1970/2000) concept of *Conscientização*, or critical consciousness, which allows the individual to critically perceive injustice and provide an intellectual means for opposing injustice. Teachers need to be given the opportunity to critically approach injustice in society in general, and in the schools in particular, as an important process in assisting them to critically reflect upon institutional and personal teaching practices.

Purpose of the Study and Background on Participants

The purpose of this study was to measure teacher beliefs about social justice over the course of an elementary mathematics teaching methods course at a university that emphasizes social justice for teachers in its conceptual framework. The participants in the study came from three unique groups of in-service and preservice teachers in master's degrees programs at a medium-size university in New York: New York City Teaching Fellows (NYCTF), Teacher Education Assessment and Management (TEAM) program, and traditional preservice teacher preparation program. The two-year graduate program for all three groups was designed to prepare teachers to teach in urban schools in New York with certification in elementary and special education.

The NYCTF program is an alternative certification program developed in 2000 in conjunction with the New Teacher Project and the New York City Department of Education (Boyd, Lankford, Loeb, Rockoff, & Wyckoff, 2007). NYCTF had the goal of bringing professionals from other careers to fill large teacher shortages in New York public schools. When the program began there was a prediction of a 7000 teacher shortage and fears that there could be up to 25,000 teacher vacancies in the early first decade of the 21st century (Stein, 2002). NYCTF teachers begin their program in June when they are immersed in coursework at their partnering universities in New York. In September they become the teachers of record in their classrooms while continuing their

graduate work in education in a master's degree program. NYCTF teachers receive a Transitional B teaching license in New York State, which is valid for three years provided they remain with the program and complete program requirements. After this successful completion of this commitment they are eligible to apply for initial certification.

The TEAM program is a collaboration between the TEAM organization and the partnering university. TEAM is an organization that facilitates partnerships with universities on behalf of student members who then receive tuition discount (TEAM, 2012). The university partnership began in 2009 and had its first cohort begin the program in 2010. Cohorts consist of 12 to 20 Orthodox Jewish teachers separated by sex in the classroom due for religious purposes but in this study all TEAM participants were women. TEAM participants enrolled in the program to prepare for certification to teach in Yeshiva and Hebrew Academies. Several of the participants were already teaching in Yeshiva and Hebrew Academies during this study, while most of the participants were preparing to become teachers, but not currently teaching.

Traditional preservice teachers were enrolled in the university's graduate program, which required extensive fieldwork. Participants in the program were required to have 10 hours of fieldwork for each three credit class in which they were enrolled. Much of the work done in the classes was related to the fieldwork experience including lesson and unit planning, as well as reflection on the teaching experience. Participants in the program were encouraged to incorporate the theory and teaching techniques they were learning in their graduate program into classroom practice.

Research Questions

1. Were there differences in beliefs about social justice over the course of a semester in a reformed-based mathematics methods course?
2. Were there differences in beliefs about social justice between the NYCTF, TEAM, and traditionally prepared teachers?
3. What were teacher beliefs about social justice in the classroom?

Methodology

This study used a quantitative methodology and the sample consisted of 115 preservice and new in-service teachers. All NYCTF teachers were in-service teachers, and TEAM and traditional teachers were preservice teachers, with several TEAM participants teaching in Yeshiva and Hebrew Academies. There were 84 NYCTF teachers, 16 TEAM teachers, and 15 traditional teachers. Participants were enrolled in an inquiry- and reformed-based elementary mathematics methods course that involved both pedagogical and content instruction and was aligned with the NCTM *Principles and Standards for School Mathematics* (2000).

Teachers were given the Learning to Teach for Social Justice Scale (LTSJ) at the beginning and end of the semester, which was developed by Enterline, Cochran-Smith, Ludlow, and Mitescu (2008) and Ludlow, Enterline, and Cochran-Smith (2008), and measured participants' beliefs about teaching from a social justice perspective. The LTSJ is a 12-item 5-point Likert scale instrument that solicits participant beliefs about social

justice in the classroom based upon diversity issues such as race, culture, language, gender, disability, and sexual orientation.

Results

Paired-samples *t*-test was conducted to answer research question one in order to determine differences in the LTSJ scores over the course of the semester. No statistically significant differences were found.

One-way ANOVA was conducted to answer research question two in order to determine differences in LTSJ scores between NYCTF, TEAM, and traditional teachers. A statistically significant difference was found at the 0.05 level for pre- and post- test LTSJ scores with $F(2, 112) = 3.592$, $p = 0.031$, $\eta^2 = 0.06$ and $F(2, 112) = 5.247$, $p = 0.007$, $\eta^2 = 0.09$, respectively. A post hoc Tukey HSD test was conducted to determine exactly where the means differed among the programs (see Table 1). On the pretest it was found NYCTF teachers ($M = 3.94$, $SD = 0.459$) had more positive dispositions toward social justice than did TEAM teachers ($M = 3.61$, $SD = 0.433$) with $p = 0.023$. On the posttest it was also found NYCTF teachers ($M = 3.94$, $SD = 0.529$) had more positive dispositions toward social justice than did TEAM teachers ($M = 3.51$, $SD = 0.382$) with $p = 0.006$. The effect sizes for both pretest and posttest were in the small to medium range. There were no other statistically significant differences.

Table 1

Mean Scores for NYCTF, TEAM, and Traditional Teachers

Learning to Teach for Social Justice Scale (LTSJ) Scores	Pretest Mean (SD)	Posttest Mean (SD)
NYCTF	3.94* (0.459)	3.94** (0.529)
TEAM	3.61* (0.433)	3.51** (0.382)
Traditional	3.87 (0.443)	3.76 (0.399)

Note. $N = 115$.

* $p < 0.05$. ** $p < 0.01$.

Descriptive statistics were used to answer research question three (see Table 2). Results indicated teachers felt most positively about incorporating diverse cultures and experiences into classroom lessons and discussions; self-examination of attitudes and beliefs about race, class, gender, disabilities, and sexual orientation; and teaching students to think critically about government positions and actions. Teachers felt most positively about negative attitudes such as preparing students for lives they are most likely to lead; student success in school being dependent on how hard they work; and the teachers' jobs as not being agents of societal change. These final three items reflect negative attitudes toward social justice.

Table 2
Survey Results for Beliefs about Social Justice

Learning to Teach for Social Justice Scale (LTSJ)	Pretest Mean	Posttest Mean
1. An important part of learning to be a teacher is examining one's own attitude and beliefs about race, class, gender, disabilities, and sexual orientation.	4.27	4.28
2. Issues related to racism and inequity should be openly discussed in the classroom.	4.08	3.93
3. For the most part, covering multicultural topics is only relevant to certain subject areas, such as social studies and literature.	4.00	3.99
4. Good teaching incorporates diverse cultures and experiences into classroom lessons and discussions.	4.60	4.50
5. The most important goal in working with immigrant children and English language learners is that they assimilate into American society.	3.75	3.74
6. It's reasonable for teachers to have lower classroom expectations for students who don't speak English as their first language.	4.12	4.10
7. Part of the responsibilities of the teacher is to challenge school arrangements that maintain societal inequities.	3.90	4.05
8. Teachers should teach students to think critically about government positions and actions.	4.17	4.18
9. Economically disadvantaged students have more to gain in schools because they bring less to the classroom.	3.99	3.93
10. Although teachers have to appreciate diversity, it's not their job to change society.	3.70	3.51
11. Whether students succeed in school depends primarily on how hard they work.	3.15	3.11
12. Realistically, the job of a teacher is to prepare students for the lives they are likely to lead.	2.90	2.96

Note. $N = 115$.
Items are from Enterline et al. (2008) and Ludlow et al. (2008).
Negative items were reversed scored so that high scores still represented positive attitudes (items 3, 5, 6, 9, 10, 11, and 12).

Discussion

It was found that while there were no differences in beliefs about teaching for social justice over the course of the semester, teachers from the NYCTF program had more positive beliefs about social justice than did teachers from the TEAM program. This result was not surprising given that teachers from the NYCTF program generally teach in high-need urban schools throughout New York (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2006). The mission of NYCTF is "to recruit and prepare high-quality, dedicated individuals to become teachers who raise student achievement in the New York City classrooms that need them most" (NYCTF, 2012). Thus, it is not surprising that NYCTF teachers would hold a positive social justice disposition. Furthermore, TEAM participants were religious Orthodox Jewish teachers who held traditional Orthodox values. As earlier stated, an example of their traditional beliefs is TEAM teachers required their classes to be separated by sex for religious purposes. It is possible that religious beliefs and culture contributed to the differences in beliefs about social justice in the classroom. These results should be interpreted with caution given the imbalance in sample size due to teacher availability.

It was found that teachers felt positively about incorporating diverse cultures and experiences into classroom lessons and discussions; self-examination of attitudes and beliefs about race, class, gender, disabilities, and sexual orientation; and teaching students to think critically about government positions and actions. While it is important that teacher educators continue to encourage teachers in these areas, it is more important teacher educators work with teachers in areas in which they felt less positively. Teachers felt least strongly that they should prepare students for life outside of the lives they will most likely lead; student success is contingent upon external variables outside of student hard work; and teachers did not feel strongly that their jobs were to be agents of societal change.

Teachers who focus on the lives they *expect* for their students reduce the possibilities for the students, which is a major issue in teaching for social justice because teachers may possess lower expectations for students of lower socioeconomic status and underrepresented groups. Students from these groups often are not exposed to adults from a wide range of career opportunities (Nakkula & Toshalis, 2006). Teacher educators need to work with teachers to help expand possibilities for these students. One method is to help the teacher focus on the individual's aptitude; rather than assume that because a student is from a less affluent family, it is not worthwhile exploring future options.

While hard work is a critical variable for student success, it is certainly not the only variable. Other variables significantly impacting success are teacher quality, parental support, access to resources, classroom environment, classroom equity, and poverty, among others. It is important for teacher educators to help teachers not place blame on students for their lack of success when other variables could certainly be contributing factors. While it certainly is important for students to be held accountable, it is equally important to consider that students from less affluent urban areas do not enter the classroom with the same opportunities as students from wealthy suburban districts.

Jonathan Kozol said students in the wealthiest suburbs of New York receive three to four times the amount of funding toward their educations as do students in the South Bronx (Anonymous, 2000). Furthermore, the wealthier students are receiving two to three years of full-day preschool, which means children in less affluent schools are already behind their wealthier counterparts (Anonymous, 2000). Placing the blame for lack of academic success solely on the students is irresponsible and unproductive. Teacher educators must help teachers understand the complex issues surrounding student academic success, and find ways to increase the likelihood of student success.

Teachers are in a unique position to be agents of social change directly in the classroom, which means they can influence change outside of the classroom through the effects they have on their students' lives. As stated earlier, Gutstein and Peterson (2005) said teaching in a neutral manner is not possible. All teaching is political in that what is omitted gives the message that certain issues are not important. Teacher educators must help teachers understand the impact they have on students, which can have profound effects not only on individual student lives, but also on community and society.

This article began with the notion that mathematics is a "gatekeeper" for quality college education and careers (D'Ambrosio, 2012; Gau Bartell, 2012; Gonzales, 2012; Koestler, 2012; Leonard, 2008; Martin, 2002; Moses & Cobb, 2001; Stinson, 2004), and subsequently quantitative literacy is necessary for some of the highest paying and most satisfying careers. Social justice considerations in education necessitate mathematics be of high priority in order for students from underrepresented groups to have the highest likelihood of later educational, career, and life success. The literature demonstrates that teachers are more likely to adopt a social justice perspective if there is consistent emphasis on social justice throughout teacher preparation programs (Koestler, 2012; Nieto, 2000). Teacher educators must support teachers in gaining a social justice perspective in their mathematics classrooms and to implement that perspective in a successful manner.

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