Teaching Social Justice Issues Through Mathematics Curriculum

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Teaching Social Justice Issues Through Mathematics Curriculum
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Abstract
Learning about the social injustices diverse individuals face can be integrated into formal education, specifically mathematics instruction. Further, creating meaningful and relevant experiences for students in mathematics is essential. When students are provided opportunities to pose questions relevant to their lives, context injustices, and challenge how the world is shaped, the true utility of mathematics becomes visible, and students can be active parts of the solution (Bush, 2019). My research consists of lessons from the textbook, High School Mathematics Lessons to Explore, Understand, and Respond to Social Injustice (Berry et al., 2020) with revisions based on the interests and needs of my students (e.g. food deserts in the Midwest and ACT scores). Three lessons were taught in a statistics course at an urban high school in the Midwest, while two other lessons were conducted in a geometry content course for pre-service K-8 teachers at a Midwestern University. Overall, high school students showed growth in their understanding of social justice issues and the uses of mathematics. While pre-service teachers also showed growth in their understanding of social justice issues and the uses of mathematics; they also acquired the ability to make more specific claims.

Background
Mathematics is a tool that can be used to help students analyze social justice issues (Bush, 2019). Creating meaningful and relevant experiences for students in mathematics is essential. When students are provided opportunities to pose questions relevant to their lives, context injustices, and challenge how the world is shaped, the true utility of mathematics becomes visible, and students are active parts of the solution (Bush, 2019). Teaching social justice through mathematics is part of a more equitable mathematics curriculum (Bush, 2019).

Further, preservice teachers would benefit from exploring social justice mathematics tasks as part of their preparation for using such tasks in their future classrooms (Appova & Garri, 2013).

Question
How does teaching mathematics through a social justice lens alter K-12 students’ and preservice elementary teachers’ understanding of mathematics’ uses and their knowledge of issues concerning society?

Methods
Participants:
15 high school students at an urban high school–enrolled in Statistics 18 undergraduate preservice elementary majors enrolled in a geometry content course for future K-8 teachers

Data Sources:
Post-pre survey consisting of multiple choice and short answer questions were given after all lessons

Results
Main Claim – High School Students: High school students showed growth in their understanding and perspectives of social justice issues through exploration with math. They were able to make broader inferences on American society based on the mathematics they conducted.

Conclusions
• Policy changes students implied over all lessons: do more with housing, eliminate ACT test, reform law system, and use mathematics to analyze gerrymandering.
• Overall perspective changes: Students realized there are structural issues within society which make aspects of life unfair for minorities and/or working-class individuals, such as redlining and gerrymandering.
• Devalue ACT test because scores may depend on external factors rather than intelligence, as they found a positive linear correlation with median household income and ACT score, and a negative linear correlation with FRL % and ACT score.
• Maybe by looking at overall GPA instead of ACT score this would not exclude marginalized students from gaining bachelor’s degrees and beyond as much as it does. This is a research question for another time.
• There was not a significant change in students’ social perspectives based on the pre and post survey from the multicultural index. In order to conclude if students’ overall social/multicultural perspective changed, more research needs to be done, over a longer time frame.
• Overall, students became more knowledgeable of social injustices using mathematics and were able to use mathematics in a way which was different from traditional methods to explore those injustices.
• Given the activities students explored, they were all able to make broad claims about the specific social justice issues explored, while the preservice teachers analyzed solutions to these social injustices and sought after breaking the status quo.

In a post-survey given to college students, 7/8 (87.5%) of students were interested in incorporating social justice issues into their mathematics curriculum in their future classrooms. Therefore, more courses on TMS (Teaching Mathematics through Social Justice) should be implemented in universities/colleges.

Citations & Acknowledgements

Table 1. Pre-Post Survey Results on Student Beliefs Related to Incarceration Rates

<table>
<thead>
<tr>
<th></th>
<th>Pre-survey</th>
<th>Post-survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black people...</td>
<td>9/10 (90%)</td>
<td>9/11 (82%)</td>
</tr>
<tr>
<td>The differing racial...</td>
<td>9/10 (70%)</td>
<td>9/11 (82%)</td>
</tr>
</tbody>
</table>

Table 2. ACT Score vs. Median Household Income

<table>
<thead>
<tr>
<th>ACT Score</th>
<th>Median Household Income (Median household income)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-survey</td>
<td>27/12 (79%)</td>
</tr>
<tr>
<td>Post-survey</td>
<td>6/9 (66.7%)</td>
</tr>
</tbody>
</table>

Table 3. Is there a Connection Between Redlined Areas and Food Deserts?

<table>
<thead>
<tr>
<th></th>
<th>Redlined areas and food deserts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-survey</td>
<td>6/12 (46%)</td>
</tr>
<tr>
<td>Post-survey</td>
<td>5/12 (42%)</td>
</tr>
</tbody>
</table>

Table 4. If something is more compact, is it more fair, less fair, neither?

<table>
<thead>
<tr>
<th>Compact = Fair</th>
<th>Less Fair</th>
<th>More Fair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-survey</td>
<td>5/7 (71%)</td>
<td>0/7 (0%)</td>
</tr>
<tr>
<td>Post-survey</td>
<td>1/8 (13%)</td>
<td>6/8 (75%)</td>
</tr>
</tbody>
</table>

Source: dsl.richmond.edu

Source: CODAP

Source: geogebra.org

Source: edgap.org