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Transforming Undergraduate Research Methods Courses Using Social Justice Pedagogy: A Pre-Post Analysis

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Undergraduate research methods courses help shape students' perceptions about research. Given the lack of diverse researchers in STEM fields, these perceptions are particularly important for underrepresented minorities. This study tested a social justice pedagogy intervention to determine the effects on various psychosocial constructs. Three differences emerged: Students in intervention classrooms (n = 81) had a stronger desire to give back to their community and greater intentions to become involved in research as an undergraduate, while students in comparison classes (n = 54) had greater increases in researcher self-efficacy.

Colleges and universities today struggle to retain students from underrepresented minorities (URMs)—especially in STEM (science, technology, engineering, and mathematics) fields—as well as to recruit them for grad-

uate education (National Science Foundation, 2011). Current biomedical and other graduate educational programs do not represent the population at large (National Science Foundation, 2011). Moreover, students from underrepresented populations often feel they do not belong or are not being welcomed in these fields and have a higher drop-out rate compared to White students (Myers & Pavel, 2011). There is a critical need for both the general workforce and the research workforce to reflect the populations they serve. In particular, increasing the diverse voices in research fields will make research more relevant and innovative.

Undergraduate research methods courses may play a critical role in students' perceptions about research that can affect their intentions to pursue further education. Students who come into research methods classes with long-standing mathematics anxieties (Elliott & Dweck, 2007; Lalayants, 2012) or internalized gender or racial/ethnic stereotypes about their abilities to be successful in such courses (Steele, 2010) may have negative experiences in these classes and be less likely to consider graduate education (Papanastasiou, 2005). Thus, undergraduate research methods courses are an ideal point of intervention. Unfortunately, there has been little guidance on pedagogical strategies that enhance success of URMs in these classes (Early, 2014; Wagner, Garner, & Kawulich, 2011).

Literature Review

In this study, we blended several fairly distinct bodies of literature—social justice pedagogy, critical theories, best practices for retaining underrepresented students, and stereotype threat—to develop and implement an intervention that could transform undergraduate research methods courses. Next, we briefly review the bodies of literature, highlight some of the main intervention approaches developed by each perspective, and describe the blended intervention used in this study.

Social Justice Pedagogy

The principles of social justice highlight the social structural power and privilege dynamics in society and aim to create more equitable solutions to societal problems (Adams & Love, 2009; Bell, 2007; Convertino, 2016; Darder, 2015; St. Clair & Groccia, 2009). When the principles of social justice are integrated with classroom pedagogy, they aim to reduce those power dynamics in the classroom by introducing democratic processes that (a) diminish the power and authority of the instructor, (b) emphasize and make visible the values and attributes of "othered" and marginalized

groups in the curriculum (Leibowitz & Bozalek, 2016), and (c) create communities of learners who focus on real life problems and seek social change. Social justice pedagogy represents a change in perspective from an individualistic view to a social structural view. In terms of research methods courses, this involves examining the potential effects of oppression on the research process itself (for example, what studies get funded, who conducts research, how groups of people studied are formed and defined, how findings are interpreted).

Critical Theories

Critical theories analyze social structural power dynamics using different frames of reference, such as race/ethnicity (for example, critical race theory), gender (for example, feminism), and sexuality (for example, queer theory), among others. All of these theories have informed social justice pedagogy, but educators have struggled to identify concrete implementation strategies from critical theories (McArthur, 2010). One relatively new area of critical theory, *critical mathematics*, has been successful in bridging the gap between critique and change. Critical mathematics is the study of power and privilege dynamics in how mathematics is taught and interpreted (Gutiérrez, 2013). This theory is particularly useful in the re-design of undergraduate research methods courses that often require math skills for reading and interpreting quantitative studies. Any course with mathematics content can be challenging at the college level, because some students enter with low self-efficacy regarding math and skill deficits that set them up for anxiety (Everingham, Gyuris, & Connolly, 2017).

Recent data showed that Black and Latinx students in public schools had average mathematics scores that fell between two and three years below that of White students (National Assessment of Educational Progress, 2015). These deficits may persist throughout high school and extend into college, intensifying the feeling of not belonging in a math-oriented class or major. However, Gutiérrez (2008, 2013) has proposed that "gap-gazing"—focusing on achievement gaps in some groups rather than examining the distribution of scores and the broader picture of structural inequality that creates the gap—paints a more negative picture of underrepresented groups. In addition, looking only at mean differences between groups of students divided by only one of their characteristics obscures the fact that students live at the intersections of many identities. Interventions posed by critical mathematics include looking at how mathematics is taught and focusing on students' strengths rather than their deficits.

College Retention Best Practices Literature

Research shows that many students from underrepresented ethnic minority groups and first-generation students come from public schools with inadequate resources to prepare them for college (Cox, 2006; Scott & Martin, 2014). If these students do reach college despite the structural deficits in their K-12 education, the classroom environment may perpetuate cultural mismatches, such as emphasizing individualistic versus communal goals that lead to a sense of alienation (Smart-Richman & Leary, 2009) as well as poorer performance (Harackiewicz et al., 2014). Moreover, many such students lack same-ethnic group peer and faculty role models and encounter an unwelcoming, if not downright hostile, climate (Chang, Eagan, Lin, & Hurtado, 2011; Perna et al. 2009; Thiry, Laursen, & Hunter, 2011). Suggestions for improving the climate for underrepresented students include having peer and faculty mentors from the same ethnic group to enhance belongingness (Strayhorn, 2012), reducing the use of jargon, and creating an environment that is more communal than competitive (Brown, 2006).

Stereotype Threat

Steele (2011) proposed that when students are faced with a situation that triggers a negative stereotype about a group they belong to (for example, women are bad at math; people of color are not smart enough to be scientists), it creates a level of anxiety that interferes with their academic performance. Many studies have demonstrated this effect (Good, Rattan, & Dweck, 2012; Jaschick, 2015; Osborne & Walker, 2006; Steele & Aronson, 1995). A set of interventions to reduce stereotype threat has been proposed and supported by research: (a) altering the verbal and written instructions used by teachers to reduce triggers (Boaler, 2013), (b) having students complete values affirmation exercises that focus on students' strengths before doing some challenging task (Martens, Johns, Greenberg, & Schimel, 2006), (c) facilitating a growth mindset (Boaler, 2013; Dweck, 2008), and (d) increasing students' sense of belongingness (Murphy & Zirkel, 2015; Spitzer & Aronson, 2015).

Intervention and Study Purpose

This study was funded as part of a university-wide grant received from the National Institutes of Health (NIH) *Building Infrastructure Leading to Diversity* (BUILD) Initiative. The overall goal of BUILD is to increase the pipeline of students from underrepresented groups who will pursue grad-

uate education and careers in biomedical research (https://www.nigms. nih.gov/training/dpc/Pages/build.aspx). SF (San Francisco) BUILD addresses this pipeline in part via the Signaling Affirmation for Equity (SAFE) model (https://sfbuild.sfsu.edu/about-build). The model targets students, faculty, and institutional practices by focusing on ways to reduce stereotype threat and enhance communal goal affirmations and, in turn, create a greater sense of belonging (for instance, strong science identity) and persistence in academia (for instance, intentions to pursue a Ph.D.).

In line with the SF BUILD and SAFE models, the goal of this study was to contribute support for social justice pedagogical interventions addressing underrepresented college students most impacted by stereotype threat. Our purpose was to develop, implement, and evaluate a theory-driven and research-based social justice pedagogy intervention for revising undergraduate research methods courses. We hypothesized that students who were exposed to the social justice pedagogy intervention would have a greater sense of belongingness, feel safer in the classroom environment, develop a stronger identity as a researcher/scientist, and, ultimately, be more motivated to pursue graduate education.

Method

Overall Design

This quasi-experimental study included an intervention group (three classrooms exposed to a social justice pedagogy intervention) and a comparison group (two classrooms that did not receive a social justice pedagogy intervention). We used whole sections of undergraduate research courses in health education, kinesiology, and social work departments because randomized assignment to conditions in a class was not possible. An intervention and comparison classroom was included for both health education and kinesiology; however, only one section of research methods existed for social work, which was used for the intervention. The three instructors for the three intervention classes were part of the research team and agreed to conduct the intervention in their classrooms, while two additional instructors teaching different sections of the same courses agreed to be the comparison group. Effects of the semester-long intervention were assessed via quantitative surveys given at the beginning and end of the semester.

Participants

A total of 102 students in the intervention classes and 82 students in

the comparison classes completed the pretest survey, while 89 students in the intervention classes and 57 in the comparison classes completed the posttest survey. Only students who completed both the pre- and posttest survey ($N = 135$) were included in data analyses, with $n = 81$ participants from intervention classrooms and $n = 54$ participants from comparison classrooms. Table 1 contains the demographics of the students from the intervention and comparison classrooms. Across all classrooms, students were, on average, in their early 20s, reported diverse ethnicities (less than 10% identifying as White), and were majority straight and female. About half of the students in both groups were the first in their family to go to college. Very few students in either group (less than 5%) were currently or had previously been involved in a research study as a research assistant.

Measures

Demographic Information

Student participants' ethnic identity was assessed via both a multiple-choice and an open-ended survey question. Sex/gender was assessed by a two-part question (sex assigned at birth and current gender identity; GenIUSS Group, 2014). Sexual identities were assessed via questions from the National Health Interview Survey (Dahlhamer, Galinsky, Joestl, & Ward, 2014). Students were also asked whether they were the first in their families to attend college, whether English was their first language, whether they had a disability, how long they had lived in the United States, how many hours per week they worked for paid and unpaid labor, their age, their semester in their major, and their economic situation when they were growing up.

Sense of Belonging

Three items were adapted from Mendoza-Denton, Downey, Purdie, Davis, and Pietrzak's (2002) study that included measures of sense of belonging to assess students' (a) sense of belonging in the department and (b) sense of belonging in the research methods course. Participants were prompted to "Circle the number that best describes your feelings towards your department/research methods course right now." Items were reversed from Mendoza-Denton et al. (2002) (for example, higher scores were adjusted to indicate greater sense of belonging) and ranged from 1 (*miserable*) to 10 (*thrilled to be here*), from 1 (*do NOT fit in*) to 10 (*definitely fit in*), and from 1 (*NOT welcome*) to 10 (*very welcome*). Two subscales were formed by separately averaging the three items related to belongingness in the department and the three items related to belongingness in the research methods course.

Table 1
Sample Demographics

	Participants From Intervention Classrooms (n = *81)*	*Participants From Comparison Classrooms* (n = *54)*
Age	*M* = 23.41 years old	*M* = 22.21 years old
Ethnic Identity	14.8% Asian 17% Pacific Islander/Filipino 6.2% Black or African American 37% Hispanic or Latino 8.6% white 2.5% Middle Eastern 9.9% More than one ethnic identity	22.2% Asian 13% Pacific Islander/Filipino 11.1% Black or African American 24.1% Hispanic or Latino 9.3% White 0% Middle Eastern 20.4% More than one ethnic identity
Gender	70.4% Female	66.7% Female
Sexual Orientation	88.9% Straight 4.9% Lesbian/Gay 4.9% Bisexual 1.2% Something else	88.9% Straight 1.9% Lesbian/Gay 7.4% Bisexual 1.9% Something else
Mental or Physical Disability	4.9 % Yes	5.6% Yes
First Generation	44.4% Yes	46.3% Yes
English First Language	55.6% Yes	74.1% Yes
Major	53.1% Kinesiology 24.7% Health education 22.2% Social work	61.1% Kinesiology 38.9% Health education 0% Social work
Previously or Currently Involved in Research	97.5% No	94.4% No

Safety of the Course Environment

A single-item scale was created for the purpose of this study to measure students' perceived safety in a research methods class. Participants were prompted to "Think about the research methods course you are taking. How often do you feel you are safe to ask questions and share your opinions?" Response options ranged from 1 (*never*) to 5 (*very often*), with higher scores indicating greater perceived safety within the classroom.

Perceptions of Stereotype Threat

A two-item scale was used from Aronson, Fried, and Good (2002) to measure students' perceptions of stereotype threat related to race. Participants were asked to what extent they agreed or disagreed that "people make judgments about my abilities based on my race" (item 1) and "people make judgments about my racial group based on my performance" (item 2). Response options were reverse coded from Aronson et al. (2002); the 7-point scale ranged from 1 (*strongly agree*) to 7 (*strongly disagree*), with higher scores indicating lower perceived stereotype threat.

Self-Efficacy as a Researcher

A six-item scale was used from Estrada, Woodcock, Hernandez, and Schultz's (2011) measure of students' self-efficacy for being a scientist. Participants were asked to rate their confidence from 1 (*not at all confident*) to 5 (*absolutely confident*) in their abilities to function as a researcher in their major. Students were prompted with items beginning with the stem "I am confident that I can" and ending with phrases such as "use research skills (use of tools, instruments, and/or techniques)," "generate a research question to answer," and "create explanations for the results of the study."

Math Anxiety

A single item was used from Nunez-Pena, Guilera, and Suarez-Pellicioni (2014) to measure students' math anxiety. Participants rated, "How math anxious are you?" with response options ranging from *not anxious* (1) to *very anxious* (10).

Community Generativity

Six items were adapted from Morselli and Passini's (2015) social generativity scale to assess the students' concerns about giving back to their community. Participants rated to what extent they agreed with the following statements: (1) "I carry out activities in order to ensure a better world

for my community," (2) "I have a personal responsibility to improve the community in which I live," (3) "I give part of my daily comforts to foster the development of my community," (4) "I think that I am responsible for ensuring a state of well-being for my community," (5) "I commit myself to do things for my community that will survive even after I die," and (6) "I help people in my community to improve themselves." Response options ranged from 1 (*strongly disagree*) to 7 (*strongly agree*) and were averaged to create a composite scale.

Intentions to Pursue a Career in Research

Three items were used from Estrada-Hollenbeck, Aguilar, Woodcock, Hernandez, and Schultz (2009) to assess undergraduate students' interest in research as part of their career. Participants were asked to assess their intentions to pursue a career in which they would (a) conduct research, (b) share research findings with others, and (c) present research papers at conferences. Students responded to each item on an 11-point scale from 0 (*definitely will not*) to 10 (*definitely will*).

Intentions to Pursue Undergraduate Research

Three items were adapted from Deemer, Thomas, Chase, and Smith (2014) to assess participants' interest in research as an undergraduate student. Participants were prompted to answer how likely they would be to (1) pursue undergraduate research opportunities, (2) volunteer to work in a faculty research lab, and (3) volunteer to work on a faculty member's research team. Participants' response options ranged from 0 (*definitely will not*) to 10 (*definitely will*), and responses to the three items were averaged to create one scale.

Intervention Component 1: Faculty Training

The social justice pedagogy intervention used to train faculty was designed to shift their teaching approaches to become more welcoming, inclusive, growth-oriented, and social-justice minded. Faculty training included approximately 10 hours of training with readings, assignments, and group discussions. The research team created a manual for the instructors in the intervention group to aid the instructor in becoming familiar with the literature on social justice pedagogy, stereotype threat, math anxiety, mindset theory, critical mathematics, and the philosophy behind the blended intervention.

Instructors in the intervention group were also provided with two checklists for re-evaluating their course materials to be more social-justice

oriented (Taylor et al., 2019). The first checklist focused on the syllabus: Instructors were asked to review and revise their syllabi by engaging with 12 questions. Questions included, "Is grading described in a way that is success-oriented rather than failure-oriented?" and "Does the syllabus tell students how research/statistics is used to improve the lives of individuals and/or communities?" A second checklist asked five questions about the course readings to assess the extent to which the articles selected were balanced and inclusive. Questions included, "Do the authors represent diverse populations?" "Does the content relate to social justice issues?" and "Does the content relate to identities or communities that are common to students in your classes?" The main product from the training was a syllabus that reflected a more inclusive and welcoming language with a growth mindset orientation, had little to no triggering language and jargon, and included explicit social justice language and content. This syllabus served as the blueprint for the class.

Intervention Component 2: First Day of Class Activities

Instructors were asked on the first day of class to conduct a belonging-ness activity to address students' worries and concerns about the course ahead and to discuss expectations the instructor had for the students, students' expectations of the instructor, and students' expectations of each other. The purpose of the activity was to help students feel acknowledged, take responsibility for the expectations asked of them, and create a learn-ing community in the classroom. Instructors also played a YouTube video in class that introduced the ideas of growth mindset to reinforce that the course materials contain learnable skills and depend on each student's perspective and efforts.

Intervention Component 3: Values Affirmations

Instructors assigned two non-graded values affirmation writing assign-ments over the course of the semester. The two assignments were focused around (a) communal goals (for instance, "preferring to work with people rather than work with things or alone") and (b) social justice research values (for instance, "being a critical thinker who helps find solutions to injustice") (Cohen, Purdie-Vaughns, Apfel, & Brzustoski, 2009; Steele & Aronson, 1995). For each assignment, students were given a list of values and prompted to answer several reflection questions (for instance, "Which value did you select as most important to you personally?" and "How does your choice of major or career allow you to express that goal?").

Students were given 10-15 minutes to reflect and write about the values they selected.

Intervention Component 4: Role Modeling

Instructors invited three guest speakers to three separate class meetings who were actively involved with research and were at different stages of their academic journeys. An undergraduate student, a graduate student, and a professor from underrepresented populations in academia came to each intervention classroom one time for approximately 30 minutes to discuss their background, experience, and interest in research (Stevens & Hoskins, 2014).

Procedure

Following approval by the university's Institutional Review Board for Human Subjects, three faculty teaching the three different research methods courses agreed to complete the semester-long intervention in their classes. Two faculty teaching sections of two of the three same courses agreed to be the comparison classes. In all five classrooms, researchers who were not instructors of the course invited students to participate in a questionnaire during the first two weeks of the academic semester (that is, the pretest). At the end of the semester, researchers returned to all five classes to invite students to complete an identical follow-up questionnaire (that is, the posttest). Only participants at each time point who gave their written informed consent completed the questionnaires. Students completed the survey during a class meeting via paper and pencil over a period of approximately 20-25 minutes. Students were offered an incentive during the posttest to maximize the response rate (for example, pizza during the class in which they took the survey).

Results

Preliminary analyses suggested normality in the dependent variables (for example, small values for skewness and kurtosis) and acceptable internal consistency reliability for the scales ($\alpha > .70$). Table 2 includes the means and standard deviations for all dependent variables, separated by intervention vs. comparison classrooms. While the means for the comparison group were generally higher than the intervention group, independent sample *t* tests showed no significant differences in pretest scores between intervention and comparison participants, except for intentions to participate in undergraduate research ($p = .002$). At baseline,

Table 2
Means (Standard Deviations) for Dependent Variables

Dependent Variable	Possible Range of Scores	Participants From Intervention Classrooms (N = 81)		Participants From Comparison Classrooms (N = 54)	
		Pretest	**Posttest**	**Pretest**	**Posttest**
Sense of Belonging to the Department	1-10	8.13 (1.31)	8.28 (1.37)	8.26 (1.26)	8.25 (1.39)
Sense of Belonging to the Course	1-10	7.94 (1.53)	8.03 (1.47)	8.22 (1.26)	8.70 (1.14)
Safety of Course Environment	1-5	4.06 (.82)	4.26 (.90)	4.24 (.75)	4.54 (.64)
Perceptions of Stereotype Threat	1-7	4.72 (1.80)	4.88 (1.93)	4.65 (1.68)	5.07 (1.94)
Researcher Self-Efficacy	1-5	3.37 (.79)	3.73 (.68)*	3.59 (.68)	4.30 (.53)*
Math Anxiety	1-10	5.33 (2.97)	5.47 (2.92)	5.30 (2.96)	5.34 (3.09)
Community Generativity	1-7	4.62 (1.36)	5.06 (1.16)*	4.95 (1.37)	4.87 (1.15)*
Intentions for Career in Research	0-10	5.74 (2.19)	5.60 (2.30)	6.41 (2.09)	6.06 (2.41)
Intentions for Undergraduate Research	0-10	5.55 (2.69)	5.85 (2.46)*	7.05 (2.63)	6.65 (2.75)*

*Indicates significant differences between intervention and comparison groups at $p < .05$.

students in the comparison classrooms reported significantly higher intentions to pursue research opportunities as an undergraduate compared to students in the intervention classrooms. For the main analyses, we created change scores (that is, posttest mean/pretest mean) to focus on comparing the groups on their improvement in the targeted outcomes, independent of their baseline score.

Ethnicity, gender, and major were initially included as covariates and were found to be non-significant. To maximize degrees of freedom, a multiple analysis of variance (MANOVA) examining differences between the intervention and comparison students on the nine dependent variables was used and found to be significant [F (9, 117) = 2.198; p = .027; Wilks' Λ = .855; η^2 = .145]. Three of the dependent variables significantly distinguished the groups. Compared to students who did not receive the intervention, students in the intervention classes had small but significantly higher increases in intentions to pursue undergraduate research opportunities (p = .018; η^2_p = .044) and community generativity (p = .019; η^2_p = .043). Students in the comparison classes had a small but significantly higher increase in researcher self-efficacy than students in intervention classes (p = .026; η^2_p = .039).

Discussion

The overall purpose of our study was to assess the semester-long effects of a social justice pedagogy intervention implemented in research methods courses. While the overall multivariate analysis showed significant differences between the intervention and comparison classes on the set of dependent variables, the student groups differed on three of the nine dependent variables, with only 3%-4% of the variance in these variables explained by group membership. Specifically, we found among students in the intervention group a small but significant increase in their intentions to pursue undergraduate research opportunities and an increase in community generativity (a measure of communal goals and values). The comparison group, who started out with slightly higher scores on their intentions to pursue research careers, gained slightly more in their self-efficacy as researchers than the intervention group. In the following paragraphs, we discuss our findings, highlight some limitations of the intervention, and identify areas for future research on social justice pedagogy interventions.

The small but significant improvements in community generativity for the intervention group offer encouraging support for the effectiveness of the intervention. One intervention strategy was a values affirmation

writing exercise focused on how students connected with and valued communal goals. This opportunity to consider how working with others and giving back to their communities synched with students' major and career choices may have further reinforced these values, compared to the students in classrooms who did not participate in a similar exercise. Interestingly, both groups showed decreases in intentions to pursue research, but the decline was smaller for students in the intervention classrooms. In this way, the social justice pedagogy strategies, such as hearing from role models who share similar characteristics and have chosen to pursue research as part of their careers, may have helped students maintain some interest in research as a career option. Finally, self-efficacy for being a researcher improved in both groups, with a significantly greater increase for students in the comparison classrooms. This finding was unexpected, but understandable, given the significantly higher pretest scores for the comparison group. That is, students in the comparison classrooms started with a higher self-efficacy and, thus, had more confidence to build upon during their research methods course.

Limitations and Future Research

A few limitations of the study are noteworthy. First, the classrooms and students were not randomly assigned, thus limiting the cause-and-effect conclusions that can be drawn from our data. The data showed the intervention and comparison groups were not equivalent at baseline. Although the differences were only statistically significant for one dependent measure (intentions to pursue undergraduate research), there was a trend for difference on several of the measures, suggesting that non-equivalence may have been a factor in the results. Moreover, the classes we included in the study were not identical in structure or content, and all five had different instructors. The intervention classes included one large, mostly lecture-style class and two smaller, discussion-oriented classes. While the study's findings are generalizable to real-life teaching contexts, suggesting high ecological validity, follow-up studies should be conducted using a true experimental design where random assignment can overcome these classroom biases and provide stronger causal support for the effectiveness of social justice pedagogy interventions.

Another limiting factor in not finding more significant differences between groups may have been the amount and intensity of the intervention itself. For feasibility and to ensure consistency across the intervention classrooms, we selected a specific number of strategies, such as inviting role models to speak in class and implementing values affirmation writing

exercises. However, these discrete events may not have been sufficient to create significant changes in student outcomes over the semester. Future studies that involve more frequent and continuous interventions could reveal a greater impact of social justice pedagogy strategies on student outcomes. Sample size was also a limiting factor: There was a relatively high attrition rate from pre- to posttest (12.7% for the intervention classrooms; 30.5% for the comparison classrooms). The posttest was conducted at the end of the semester, when attendance was lower; thus, some students were not in class the day that the survey was administered. In future studies, the timing of the pre- and posttest during the semester should be considered more carefully to maximize participation.

Finally, it is important to acknowledge the broader teaching context within which the intervention took place. This study was conducted at one university located within a major cosmopolitan area with a diverse population. The university has a social justice-focused mission, a diverse student body, and progressive faculty and programs. Moreover, the university has the nation's only College of Ethnic Studies, and taking a course focused on social justice is a general education requirement for all students. Thus, students participating in this study may have already been exposed to social justice content in other classes. Additionally, it may be that instructors, regardless of using an explicit intervention, may incorporate social justice into their teaching at this type of university. Future research could address these potential confounds by asking students at the pretest whether they had already taken a social justice-focused class as well as identifying to what extent instructors are already using social justice pedagogy.

Conclusions

This study is an important first step in considering ways to improve the classroom experience for diverse students in undergraduate research methods courses. The study is one of the first to examine issues such as stereotype threat, belongingness, and intentions to pursue research in classrooms with predominantly unrepresented minority students. Further research is needed to study these concepts in classrooms across institutions with different student populations. In addition, further inquiry into the pedagogical strategies used in undergraduate research courses is critical for inspiring students and increasing the diversity and strength of the research workforce.

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