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The Impact of an Undergraduate Led Mathematics Summer Camp on High School Students' Interest in Mathematics and Mathematics Teaching

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ABSTRACT

Considering the prevalence of mathematics teacher shortages in the United States, together with declining enrollments in teacher preparation programs, it is crucial for districts and teacher preparation programs alike to investigate new recruitment initiatives. In this pilot study, a university aimed to increase high school students' interest in mathematics and mathematics teaching through a 1-week summer mathematics camp led by university undergraduates who were participating in an experiential learning program in mathematics teaching. The undergraduates engaged the high school students in activities chosen to allow exploration and discovery related tp advanced mathematics topics. High school students expressed highly positive perceptions of the mathematics camp outcomes. Furthermore, participants experienced increased interest in mathematics at the end of the week and approximately one-third of participants attributed the camp to improving their likelihood of entering a teacher preparation program. Participants highlighted the positive classroom environment and focus on social emotional learning as strong contributors to the success of the camp. Implications for future research and practice are discussed.

KEYWORDS

Attitudes; interest; mathematics camp; mathematics teaching; teacher recruitment

Declining enrollments in teacher preparation programs together with widespread teacher shortages highlight the critical need to recruit more students into teaching programs (Yarrell, 2022), specifically in mathematics and other fields within science, technology, engineering, and mathematics (STEM) where teacher shortages are more pronounced (Feng & Sass, 2017). Since recruitment into mathematics teaching requires a strong interest in and passion for the content area as well as education, a key place to begin recruitment efforts is by stimulating high school students' interests in mathematics before college majors are chosen and career field decisions are fully formed. Along these lines, researchers have identified high school students as a prime population for recruitment into teacher preparation (e.g. Demir et al., 2019; Reys & Reys, 2004).

A small liberal arts university in the New England area designed the Leadership in Teaching Program in an effort to attract more students into mathematics teaching through a two-pronged approach: (a) providing a yearlong experiential learning program for first-year undergraduate students to explore teaching, and (b) running a summer mathematics camp for local high school students that was facilitated by the undergraduates. The article herein focuses on the latter approach, where the goal was to cultivate positive attitudes and interest in mathematics for high school students, while increasing the visibility of mathematics education teaching possibilities through participation in the summer mathematics camp experience.

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Literature Review

Research evidence points to improving attitudes towards and interest in STEM as a necessary first step towards generating interest in STEM careers (Dabney et al., 2012; Hayden et al., 2011). Informed by the existing literature, the one-week mathematics camp: (a) recruited from the population for which the teacher preparation program feeds (e.g. Castro et al., 2018), (b) engaged local teachers to enlist and encourage their high school students to participate (Carothers et al., 2019), (c) promoted interest in mathematics with challenging, collaborative activities (e.g. Bischoff et al., 2008; Carothers et al., 2019; Caswell, 2018), and (d) incorporated near-peer, undergraduate student role models as camp leaders (Tenenbaum et al., 2014).

Grow Your Own Programs

One recommended approach to remedying the teacher shortages identified in the University Council for Education Administration Policy Brief involved *grow your own* programs in high needs schools (Castro et al., 2018). Grow your own programs target recruitment and training from within the community a district serves. A projected benefit of such programs was to recruit more teachers who were ethnically and culturally similar to the school population (Gist, 2019). For instance, Carothers et al. (2019) partnered with a local district to utilize a one-week education camp for high school students as part of a grow your own recruitment strategy. The district teachers identified ideal candidates from among their students and recommended participation in the camp to those selected candidates. Although conclusions cannot be drawn about whether the education camp led to more individuals pursuing teaching, interest in teaching increased from pre- to post-camp (Carothers et al., 2019).

Summer Camps

Several studies have shown that summer camps serving as an introduction to teaching and teaching methods for high school students have potential to be a fruitful recruitment technique (e.g. Carothers et al., 2019; Caswell, 2018). Alternatively, summer camps aiming to increase interest in and/or improve attitudes towards mathematics or STEM fields have led to positive recruitment outcomes into STEM majors (e.g. Aeschlimann et al., 2016; Bischoff et al., 2008; Bottia et al., 2015; Chittum et al., 2017; Nation & Muller, 2023; Vela et al., 2020; Wiest, 2004) and increased interests in STEM careers (e.g. Kitchen et al., 2018; Luecke et al., 2023; Martinez Ortiz et al., 2018; Mohr-Schroeder et al., 2014; Vela et al., 2020), particularly with the involvement of near peer mentors also participating in the camp (Heise et al., 2020; Sithole et al., 2017; Tenenbaum et al., 2014). In fact, individuals who participated in STEM summer camps were found to be 1.4 times more likely to intend to pursue a STEM-related occupation (Kitchen et al., 2018) inclusive of careers in mathematics and mathematics teaching. Although there is substantial evidence of STEM academies impacting participants' interests in STEM and in pursuing STEM careers, there are relatively few studies specific to mathematics and even fewer examining content-focused extracurricular programs for recruitment into mathematics teaching. To our knowledge, this study is the first to employ undergraduates to facilitate the mathematics summer camp and to serve as near-peer role models to the high school students to improve high school students' attitudes towards mathematics and increase their interest in becoming educators.

This project aims to stimulate interest in mathematics, while increasing visibility and awareness of pathways to teaching mathematics, by providing a mathematics summer camp for high school students from within the communities the teacher preparation program serves. Near-peer role models, many of whom were prospective teachers, facilitated the camp and engaged the high school students in hands-on, collaborative problem-solving tasks. Our research questions included:

(1) Does participating in a mathematics summer camp led by undergraduates impact high school students' attitudes towards mathematics?
(2) Does participating in a mathematics summer camp led by undergraduates impact high school students' future plans to pursue a teaching pathway?
(3) How did the high school students perceive the camp experience?

Methods

Participants

Participants in this study included 14 high school students. They were all (100%) incoming sophomores, 50% female, and primarily Asian (see Table 1). Participants were enrolled at seven public schools in six different school districts in one region of a northeastern state. All indicated a plan to pursue an undergraduate degree. To be included in the study they had to: (a) be a ninth or tenth grader at the time of application, (b) complete the application process and be accepted into the program, and (c) commit to attending the full week of the mathematics summer camp.

Procedures

Before beginning, Institutional Review Board (IRB) approval was received for this study. In partnership with local educational agencies, ninth and tenth grade students with an interest in or aptitude for mathematics, with particular encouragement for students from underrepresented ethnic and socioeconomic groups, were recruited to participate in the camp. The first author/camp director emailed recruitment information to 23 mathematics teachers and mathematics department chairs at 13 local high schools in six districts. Like Carothers et al. (2019), local mathematics teachers identified candidates, recommended them to the camp directors for follow-up if needed, shared the link for the application, and personally encouraged those selected students to apply. The electronic application required a short essay explaining why they: (a) were interested in attending in the summer camp, and (b) should be selected to participate. Additionally, it asked students to describe their extracurricular involvement and previous academic summer camp experiences.

Applicants were accepted if their application was complete, their essay explained personal motivations for attending, and there was evidence of aptitude for mathematics (via teacher recommendation or extracurricular activities). Of 20 high school students who applied to the camp and were accepted, 15 attended the first day of camp and 14 assented to participate in this study.

Table 1. Participant demographics (n = 14).

Characteristic		N (%)
Gender	Female	7 (50.0%)
	Male	7 (50.0%)
	Non-binary	0 (0.0%)
Race	Asian	8 (57.1%)
	White	5 (35.7%)
	Black	0
	American Indian/Alaska Native	1 (7.1%)
Ethnicity	Hispanic/Latinx	1 (7.1%)
	Non-Hispanic/Latinx	13 (92.9%)
Grade Completed	9^{th}	14 (100%)
School District Type	Urban	3 (21.4%)
	Suburban	11 (78.6%)
	Home-school	0 (0.0%)
Parent Level of Education	Graduated college	10 (71.4%)
	Did not graduate college	4 (28.6%)

Summer Mathematics Camp Procedures

The [removed for review] Institute of Mathematics (AIM) was a week-long day camp in July that ran from 9:15 am to 2:45 pm daily. It was held on the university campus. The length of the camp was determined based on previous studies that involved one-week camps, such as Carothers et al. (2019) and Vela et al. (2020). The day was split into three mathematics blocks, including lunch, according to the following daily schedule:

- 9:15 – 9:30 Arrival
- 9:30 – 11:00 Mathematics block 1: Morning Task
- 11:00 – 11:15 Snack Break
- 11:15 – 12:00 Mathematics block 2: Mini Game
- 12:00 – 1:00 Lunch
- 1:00 – 2:30 Mathematics block 3: Afternoon Task
- 2:30 – 2:45 Dismissal

The morning and afternoon tasks were chosen to allow exploration and discovery related to advanced mathematics topics (e.g. Reimann Sums, Binomial Theorem), paradoxes (e.g. Simpson's, Birthday), and well known problems (e.g. Monty Hall, 4-Fours, Overhanging Blocks). To further engage the students, *mini games*, which involved the use of mathematics within a friendly competition, were incorporated. Students earned small rewards for winning a mini game such as candy and university branded pencils and decals. For example, one mini game called, the Last Banana, originally presented in a TED-Ed Lesson (Barichello, 2015) leads to the exploration of fairness using probability. Students repeatedly played the dice game with a partner to determine who was most likely to receive the last banana on a stranded island. One player wins when the largest number rolled on the two dice is 1, 2, 3, or 4, while the other player wins if the largest number rolled is a 5 or 6. Another mini game was based on Bachet's Problem where students were challenged to manipulate weights and a pan balance to show that an object weighing any whole number 1 to 40 pounds could be weighed on the scale using a subset of weights representing 1, 3, 9, and 27 pounds. Table 2 outlines the daily curriculum for Camp AIM.

The campers worked collaboratively in teams of three to four on the mathematical tasks. Undergraduate students at the hosting university facilitated all aspects of Camp AIM, under the supervision of two professors. In an experiential learning program, ten undergraduates, having trained in coursework, prepared for and led the academic summer camp. The group was responsible for introducing the tasks, monitoring and fostering engagement, asking and responding to questions, discussing the underlying mathematics, as well as interacting with campers during arrival, dismissal, breaks, and lunch. For more details on the undergraduate experience see de la Cruz and Goldman (2023).

Data Collection

Data were collected from the participants at the start of the camp (pre-camp) and again at its conclusion (post-camp) via electronic surveys. Before beginning each survey, participants provided

Table 2. Daily curriculum for camp AIM.

	Tasks				
Block	Monday	Tuesday	Wednesday	Thursday	Friday
Block 1	4 Fours	Birthday Problem	Overhanging Blocks	Simpson's Paradox	Pascal's Triangle: Part 2
Block 2	Last Banana	Krypto	Balance	Sort the Numbers	Don't be Mean
Block 3	Compound Interest	The Game Show	Fun with Sums	Pascal's Triangle: Part 1	9 Nines

their assent; their parents/guardians had previously consented to their participation. Surveys consisted of three main sections related to: (a) attitudes towards mathematics, (b) future teaching plans, and (c) perceptions of the camp experience.

Mathematics Attitudes

Attitudes towards mathematics were measured at pre- and post-camp using 7 items generated by the author to capture Ajzen's (1993) three components of attitudes (ABC Model of Attitude): affect, behavior, and cognition. Walker et al. (2020) showed the reliability and validity of Ajzen's three-factor model (alpha=.74–.91; factor loadings=.49–.90). We adapted the measure to be less school-specific (e.g., "I finish my math homework in time") and more aligned with camp activities. For example, an item from the affect factor, "I am interested in the things I learn in math," was changed to "I find math to be interesting." Participants rated their agreement with each statement on a scale from 1, *strongly disagree*, to 5, *strongly agree*. Two items for two components were reverse scored to ensure higher numbers indicated more positive attitudes; results showed similar responses for these items (once reverse scored), indicating participants carefully read and considered each item. Due to the mall sample size, we were unable to calculate the reliability and validity statistic for our adaption of Ajzen's (1993) model. We present the results by individual item, rather than based on the 3-factor model, for this reason.

On the post-camp survey, participants rated their agreement with three additional items specifically related to their perceptions of the impact of the camp experience on their attitudes towards mathematics (e.g., "After camp, I think I enjoy mathematics more"). These were also rated on a 5 point Likert-type scale from *strongly disagree* to *strongly agree*.

Future Teaching Plans

Three items related to future teaching plans (e.g., "I want to be a math teacher") were developed by the author and rated on the same 1–5 scale on the pre- and post-camp surveys. Three additional items were rated from 1–5 on the post-camp survey regarding participants' perceptions of the impact of the camp experience on their future education and career plans (e.g.,"Because of camp, I might be interested in learning how to teach mathematics in college").

Perceptions of Camp

In addition to the two sections described above, participants' perceptions of their camp experience were gathered in the post-camp survey. Participants rated their level of agreement with seven statements (e.g. "I learned a lot at Camp AIM," "I would encourage a friend to participate in Camp AIM in the future") on a 1–5 scale. They also answered three open response questions about their camp experiences: (1) "Why did you decide to attend Camp AIM? Did it meet your expectations? Why or why not?" (2) "What part of Camp AIM did you enjoy most?" and, (3) "Do you have any recommendations for improving Camp AIM?"

Data Analysis

Across all individual items, descriptive statistics were calculated after items were reverse coded as needed. Non-parametric statistics, Wilcoxon Matched-Pairs Test, were used because of the small sample size to compare participants' ratings on each item from pre- to post-camp. One participant did not complete the post-survey. Therefore, any non-parametric statistics or descriptive statistics for measures only collected on the post-survey are reported for $n = 13$ participants. Responses to open-ended questions were reviewed independently by both authors to generate and come to consensus on themes that answered our research questions.

Table 3. Attitudes toward mathematics.

Item	Pre-Camp Mean (SD)	Pre-Camp Range	Post-Camp Mean (SD)	Post-Camp Range	Mean Change Score	Wilcoxon Matched-Pairs *Z*	Wilcoxon Matched-Pairs *p*
Attitudes							
Affect							
It is easy to get others excited about math.	2.54 (0.97)	1–4	3.62 (1.12)	2–5	+1.08	2.72	.006**
I find math to be interesting.	4.54 (0.52)	4–5	4.85 (0.38)	4–5	+.31	2.00	.046*
Behavior							
I want to have a job where I use math every day.	3.46 (0.66)	3–5	3.77 (0.93)	2–5	+.31	1.27	.206
I am not going to take any more math classes in high school. (RC)	5.00 (0.00)	5–5	4.92 (0.28)	4–5	−.08	−1.00	.317
I want to study math in college.	3.54 (1.13)	2–5	3.69 (1.11)	2–5	+.15	0.71	.480
Cognition							
I do well when solving math problems.	4.23 (0.60)	3–5	4.31 (0.63)	3–5	+.08	0.58	.564
I find using math to solve problems to be difficult (RC)	3.92 (0.86)	2–5	3.62 (0.65)	3–5	−.30	−1.63	.102
Perceived Impact of Camp							
After Camp AIM, I think I enjoy math more.			4.54 (0.66)	3–5			
After Camp AIM, I am more likely to encourage a friend to learn more math.			4.46 (0.87)	3–5			
Because of Camp AIM, I am more likely to study math in college.			4.15 (0.80)	3–5			

Note: RC = reverse coded; *p < .05; **p < .01.

Results

The results are parsed into three sections relating to: (a) attitudes towards mathematics, (b) future teaching plans, and (c) perceptions of the Camp AIM experience.

Attitudes Towards Mathematics

Table 3 presents the descriptive and non-parametric statistics, as well as the change scores for each item related to mathematics attitudes that was measured pre- and post-camp. Examining Wilcox Matched Pairs for individual items revealed statistically significant changes on two items from pre- to post-camp, both of which related to the affect component of mathematics attitudes. Participants started with the lowest pre-survey score for affect related to the ease of getting others excited about math; they also showed the greatest improvement on this item ($p < .01$). Participants also showed significant change in finding mathematics to be interesting ($p < .05$), despite a high pre-survey average on this item. Though not statistically significant, participants increased by a similar amount in their agreement with the statement, "I want to have a job where I use math every day." Also not statistically significant, participants actually decreased in their agreement with the reverse coded statement related to finding using mathematics to solve problems difficult. Participants rated items on their perceptions of the impact of the camp experience on their attitudes towards mathematics highly. All items had a mean of greater than 4, indicating strong agreement; no participants disagreed with any of these statements (range 3–5).

Table 4. Future teaching plans.

Item	Pre-Camp Mean (SD)	Pre-Camp Range	Post-Camp Mean (SD)	Post-Camp Range	Mean Change Score	Wilcoxon Matched-Pairs *Z*	Wilcoxon Matched-Pairs *p*
I want to be a teacher but not a math teacher	1.92 (1.19)	1–5	2.08 (0.86)	1–4	+.16	1.00	.317
I want to learn how to be a teacher when I go to college	2.77 (1.24)	1–5	2.92 (1.32)	1–5	+.15	0.54	.589
I want to be a math teacher	2.00 (0.82)	1–3	2.08 (0.86)	1–3	+.08	0.33	.739
Perceived Impact of Camp							
Because of Camp AIM, I might be interested in learning how to teach math in college.			3.23 (1.36)	1–5			
After Camp AIM, I am more interested in the possibility of teaching math in the future.			3.15 (1.07)	1–5			

Future Teaching Plans

Table 4 presents the descriptive and non-parametric statistics, as well as the change scores for each item related to future teaching plans that was measured pre- and post-camp. Changes in participants' future teaching plans were limited, with mean ratings both before and after camp indicating some level of disagreement with statements about wanting to become a teacher (i.e., mean < 3). No differences were statistically significant, although there was a small positive change on each item. Mean levels of agreement with statements about participants' perceptions of the degree to which the camp experience positively impacted their plans to become mathematics teachers were slightly above neutral, with more participants indicating a positive impact than not. The ratings of individual participants varied greatly on these items related to the impact of Camp AIM on choosing a mathematics teaching pathway, ranging from 1–5. For each item, five participants were "neutral," five reported some degree of agreement, and three reported some degree of disagreement.

Perceptions of Camp AIM

The 13 participants who completed the week of camp and the post-survey all *strongly agreed* that "Camp AIM was fun" and that they "want more experiences like the one I had at Camp AIM" (see Table 5). Perceptions of the experience were extremely positive overall, with the average level of agreement at *strongly agree* across the seven items ($M = 4.91$, $SD = 0.14$). No participant rated any item lower than a 4 (indicating agreement). Campers indicated that they would both participate in the camp again and would encourage a friend to attend the camp. Table 5 displays the averages for each of these items, where 1 indicates strong disagreement and 5 represents strong agreement. Furthermore, responses to the open-ended prompts revealed that Camp AIM met or exceeded the participants'

Table 5. Camper perceptions of camp AIM experience.

Item	M (SD)	Range
Camp AIM was fun	5.00 (0.00)	5
I want more experiences like the one I had at Camp AIM.	5.00 (0.00)	5
Camp Aim was educational	4.92 (0.28)	4–5
I had fun at Camp AIM	4.92 (0.28)	4–5
I would encourage a friend to participate in Camp AIM in the future.	4.92 (0.28)	4–5
If given the opportunity, I would participate in another Camp AIM or similar camp in the future.	4.92 (0.28)	4–5
I learned a lot at Camp AIM	4.69 (0.48)	4–5
Average across items	4.91 (0.14)	4.57–5.00

Table 6. Open ended responses: camp AIM experience.

Theme	Participant quote
"Fun"	" . . . they made the lessons fun."
	" . . . Every activity we did was so much fun and we eased our way into difficult material, that when we did get into difficult material, it made so much sense. Camp AIM really got me excited about math, that when I got home, I just could not stop talking about what I learned."
	" . . . It was really fun and it was interesting to see the mathematical thinking of other students and to learn about cool math."
	"Camp AIM certainly surpassed my expectations because it was so distinctive from other conventional math events. Instead of the cold and rigid math even I imagined, Camp AIM was filled with games, laughs, and unique methods to learn math concepts."
	"My favorite aspect of Camp AIM was how learning was turned into a game. Nothing in the camp ever felt like "work" and every activity was enjoyable."
Impact of Counselors	"I greatly enjoyed the counselors. They were so fun and made the whole experience so fun and made me excited to go to sleep and wake up to come back to camp."
	"Being able to interact with the mentors [was the part of the camp I enjoyed most]."
	"I really enjoyed how the counselors crafted activities that made learning math fun."
	"Very very friendly counselors."
	"It exceeded my expectations because . . . the camp counselors made all of us feel included."
	" . . . the counselors definitely made the environment light hearted and enjoyable . . . "
Positive Environment/ Collaboration	"Another thing that made the experience were the competitions and our discussions. The environment was a good one, so I felt that it was easy for me to express my thoughts and disagree with others freely, without worrying about anything."
	" . . . And I love how discussion and sharing ideas while also respectfully arguing is at the heart of this camp."
	"I liked meeting new people with similar interests as me."
	"Everyone was very nice and easy to talk to, and it was a very effective way to make new friends."
	"Food, environment, and friendly competitions [were what I enjoyed most]."
	"I loved the team activities."
	"The environment [was what I enjoyed most] because it was friendly . . . "

expectations. The responses centered around three main themes: (a) the camp being "fun," (b) the positive impact of undergraduate camp counselors, and (c) the collaborative learning environment (see Table 6).

Discussion

This project explored an innovative mathematics teacher preparation recruitment initiative involving a mathematics summer camp for local high school students led by university undergraduates. Because the literature points to the essentiality of improving attitudes towards STEM fields as a precursor to increasing interest in STEM careers (Dabney et al., 2012; Hayden et al., 2011), we examined whether attitudes towards mathematics improved and future teaching plans changed from pre- to post-camp.

The project goal to stimulate interest in mathematics through a mathematics summer learning opportunity for high school students was successfully achieved, with significant change specifically related to the affect component items of mathematics attitudes ("I find math to be interesting" and "It's easy to get others excited about math"). According to Svenningsson et al. (2022) affective attitude components influence cognitive and behavioral; thus, changing affective attitudes is a first step to changing overall attitudes towards mathematics. Multiple campers attributed the camp to changing the way they see mathematics and mathematics learning, expressing a change in viewpoint to see challenging mathematics can be engaging and enjoyable. Thus, consistent with the literature, participation in a mathematics summer camp increased interest in mathematics (e.g. Kitchen et al., 2018; Luecke et al., 2023; Martinez Ortiz et al., 2018; Mohr-Schroeder et al., 2014).

In addition to improved attitudes towards mathematics, over one-third of participants agreed or strongly agreed that they are more interested in academic studies and a career in mathematics teaching. Participants agreed on average that they were more likely to study mathematics in college because of Camp AIM. Furthermore, there was a moderate increase in the desire to have a mathematics related career. However, examining interest in mathematics teaching as a specific

career choice, we found only a slight increase in the mean level of interest from pre- to post-camp. Moderators of change in attitudes towards a career as a teacher, such as gender differences and family perceptions of teaching, should be studied in future research to better understand for whom a mathematics camp is an effective strategy for recruiting future teachers.

However, all participants' perceptions of the mathematics camp experience were highly positive. All (100%) campers provided the highest possible level of agreement (5/5) that Camp AIM was fun and that they wanted more experiences like Camp AIM. They also all noted that Camp AIM met or exceeded their expectations. With highly positive perceptions of the Camp AIM experience and improved attitudes towards mathematics, one might ask why interest in teaching did not see stronger gains. For example, our method of recruitment involved a focus on students with an aptitude for mathematics; perhaps such high schoolers are more likely to pursue a mathematics-related career, but not one in the field of education that likely has lower salary and status. Different inclusion criteria may have yielded different results. Studies involving current and recent graduates in STEM fields have revealed common misperceptions about teaching careers related to salaries and job satisfaction as factors influencing the decision not to pursue a STEM teaching profession (Adams, 2022; Marder et al., 2017).

Although no claims can be made regarding whether the camp experience yields mathematics majors or future mathematics teachers, participants were exposed to the possibilities of mathematics teaching pathways through interactions with and learning from undergraduates who were mostly prospective STEM and education majors. In support of previous findings that interest is increased with the incorporation of near peer mentors (Sithole et al., 2017; Tenenbaum et al., 2014), participants attributed much of the success of the experience to the "counselors," close in age role models. Also, corroborated by previous studies, participants highlighted the positive classroom environment and focus on social emotional learning (e.g. inclusivity, communication, confidence, collaboration) as strong contributors to the success of the camp (Chi et al., 2010; Sutherland et al., 2022; Yilmaz, et al., 2010).

Implications for Practice and Policy

Our findings have several important implications for practice and policy. First, K-12 schools, teacher preparation programs, and state departments of education may formally build on the idea of near-peer mentors in order to recruit potential teachers to the pipeline earlier and continue to build on the connections and interest generated through Camp AIM. Just as school districts provide financial incentives for mentoring of new teachers, programs may be created to link a triad of current mathematics educators, pre-service mathematics educators, and prospective mathematics educators. Such a program may help to sustain and grow the interest developed through this program, and help prospective students to move beyond an interest in mathematics to an interest in mathematics education. At the undergraduate level, other universities with teacher preparation programs may replicate the procedures used in this study in partnership with local high schools. Many state departments of education highlight the importance of partnership between teacher preparation programs and K-12 schools, and this is one way to promote such collaboration through practice and policy.

Limitations and Future Research

Longitudinal studies are necessary to determine if increases in mathematics interest and improving attitudes towards mathematics, along with exposure to the possibility of teaching mathematics, is a fruitful teacher recruitment strategy. In this study we relied on participant's self-reported perceptions at two time points, but did not have a control group and therefore cannot make statements about the efficacy of this mathematics camp. Our preliminary findings could be explored in a follow-up survey to see if participants' perceptions have changed or maintained over time. In addition, we relied on

participant self-report and did not use existing, validated measures. Without reliability and validity statistics, results can be presented by item, but we are not able to draw strong conclusions by factors (i.e., ABCs). Additional research focused on validating this measure that was adapted for Camp AIM is needed. Future research is also needed expand on our preliminary findings with a larger, more ethnically diverse sample and more rigorous methodology (e.g., measures, design). Although we found some statistically significant differences from pre- to post-camp, our analyses may have been underpowered due to the small sample size.

Furthermore, additional research could explore a conglomerate of this mathematics focused recruitment initiative with aspects of successful education focused camp recruitment initiatives such as those studied by Carothers et al. (2019) and Caswell (2018), which provided an overview of teaching pathways and strategies, while also utilizing the university's prospective teachers as camp leaders and peer mentors. Also, evaluating the existing camp design along with the incorporation of 'Get the Facts Out' handouts and student presentations, which have been shown to increase interest in teaching and improve attitudes towards teaching by dispelling misperceptions about job satisfaction and salaries of teachers (Chasteen, 2022), is a possibility for future studies.

Additionally, although a grow your own approach was used to target recruitment from within the community and recruit an ethnically and culturally diverse sample (Gist, 2019), participants in this study were not representative of the local community. Future research is needed to determine how to better build on partnerships with local school districts and develop a culturally-sensitive recruitment process and camp experience. In order to recruit a larger sample of more diverse participants in future research, we may need to offer incentives beyond camp participation (e.g., stipends, university products) or provide support for students who experience financial barriers to access (e.g., transportation, housing).

Despite limitations, this model for stimulating interest in mathematics and mathematics teaching through an undergraduate led summer camp for high school students shows promise. It adds to the existing literature as the first of its kind to utilize near-peer teachers (college students), most of whom were prospective educators, to lead the camp activities. Additional research should be conducted to determine if this may be an effective approach for addressing the mathematics teacher shortage.

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