

Education Brief

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Math Corps Successfully Replicated



Nearly 30 years ago, Steven Kahn and Leonard Boehm at Wayne State University (WSU) started Math Corps, a summer camp for middle school students who could benefit from mentoring and positive influences. Their primary goal for the camp was to support the emotional and social needs of the students in Detroit; accordingly, the educators leveraged their backgrounds as math teachers to create an intensive summer program that provides not only that emotional and social support, but also high-quality math instruction.

In 2015, the National Science Foundation awarded WSU an Advancing Informal Science, Technology, Engineering, and Mathematics (STEM) Learning (AISL) grant, enabling the Math Corps summer camp to be replicated in three cities (Cleveland, Ohio; Philadelphia, Pennsylvania; and Utica, New York) in summers 2017, 2018, and 2019. As part of the grant, WSU contracted with Mathematica to conduct an independent study of Math Corps. This brief presents the results of a prospective descriptive analysis of the student characteristics and mathematics achievement at the three replication sites.

Math Corps philosophy and main principles

The Math Corps philosophy is based on the belief that all children have greatness within them and that the surest road to realizing that greatness lies along the path of simply being yourself. Math Corps upholds the following two basic principles:

- High standards and expectations should be held at all times for every student in the program with regard to both academics and character, and without regard to either past performance or background.
- A sense of family should exist, whereby every student in the program is cared for as an individual, is supported non-academically as well as academically, finds friendships and mentoring relationships that are both meaningful and long-lasting, and is made to feel that they belong to something very special.

From the Math Corps website, www.mathcorps.org

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Math Corps

WSU's Math Corps summer camp is a math enrichment and mentoring program that seeks to provide Detroit children from disadvantaged backgrounds with a high-quality learning environment and a safe place. It has four core components:



Community. Math Corps is a place where students can build family and community connections and learn to strive to achieve more than they might otherwise accomplish. Math Corps develops cultural norms for interacting with one another and uses the Socratic approach to help build community. The curriculum is also designed to strengthen connections through teams and mentors. High school students mentor middle school students, and college students and professors mentor high school and middle school students. Camp participants are divided into teams, each of which includes 10 middle school students, 5 high school teaching assistants, and a college student mentor who leads the team. Math Corps strongly encourages students to return to the program year after year, and many of the middle school participants ultimately become high school and college mentors.



Schedule. The camp runs Monday through Thursday from 9:30 a.m. to 2:30 p.m. Camp begins with an assembly at 9:30 a.m. All students attend the assembly together to learn the Math Corps philosophy and cultural norms, have fun, and celebrate middle school student successes. After assembly, middle school students have 1.5 hours of “Team Time,” which includes their basic math course and a practice session during which teaching assistants and college student instructors help students with their work. After the morning Team Time, students have a lunch break, take their advanced math course, and have time to write in journals. Each day ends with special math activities and projects or computer activities, such as playing chess, making tessellations, studying astronomy, or learning about probability. On Friday, the camp offers special activities from 9:30 a.m. to 12:30 p.m., such as Movie Day, Craft Day, Volunteer Day, Game Day (board and video), Karaoke Day, or a field trip (for example, to a planetarium). Attendance is mandatory Monday through Thursday and optional on Fridays. Students are encouraged to arrive early for breakfast and stay late for tutoring, daily.



Curriculum. Students receive instruction in both basic and advanced math topics. The basic math courses offered each morning include “The Real Numbers” for 7th graders, “The Operations on Real Numbers” for 8th graders, and “The Foundations of Algebra” for 9th graders. University professors teach the afternoon advanced math course using the Socratic method. These courses encourage students to think creatively, explore new concepts, and discover advanced math topics.



Values. Math Corps' philosophy emphasizes that “everything begins with loving and believing in kids.” Math Corps' values of kindness, integrity, and student greatness are promoted daily in all activities and assignments. In addition, the program holds students to strict standards of behavior by immersing them in a caring and mutually supportive environment. Having fun is considered a daily requirement. ▲

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Replication sites

The three replication sites were selected because they had summer camp programs in development and were considered to be in a strong position to implement Math Corps. In addition, each replication site had dedicated leaders who were committed to serving the underserved students of their communities using the “Math Corps way.”

The replication plan, as stated in the grant proposal, included two core elements:

1. Intensive training for replication site staff at WSU. For three consecutive summers, each site would send its staff (including high school teaching

assistants, college student instructors, college student assistants, and senior camp personnel) to WSU for training. The training would cover the program’s operation, philosophy, principles, practices, and pedagogical approach. The training sought to give replication site staff opportunities to witness the Math Corps culture in practice at WSU and help develop a similar culture at each replication site.

2. Scale-up of each replication camp, from four weeks initially to five or six weeks, serving 120 students, including 7th and 8th graders and teaching assistants.

Replication Sites



Cleveland. The Cleveland Math Corps took place each summer at Cleveland State University. Staff at Cleveland State University, Case Western Reserve University, and the Federal Reserve Bank of Cleveland had been interacting with WSU and working to implement a Cleveland Math Corps for several summers before the AISL grant. Prior to the grant, Cleveland staff had observed and helped teach at the Detroit Math Corps, and several Detroit staff had been going to Cleveland to help implement a Cleveland Math Corps. WSU staff continued to support Cleveland during the grant, which may have contributed to the reported similarities in culture between the Cleveland and Detroit Math Corps.



Philadelphia. The Philadelphia Math Corps took place at Drexel University each year of the grant. It was initially led by a small nonprofit organization that had been offering summer tutoring for several years before the grant. After receiving the AISL grant, WSU sent its staff to Philadelphia each summer to help prepare for camp and lead and teach at the camp each summer. Thus, the camp was similar to the original in Detroit because WSU staff were helping run the camp in Philadelphia. After two summers, the camp operations were transferred from the nonprofit to Drexel University. Drexel University brought in new leadership and camp instructors, all of whom reportedly embraced the Math Corps culture and leaned on the assistance of WSU staff to help run the camp in summer 2019.



Utica. The Utica Math Corps took place at Mohawk Valley Community College (MVCC) each year of the grant. Before the AISL grant, MVCC had received Gear Up and Upward Bound grants that it used to provide a summer camp to local middle and high school students. Although Utica implemented the math curriculum consistently with the Math Corps model, there was less interaction between WSU and Utica staff than at the other two replication sites, which may have contributed to some of the reported differences in culture between the Utica and Detroit Math Corps. In addition, the population Utica serves is more diverse than in other sites and includes a wide variety of immigrant groups, so the Utica Math Corps tailored activities to meet the needs of its population. ▲

Key findings

- / **The replication sites were successful in serving their priority communities.** The program prioritizes students from disadvantaged areas and circumstances, which is often measured by poverty levels. The average neighborhood median household income for Math Corps participants was relatively low, and participants lived in neighborhoods where more than a third of people younger than 18 were in poverty.
- / **Attendance at Math Corps was strong at all three replication sites.** Math Corps encourages daily attendance. Across all three years of the grant, the average attendance on any given day of camp was 98 percent in Philadelphia, 96 percent in Cleveland, and 88 percent in Utica.
- / **Homework completion rates were generally high.** To ensure strong math learning each summer, students are strongly encouraged to complete homework daily. The average homework completion rate on any given day of camp was 97 percent in Philadelphia, 95 percent in Cleveland, and 86 percent in Utica.
- / **Students made large and statistically significant gains on the Math Corps exam between the start and end of camp in all sites and years.** In all sites and years, students' gains on the Math Corps exam before and after the program were statistically significant. On average, students scored about 38 percent on the pre-program exam and 75 percent on the post-program exam.

Conclusion

Math Corps seeks to serve students from minority and disadvantaged backgrounds with the goal of improving their life trajectory. Achieving this goal

requires getting students to attend and engage in the summer camp. The findings of this analysis suggest the three replication sites were largely successful in implementing the Math Corps summer camp, and that Math Corps can be reasonably replicated in new sites in a relatively short period of time (within three years). In addition, we saw that students who attended the Math Corps replication sites demonstrated significant gains in math achievement during camp. The student gains at the replication sites are significant, even though they are smaller than those at the Detroit Math Corps (which averages a 55-point gain compared to the average 37-point increase in the replication sites).

A prior retrospective analysis showed that Math Corps increases college enrollment. Taken together, these are promising findings. Other communities seeking a math-focused program that supports short- and long-term outcomes, as well as the emotional needs of middle school students, may benefit by learning more about Math Corps and implementing a similar program.



— In a city where the dreams of children are so often unfulfilled, the Math Corps has from the beginning, been about making a difference and changing lives.

—www.mathcorps.org

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Study methods

We conducted descriptive analyses on all Math Corps participants in the three replication sites. Our data sources were administrative data from each of the sites, economic neighborhood data from the American Community Survey, and neighborhood demographic data from the Robert Graham Center. ▲

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Contact us.

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