Wilder Research

STARBASE Minnesota Program Impact

Follow-up study summary

STARBASE Minnesota strives to increase the knowledge, skills, and interest of inner-city elementary school youth in science, math, technology, and engineering for greater academic and lifelong success.

The week-long program is offered to 4th and 6th grade classes of Minneapolis and Saint Paul students during the school year. Held at the Minnesota Air National Guard Base, it takes advantage of the technology-rich aerospace environment to provide hands-on experiences ranging from experimenting with rockets and wind tunnels to exploring aircraft and conducting computer-aided design and simulations.

STARBASE Minnesota is part of a national program. While short-term evaluations of local programs have been conducted previously, this study is the first to take a comprehensive look at the potential long-term impacts of participation. It examines high school students' interest, motivation, knowledge, and skill development in science, math, and technology, and participants' interest in joining the military.

The study is unique in its rigorous design – matched-comparison of 442 former STARBASE participants with 442 non-STARBASE students who were academically and demographically similar. Students in the study sample were enrolled in 10th, 11th or 12th grade in the Saint Paul Public Schools during the 2008-2009 school year. The study used three data sources: STARBASE records, Saint Paul Public Schools records, and a survey of students in the study.

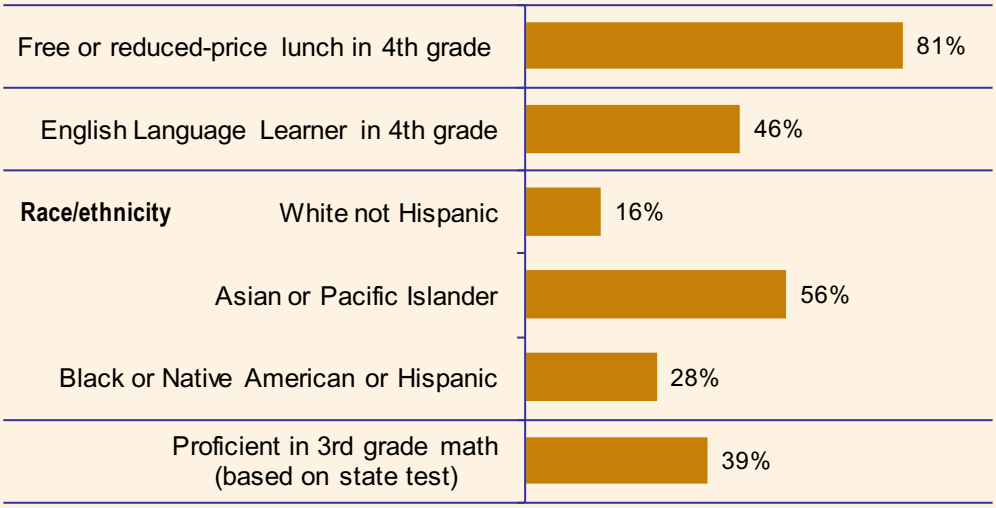
Results

Survey

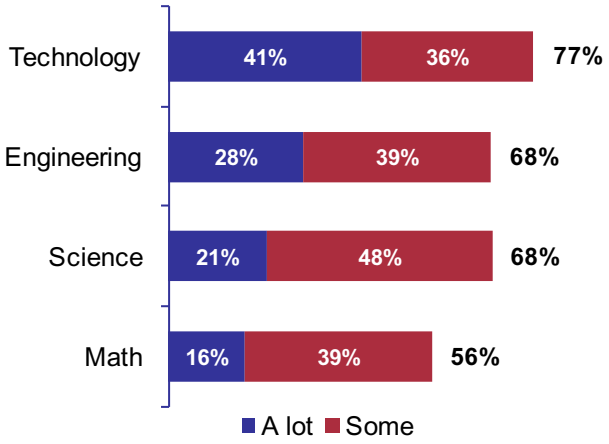
In this summary, survey results are divided into three sections. The first section reports on responses to questions asked only of STARBASE participants about how much the program increased their learning, interest, and participation in science, technology, engineering or math (STEM). The second section reports on responses to questions completed by both the STARBASE group and the comparison group about their interest in STEM subjects and their future career plans. The third section compares the effects of high exposure (attended program in 4th and 6th grades) with low exposure (attended program in 4th grade only). Most questions were based on a four-point scale (a lot, some, a little, or none).

continued

STARBASE STUDENT PROFILES



STARBASE INCREASED STUDENTS' INTEREST



STARBASE students. When asked if STARBASE helped them better understand STEM subjects, a majority of students (63%) responded a lot or some. Nearly three-quarters (73%) of students also reported learning a lot or some about STEM-related careers. A majority of STARBASE students reported that their interest in STEM subjects increased either a lot or some, especially in technology (77%).

About one-quarter (26%) of students indicated that their participation in the program continues to impact them today, while over half (57%) weren't sure.

The increased interest in STEM subjects stimulated by STARBASE led some students (18%) to get involved in STEM-related activities or programs. Examples include:

> My job at the Science Museum.
>
> I'm taking engineering classes at college.
>
> [I do] web design, audio recording, and video recording.
>
> I'm in the ACE (Architecture, Construction, and Engineering) Academy [at Johnson Senior High School].

Note: Due to rounding, numbers do not always add up to total.

STARBASE participants vs. comparison students. Survey results showed statistically significant differences between the groups in two areas: level of interest in technology and in joining the military.

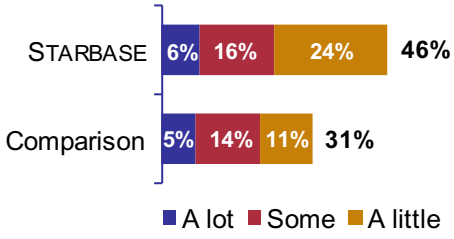
About half of STARBASE students indicated that they have a lot of interest in technology compared to 34 percent of comparison students. STARBASE and comparison students' responses were similar for science, math, and engineering.

LEVEL OF INTEREST IN STEM SUBJECTS

	A lot	Some	A little	None
Technology				
STARBASE	49%	32%	13%	6%
Comparison	34%	40%	22%	4%
Science				
STARBASE	27%	48%	20%	5%
Comparison	27%	44%	23%	6%
Math				
STARBASE	27%	44%	20%	10%
Comparison	29%	35%	25%	11%
Engineering				
STARBASE	28%	30%	29%	13%
Comparison	22%	35%	24%	19%

Nearly half of STARBASE students reported having an interest in joining the military compared to 31 percent of the comparison group students.

LEVEL OF INTEREST IN JOINING THE MILITARY



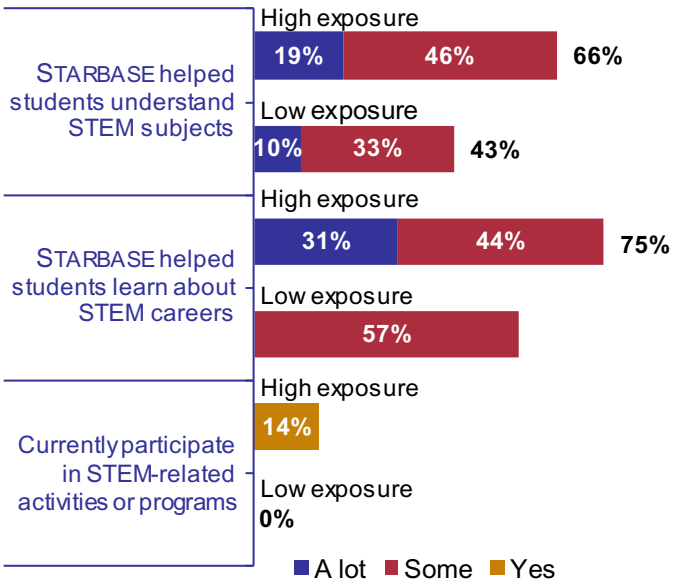
There were no statistically significant differences between STARBASE and comparison students' responses to questions about future education or career plans. Almost all students from both groups planned to attend college, and nearly half of STARBASE students

and slightly fewer comparison students reported that they plan to pursue a STEM-related career.

Impact of exposure levels. A modest pattern of differences emerged when looking at survey results of those with a high level of exposure compared with those with a low level.

Analyses indicated statistically significant differences for three measures: understanding STEM subjects, learning about STEM careers, and participating in STEM-related activities.

DIFFERENCES IN SURVEY RESULTS BY EXPOSURE



The impacts in these areas should be considered with caution as the differences between high and low exposure subgroups are often small, and other factors may have contributed.

School records

The study also examined the courses taken and academic achievement of students in junior and senior high school. STARBASE and comparison students performed very similarly on these school record-based outcome measures. The three statistically significant differences in which STARBASE students outperformed comparison students were:

- Junior high school grade average in science
- 10th grade Algebra 2 completion
- Senior high school attendance

However, it should be noted that these differences could simply be due to chance, rather than program impact, because of the large number of statistical tests conducted. Additionally, they are isolated findings, as STARBASE and comparison groups showed no differences for other similar indicators.

Similar to survey results, examination of student record-based measures over time suggested a very modest pattern of STARBASE students who participated in both 4th and 6th grades performing slightly better on more measures than those who participated in just 4th grade. This pattern was seen for the indicators measured in junior high school and 9th grade, but did not continue in 10th grade or after, and suggests that more STARBASE exposure may influence students' course choices and academic performance to a slight extent.

Potential areas for further program development

Previous short-term STARBASE studies have shown initial program effects that include an increased understanding of science and math concepts. However, due to the number of years since program participation and the limited amount of program exposure of students in this study, it is not surprising that school record-based data yielded few statistically significant differences in this study. At the same time, the survey data suggest some program impact over time, which has the potential to be strengthened with further STARBASE exposure or reinforcement of content.

Program staff and stakeholders may want to consider the following to strengthen or sustain short-term program effects over time:

More exposure

Although very modest, results suggest that greater exposure to STARBASE was linked to stronger outcomes on some measures, indicating there may be some benefit to increasing the level of exposure to the program.

Integration with classroom curriculum

STARBASE has taken key steps to align and integrate its programming into the classroom. Continuing to build on these efforts may enhance the programs' effects. STARBASE may also want to consider other ways to work with teachers, schools, or other STEM organizations to reinforce program content through such things as teacher training or additional follow-up materials for teachers and students.

Longer term effects of interests stimulated

Survey results of former STARBASE students in high school suggest that STARBASE increased their interest in STEM and the military. Some research indicates that interests stimulated by programs or activities may be manifested later in fields of study in college or career choices. Hence, creating or increasing student interest in STEM or the military may have longer term effects, even though such effects are not seen clearly in the shorter term.

WHAT PARTICIPANTS SAY

"STARBASE was my foundation for learning complex science and math skills that I didn't know of prior to the field trip.

While there, I learned a lot about rockets, math, and science that I will never forget. I felt it got me ahead of others.

STARBASE showed me a lot of things – not just building up my skills in math, technology, science, and engineering, but my leadership skills as well.

It helped me with my problem solving abilities.

Starbase was a fun, exciting way to learn about science, math, etc. It taught me that I can have a fun career doing science, math, etc.

It opened my eyes to the current technology and caused me to wonder how future technology could be. It caused me to study technology.

It made me join [Air Force] ROTC to possibly be a rocket scientist."

Wilder Research
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WILDER FOUNDATION

For more information

This summary presents highlights of the *Follow-up study of STARBASE Minnesota participants* report. This report and other reports on related topics are available at www.wilderresearch.org.

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