



About the Project

At Seattle Children's Research Institute (SCRI), we are passionate about supporting science education in schools and inspiring students to become tomorrow's scientists, healthcare professionals, and innovators. Our 45-foot mobile laboratory, the Science Adventure Lab, provides elementary and middle school students with innovative, hands-on laboratory experiences and the opportunity to interact with scientists who serve as inspirational role models. More than 58,000 students from 171 different schools have participated in activities onboard the Science Adventure Lab since we launched the program in 2009.

Thanks to funding from the National Institutes of Health (NIH), in 2012 we launched a new five-year project in partnership with ten

elementary schools in western Washington. The objective was to measure whether providing hands-on science activities on the mobile lab, opportunities to interact with scientists, and a visit to our Research Institute had a positive, lasting impact on students' knowledge of science topics, interest in science, and awareness of careers in STEM (Science, Technology, Engineering, and Math). Student interest in STEM starts early so we focused the main project activities on students in grade four. We created two new curriculum modules that support the Next Generation Science Standards specifically for this project. Both modules utilize authentic research-grade and medical equipment and expose students to the broad range of career options in STEM and healthcare. All of the project activities were taught by Seattle Children's scientists.

In the "Sense, Think, Move: Exploring Brain Functions" module, students learned about the senses, basic brain anatomy and physiology, and measured the electricity produced when muscles move using electromyography. Students measured heart rate and blood pressure, respiratory rate, and temperature in the "Vital Signs: Monitoring our Body's Systems" module.

The project also included a half-day field trip to SCRI and a family science night at the school. Previous studies showed it is important to include families in science learning as well,

so we invited them to attend both the field trip and the science night. During the field trip, students got a behind-the-scenes tour of the Research Institute, learned more about science by doing additional hands-on activities with our team of scientists who volunteered their time and energy, and had a delicious, catered lunch. The family science night included an opportunity for families to do activities onboard the mobile lab alongside their child, a science quiz show, and a presentation on the importance of STEM in everyday life. Students also participated in an additional Science Adventure Lab visit in grade five. The module was selected by the grade five teachers and varied by school.

Project Activities

Grade Four



- 2 mobile lab visits with hands-on activities, neuroscience (Sense, Think, Move) and body systems (Vital Signs)
- Students and families invited to a field trip at SCRI and family science night at the school
- All activities included information about careers in STEM and healthcare
- Assessment of knowledge, and interest in science and STEM careers before and after the activities



Grade Five

One mobile lab visit and follow-up assessment



Grades Six and Seven

Follow-up assessments



Schools

- Ten elementary schools, eight urban, two rural
- All Title I-eligible
- 75% of students received free or reduced-price meals
- More diverse than average for the state

Students and Families



- 2,071 grade four students participated in the project
- 90% of students attended the field trip, 22% had a family member attend
- 21% of students attended a science night with a family member
- 62% of students completed an activity onboard the mobile lab in grade five

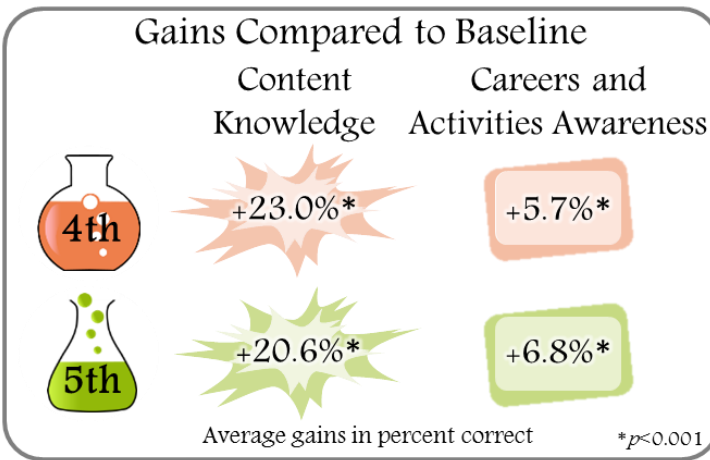


How did we Measure the Impact?

Data Collection

Grade four students were given an assessment prior to starting the project to determine their baseline knowledge and interest (Baseline). Students answered questions about the topics covered by the modules, their awareness of STEM careers and activities associated with those careers, and to rate a series of statements that measured their interest in learning science and in pursuing a career in STEM. The knowledge and career/activity awareness questions were multiple choice and the interest and engagement questions allowed students to rate statements on a three-point scale. Students completed the same assessment after the project activities in grade four and again in grade five.

We followed up with the students in grades six and seven by identifying which middle or junior high school the students who participated in our program were likely to attend and asked teachers to give an assessment to their classes. These assessments had different wording than those given to students in grades four and five so that they were developmentally appropriate, but they still measured knowledge about the topics of the modules and interest and engagement in learning about STEM. The grade six and seven classes at the twelve middle schools that did the

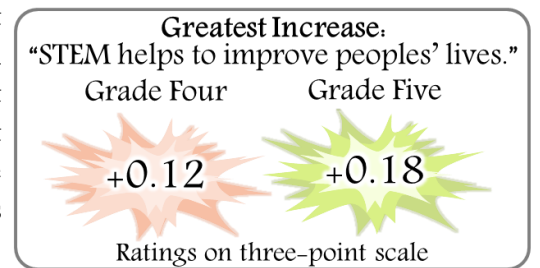


follow-up assessments were a mix of students who had participated in our project and students who came from elementary schools that had not participated, so the students who had not participated served as a comparison group (non-participant peers). Depending on which year of the project a student in grade four started participating, they were followed for one to three years. Not all students who started the project completed all of the activities or assessments.

Key Findings

Students in grades four and five

After completing the project activities in grade four, students had a 23% increase in knowledge about vital signs, body systems, and neuroscience compared to baseline. The gains persisted into grade five, where students maintained a 20.6% increase in content knowledge. Students completing the project activities also showed gains in awareness of STEM careers and activities associated with a career in STEM. In grade four, there was an increase of 5.7% in the correct identification of STEM careers and associated activities and gains persisted into grade five with a 6.8% increase. There was a small but significant increase in positive ratings for the statements measuring students' interest and engagement in learning science. The greatest increase was in the rating for the statement "STEM helps to improve peoples' lives". This increase persisted into fifth grade.



The field trip to our research institute was well attended. Of the 90% of grade four students who attended the field trip, 22% had a family member also attend. 21% of students attended a science night at their school with a family member. Families were sent surveys that asked them to identify the key benefits of participating in these events. The most commonly reported benefits were that students made connections between the activities and prior knowledge, students learned new knowledge about the scientific topics, and that students had a stronger interest in science and/or STEM as a result of participating in the family activities. These parent survey responses support our hypothesis that engaging families can support science learning.



How did we Measure the Impact? Continued...

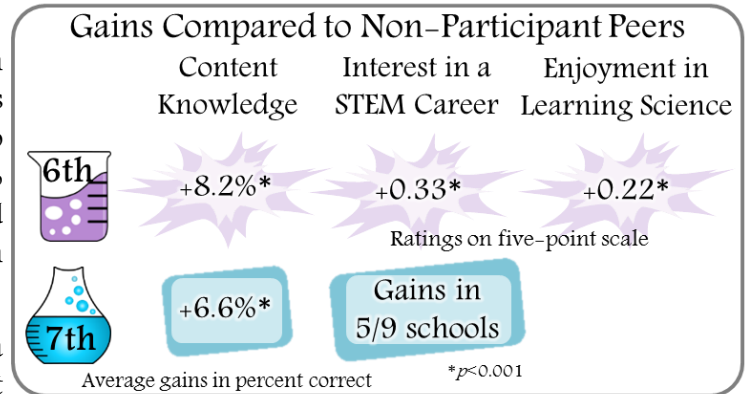
Students in grades six and seven

Students in grades six and seven who had participated in the project had greater knowledge of the science topics addressed by the activities compared to their peers who had not participated. Students in grade six scored 8.2% higher than their peers who did not participate, and students in grade seven scored 6.6% higher. Both increases were statistically significant.

We also asked students in grades six and seven to rate a series of statements about their interest and engagement

in STEM on a five-point scale. In general, grade six students who had participated in our project gave statistically significantly higher ratings than their peers who had not participated in the project. Of significance, the greatest differences between participants and non-participants were for the two key indicators of project success: their interest in a career in STEM and their enjoyment in learning science.

We were encouraged to find that many of the grade seven students who participated in our project also rated the two indicators of project success higher than their peers who had not participated. While there was school-to-school variability in the magnitude of the difference between the participants and their peers, we saw a clear impact (as measured by effect size) on students' interest in a STEM career for 5/9 middle schools and a significant impact on students' opinions that STEM improves people's lives at 3/9 middle schools. It was challenging to identify large numbers of grade seven students who had participated in our project in grade four due to the scattering associated with the transition to middle school, which impacted our ability to do statistical comparisons.



Summary

Collectively, these data indicate that our project was a success. Participating in the project in grades four and five had a sustained, positive impact on students' knowledge of science topics and on the two key indicators of project success: enjoyment in learning science and interest in a STEM career. Families reported clear benefits for participating in the field trip and family science night. These gains persisted into grade six and, for many students, into grade seven. Our hope is that all of the students who participated in the project have a greater understanding of science and its importance, and that some of the students have been inspired to pursue careers in science, healthcare, and other STEM fields. We are building on the success of this project and developing new programs to help middle school students further explore careers in STEM and to help high school students prepare for college coursework in the STEM fields. For more information about these other programs, please visit www.seattlechildrens.org/research/science-education-department.

Acknowledgements

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