Rosa Parks Tech Challenge Summative Evaluation Report

Prepared for

by

Melissa Laurie, Todd Shagott, and Annie Wentz

OMSI Evaluation & Visitor Studies Division

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EXECUTIVE SUMMARY

During the 2012–2013 school-year, the Oregon Museum of Science and Industry (OMSI) partnered with Rosa Parks Elementary, a pre-K–5th grade school located in a predominately African-American neighborhood in north Portland, Oregon, to provide a year-long educational program, entitled *Rosa Parks Tech Challenge*. The program, funded by the American Honda Foundation, was comprised of year-long activities designed for teachers, parents, and students and focused on the critical subjects of engineering, innovation, and technology.

PROJECT GOALS

The goal for the *Rosa Parks Tech Challenge* was to implement and evaluate a model of museum-school partnership that leads low socio-economic status (SES) students through a year-long sequence of technology learning experiences designed to provide students with technology skills and confidence, parental and teacher support, and personal motivation to better prepare them for the technology workforce. This unique museum-school partnership between OMSI and Rosa Parks Elementary provided integrated and interconnected programming for K–5 students, elementary school staff, and parents and family members.

The programming was designed to:

- Provide approximately 17 classroom teachers with year-long professional development and curriculum enhancements that result in increased comfort teaching engineering, technology, and design subjects
- Provide approximately 400 students with engineering, technology, and design skills and confidence, along with the personal motivation to better prepare them for the technology workforce
- Encourage approximately 375 parents and/or guardians (hereafter referred to as parents) of participating students to access and directly participate in their children's learning.

EVALUATION METHODS

The summative evaluation of the *Rosa Parks Tech Challenge* examined the outcomes for participating students, parents, and teachers. Qualitative and quantitative data were collected through the use of surveys and a parent focus group. This multi-method approach allowed for the documentation and assessment of changes in skills, engagement, attitudes, behavior, and knowledge.

Data was collected from students and teachers in the form of questionnaires administered at the beginning and conclusion of the school year. Students were sampled from a randomized set of three grade three, four, and five classrooms (N=61 and N= 51). Almost all classroom teachers (N=20; 100% and N=19; 95% response rates) participated in the two surveys. Finally, data was collected from parents in a questionnaire administered at the program-culminating Family Science Night (N=31) and in a focus group at the final OMSI Parent Coffee (N=15).

KEY FINDINGS

The *Rosa Parks Tech Challenge* Program exceeded almost all of the success indicators and proved to be successful in achieving its intended outcomes. Its particular strengths were found to be in the engineering skills, attitude, and interest outcomes.

The project established a partnership with a minority-serving elementary school in North Portland, Rosa Parks Elementary, and provided engineering design educational programming that reached the entire student body (K–5), classroom teachers, and participating parents and family members.

The multifaceted and integrated student, teacher, and parent programs were rated by participants as effective, engaging, and critical to:

- Preparing students with the skills, confidence, and personal motivation to participate in civic life and to eventually, if they desire, enter the technology workforce
- Preparing teachers with the instructional strategies and skills to deliver hands-on engineering and technology education in their classrooms, and
- Providing parents with opportunities and tools to support their child's technology learning experiences and interest in STEM careers.

STUDENTS

At the conclusion of the program, a majority of students participating in the *Rosa Parks Tech Challenge* reported that they feel they have gained skills, confidence, and personal motivation to enter the technology workforce

Students perceived they have greater abilities related to technology and engineering. These changes were identified in responses from both students and parents. Students perceived themselves to be better at engineering and more creative problem solvers. Students were able to describe how they used the engineering design cycle and problem solving in their Robotics Labs. Teachers described their students as more engaged learners (for instance they perceived students were more likely to attend school on integration/OMSI science days) and able to work cooperatively and creatively in teams.

Students began the program with little to no awareness of or interest in engineering careers. At the conclusion of the program, students had a greater awareness about and perceived engineering careers as more interesting than prior to participation. Students gained knowledge and awareness of what an engineer is, and they were more excited about becoming an engineer or using engineering design in their professional lives.

TEACHERS

Teachers viewed the programming as highly effective: relevant, enjoyable, and educational for themselves. The entered the program with low confidence in their ability to provide integrated science and engineering education to their students and concluded it with significantly greater confidence. This confidence and enthusiasm translated into a more frequent delivery of engineering and technology lessons in their classrooms.

PARENTS/GUARDIANS

A diverse set of parents and guardians were engaged and participated in the *Tech Challenge* programs. At the conclusion of the program the majority of the parents perceived the value of and intended to continue to support their children's technology learning experiences and their child's interest in science, technology, engineering, and math (STEM) careers.

SUCCESSES AND CHALLENGES

The Lego Robotics labs, field trips, teacher in-services and mentorships, monthly Parent Coffees, and family nights all received high ratings. However, there were some negative remarks about the scheduling of activities for teachers and the organization of heavily attended family nights. Finally, while the monthly coffee programs were successful at building strong relationships between OMSI and participating Rosa Parks parents, as well as increasing those parents' interest and awareness in engineering and science, the activities did not readily translate into take-home activities. Perhaps additional supports or materials are needed to provide parents with activities they will use at-home with their children.

Programs for all three audiences were remarkable in their ability to inspire creativity and excitement. Teachers described themselves becoming more creative in their lesson plans, making "science tools out of anything." Parents, teachers, and the students themselves all described how students became more excited about science and engineering and how they became more creative in their problem-solving during the program year. Finally, parents described how by reading together with their students and by trying hands-on activities in the monthly coffees, they enhanced their own creativity and tried new things, despite in their own words their "very adult fear of failure."

In terms of sustainability, all three audiences perceived the program as working within and building on the strengths and resources within their community. Like the spin-art supplies and building kits that remain in the parent resource center, the lesson plans that were developed this year and will be used in future years, and the museum doors that remain open, by working within the resources and strengths of a community, benefits can persist even after funding is complete.

Ultimately, this program demonstrated the ability in an underrepresented community to increase interest in and understanding of engineering and technology careers and the building of related engineering, technology, and innovation skills to contribute to preparing the next generation workforce for STEM careers.

TABLE OF CONTENTS

Introduction	1
Project Goals	1
Intended Project Impacts	2
Project Evaluation	3
Evaluation Methods	5
Findings: Students	8
Sample	8
Interest and engagement in engineering and technology	11
Engineering and technology skills	16
Engineering career awareness and interest	21
Findings: Staff	26
Sample	26
Program effectiveness	27
Value of engineering and technology student education	30
Engineering and technology instructional knowledge and skills	34
Findings: Parents	36
Sample	37
Program effectiveness	39
Awareness of value of engineering and technology education	44
Parental involvement with student's experiences	46

Discussion and conclusion 48

Appendix A: Student Surveys 50

Appendix B: Teacher Surveys 56

Appendix C: Parent Survey 66

Appendix D: Parent Focus Group 71

INTRODUCTION

During the 2012–2013 school-year, the Oregon Museum of Science and Industry (OMSI) partnered with Rosa Parks Elementary, a pre K–5th grade school located in a predominately African-American neighborhood in north Portland, Oregon, to provide a year-long educational program, entitled *Rosa Parks Tech Challenge*. The program, funded by the American Honda Foundation, was comprised of year-long activities focused on the critical subjects of engineering, innovation, and technology to impact teachers, parents, and students.

PROJECT GOALS

The goal for the *Rosa Parks Tech Challenge* was to implement and evaluate a model of museum-school partnership that leads low socio-economic status (SES) students through a year-long sequence of technology learning experiences designed to provide students with technology skills and confidence, parental and teacher support, and personal motivation to better prepare them for the technology workforce. This unique museum-school partnership between OMSI and Rosa Parks Elementary provided integrated and interconnected programming for K–5 students, elementary school staff, and parents and family members.

The programming was designed to:

- Provide approximately 17 classroom teachers with year-long professional development and curriculum enhancements that result in increased comfort teaching engineering, technology, and design subjects

- Provide approximately 400 students with engineering, technology, and design skills and confidence, along with the personal motivation to better prepare them for the technology workforce

Encourage approximately 375 parents and/or guardians (hereafter referred to as parents) of participating students to access and directly participate in their children's learning. The primary audience for this project was low socio-economic status (SES) students in grades K–5, with particular focus on African-American and Hispanic children. Students at Rosa Parks are 46% African-American and 30 % Hispanic and 94% of the school qualifies for free or reduced-price lunch. The secondary audience for the project was the parents of participating students. The year-long program encouraged parents to take part in their children's education. Once a month, at a regular parent gathering at the school, OMSI professional educators introduced easy-to-use, hands-on activities, and trained parents to engage with their children around these activities at home. Many parents also participated in two Family Science Nights in which they were encouraged to assist their children in presenting their work. The cornerstone component of involving parents on an ongoing basis was to provide each parent with a book and a kit that promotes interaction around engineering and design in the home. The two books selected were *Harold and the Purple Crayon*, by Crockett Lewis and *Galimoto*, by Karen Lynn Williams and Catherine Stock. The third audience for this project was the teachers of these students. The varied levels of curricular support ranged from professional development workshops provided by OMSI professional educators, to lesson plans from OMSI's library of prepared materials collected in an activity-rich book, *Engineering in the K–8*

Classroom. These materials, provided with in-person support from OMSI professional educators, aimed to prepare Rosa Parks' teachers with knowledge, skills, and tools needed to engage children in engineering and technology learning.

INTENDED PROJECT IMPACTS

The project intended to result in the following impacts on the target audiences:

STUDENT IMPACTS

Interest and Engagement

- Students will be interested in careers in engineering, technology, and related careers.

Skills

- Students will gain 21st Century Skills (*Partnership for 21st Century Skills*, http://www.p21.org/overview): implement innovations, solve technology problems, apply technology effectively, and become self-directed learners.

TEACHER IMPACTS

Knowledge

- Teachers will learn engineering, design, and technology content and instructional strategies to deliver supplemental lessons based on OMSI's Innovation & Engineering programs.

Skills

- Teachers will develop skills to support student accomplishment in engineering, design, and technology work during the school year.

PARENT IMPACTS

Attitudes

- Parents will express belief that engineering, design, and technology skills gained can contribute to a successful career for their child.

Behaviors

- Parents will be directly involved in and supportive of their child's engineering, design, and technology learning experiences.

PROJECT EVALUATION

EVALUATION PURPOSE

The summative evaluation of the *Rosa Parks Tech Challenge* examined the outcomes for participating students, parents, and teachers. Qualitative and quantitative data were collected through the use of surveys and a parent focus group. This multi-method approach allowed for the documentation and assessment of changes in skills, engagement, attitudes, behavior, and knowledge.

This evaluation is useful in that it assesses the extent to which the outcomes for program audiences mirrored those intended by program developers. This evaluation documents the successes and challenges of the programming, which may help improve future museum-school partnerships. This evaluation keeps OMSI accountable to the funder of the project, the American Honda Foundation, and to the audiences OMSI serves.

EVALUATION QUESTIONS

Students
Surveys were constructed in order to answer three evaluation questions about the impact of the *Tech Challenge* program on participating students:

- To what extent and in what ways do students view engineering, science, and technology as interesting or relevant? To what extent does this reflect or differ from the program's intended outcomes?
- How does participation in *Tech Challenge* activities build student skills related to technology and engineering? To what extent does this reflect or differ from the program's intended outcomes?
- How aware are students of engineering careers? Are students interested in engineering careers? To what extent does this reflect or differ from the program's intended outcomes?

Teachers
Surveys were constructed in order to answer two evaluation questions about the impact of the *Tech Challenge* program on participating teachers:

- To what extent and in what ways do teachers view engineering, science, and technology as interesting or relevant for the students? To what extent does this reflect or differ from the program's intended outcomes?
- How does participation in *Tech Challenge* activities build teachers' instructional skills related to technology and engineering? To what extent does this reflect or differ from the program's intended outcomes?

Parents
The survey and focus group were constructed in order to answer three evaluation questions about the impact of the *Tech Challenge* on participating parents:

- To what extent do parents view the partnership model as effective for their own and their children's science learning?

- To what extent and in what ways do parents view engineering, science, and technology as contributing to the success of their children? To what extent does this reflect or differ from the program's intended outcomes?
- To what extent do parents support *Tech Challenge* students' learning experiences?

PROJECT MEASURES OF SUCCESS

Three intended outcomes guided the evaluation of the project:

1. A majority of students participating in the *Rosa Parks Tech Challenge* will report that they feel they have gained skills, confidence, and personal motivation to enter the technology workforce;

2. A majority of the parents will engage with the project activities aimed at involving them in and supporting their child's technology learning experiences and their child's interest in science, technology, engineering, and math (STEM) careers;

3. A majority of the teachers will use the technology content and instructional strategies gained from *Rosa Parks Tech Challenge* curriculum to deliver the sequence of lessons in their own classrooms and support student technological learning during the school year.

EVALUATION METHODS

Qualitative and quantitative data were collected from students, teachers, and parents through the use of surveys and a parent focus group. This multi-method approach allowed for the documentation and assessment of changes in skills, engagement, attitudes, behavior, and knowledge.

STUDENTS

Student surveys were collected twice during the school year. The first collection occurred at the beginning of the school year before any of the students had participated in *Tech Challenge* programs; and OMSI administered the second survey at the conclusion of the school year, in May, after all students had participated in all labs, field trips, and Family Science Nights. Paper surveys were passed out and collected by the students' teachers during school hours. OMSI staff collected completed surveys from teachers for entry and analysis.

This survey (provided in Appendix A) was designed to be age appropriate and asked questions about each participant's knowledge, attitude, and interest as it related to the intended program outcomes. The interest and skills items were adapted from the assessment tools developed and field tested by the National Science Foundation funded *Assessing Women and Men in Engineering Project* (AWE; NSF HRD-0120642, HRD-0734072). This project was a collaboration among seven institutions that worked together to develop and field test the AWE survey, instruments and other products. AWE partner institutions represent a broad spectrum of institutions including public and private, large and small, and institutions with a range of ethnic diversity.

Surveys were distributed to a sub-set of students in grades three, four, and five at Rosa Parks Elementary. Participation in the evaluation was randomized at the level of the teacher. A random number generator was used to select one teacher per grade from a list of all third, fourth, and fifth grade teachers in the school. There were three classes/teachers in each grade. Selected teachers were invited to participate in the evaluation during the kick-off meeting for the event. All invited teachers agreed to have their students participate.

All three classrooms participated in both surveys. From these three classrooms, 64 students participated in the baseline survey and 51 participated in the end of year survey. According to the Oregon Department of Education's official enrollment, as of October 1, 2012 there were 389 students enrolled at Rosa Parks Elementary, 191 in grades three through five (Oregon Department of Education, School Year 2012–2013, www.ode.state.or.us). While the distribution of students was not completely evenly distributed by classroom teacher, as per our sample design, we see that roughly a third of the student body in grades three, four, and five participated in the evaluation.

TEACHERS

Staff survey participants were classroom teachers (Kindergarten through fifth grade) at Rosa Parks Elementary School in the 2012–2013 school year. Additionally, three English as a Second Language teacher specialists participated in the evaluation.

All classroom teachers at Rosa Parks were invited to participate in the evaluation. Paper surveys were distributed and collected by OMSI staff at the Partnership Kick-off Meeting in August 2012 and at the final *Tech Challenge* staff development session in May 2013.

Questionnaires (provided in Appendix B) asked teachers about their baseline knowledge and use of technology projects and activities in their classrooms and subsequent changes over the school year. Teachers were also surveyed on whether they perceived their students gained a deeper interest in and understanding of engineering and technology content and careers.

20 staff participated in the baseline survey and 19 participated in the end of year survey. This is a 100% response rate at baseline and 95% response rate at year end.

At the Kick-off Meeting, surveys were collected from all staff in attendance, including individuals in roles other than classroom teacher. Some of those roles included: student teachers, family resource coordinator, counselor, and speech pathologist. However as these staff members were not an intended audience for the partnership professional development, and did not participate in the programs for either staff or student, they were excluded from analysis.

PARENTS/GUARDIANS

Paper copies of the parent/guardian surveys were distributed and collected at the final Family Science Night by OMSI evaluation staff on April 25, 2013.This event was the culmination of OMSI programming at Rosa Parks. Over 240 people attended, and families were encouraged to bring older siblings, cousins, and members of their extended community. Each family was invited to participate in the surveys and surveys were collected from only one member of each family. Thirty-one families returned the survey.

Questionnaires (provided in Appendix C) asked parents and adult family members about their engagement with their children, which activities they performed at home, and how their attitudes may have changed towards potential technology and related careers for their children. Parents were also surveyed on whether they perceived their students gained a deeper interest in and understanding of engineering and technology content and careers.

Surveys were only available in English, however, about a quarter of survey respondents prefer to speak a language other than English at home. This was a limitation of the data collection approach. During the event, the evaluator witnessed some families, for whom English is a second language struggling to complete the survey. Parent resource and translation staff from Rosa Parks were on-site and assisted some parents in completing the survey.

A follow-up group interview (provided in Appendix D) was conducted on May 3, 2013 with parents attending the final OMSI Parent Coffee. There were fifteen parents attending the final coffee and all fifteen participated in the group interview, which lasted twenty minutes.

The focus group was conducted in English with simultaneous translation into Russian and Spanish by Rosa Parks' bilingual parent engagement staff. The interview was conducted by OMSI education staff, given their greater comfort and familiarity with the simultaneous translation. A member of the OMSI evaluation team was on site and collected handwritten notes and observations at the event.

DATA ANALYSIS

Data entry, data coding, and data analysis were completed by evaluation staff for all three audiences. All data procedures were undertaken in accordance with the quality control processes for handling data established by OMSI's Evaluation & Visitor Studies division. These quality control processes entail the review of all data, analysis, and reporting materials by at least two evaluation staff members in addition to the original author.

Descriptive statistics, such as means and percentages, were utilized to analyze quantitative data. Qualitative open-ended survey and focus group responses were coded by a trained data analyst. These codes were then applied to the interview data and examined in terms of frequency of responses.

STUDENT FINDINGS

Student Evaluation Questions
Student questionnaires were constructed in order to answer three *Tech Challenge* evaluation questions:

- To what extent and in what ways do students view engineering, science, and technology as interesting or relevant? To what extent does this reflect or differ from the program's intended outcomes?
- How does participation in *Tech Challenge* activities build student skills related to technology and engineering? To what extent does this reflect or differ from the program's intended outcomes?
- How aware are students of engineering careers? Are students interested in engineering careers? To what extent does this reflect or differ from the program's intended outcomes?

Results are based on survey responses related to engineering and technology awareness, and interest and confidence in technology skills both before and after the Rosa Parks *Tech Challenge* school year program.

CHARACTERISTICS OF STUDENT RESPONDENTS

Three classrooms were sampled to participate in the evaluation. Sixty-four students participated in the baseline survey and 51 participated in the end of year survey. Survey participants were in grades three, four, and five and ages ranged between 8 and 11 (Mean = 9.8 years). There were 13 fewer students in the sample than in the post-test. This is likely due to normal changes in school enrollment coupled with data collection day absences.

The sample of students that participated in the evaluation matches the distribution of students by grade enrolled at the school during the two time points data was collected. According to the Oregon Department of Education official enrollment, as of October 1, 2012 there were 389 students enrolled at Rosa Parks Elementary, 191 in grades three through five (Oregon Department of Education, School Year 2012–2013, www.ode.state.or.us). While the distribution of students was not completely evenly distributed by classroom teacher, as per our sample design, we see that roughly a third of the student body in grades three, four, and five participated in the evaluation.

Table 1.
Number and Percentage of Questionnaires Completed by Grade

	Pre		Post		
Grade	Freq. (N=64)	%	Freq. (N=51)	%	Difference
Third Grade	24	38	18	35	-6
Fourth Grade	22	24	17	33	-5
Fifth Grade	18	28	16	32	-2
Total	64	100	51	100	-13

In both pre and post test conditions, the distribution by gender is about 60% male and 40% female See Table 2.

Table 2.
Number and Percentage of Questionnaires Completed by Gender

	Pre[a]		Post[b]	
Gender	Freq. (N=62)	%	Freq. (N=50)	%
Female	25	40	19	37
Male	37	60	31	61

[a] *excludes 2 surveys where gender was not reported*

[b] *excludes 1 survey where gender was not reported*

There were no significant differences between the pre- and post-test samples by age, grade, or gender. The reduction of sample size was not significant in the analysis. If the *Tech Challenge* program was an after-school program, where changes in enrollment can be a direct indication of lack of satisfaction and effectiveness of programming, a reduction in participation would be of greater concern in the evaluation. There would be a concern that the students not participating in the post test would be significantly different than the ones that did participate. However, because the program is embedded within school day programming, sample size reduction is less of a threat to the validity of findings. It is not an indication of dropping out of or lack of participation by students in the *Tech Challenge* activities.

PARTICIPATION IN PROJECT ACTIVITIES

At baseline, survey participants were asked about their background and experiences with informal science education. Most (81%) respondents had visited OMSI prior to the program (see Table 3).

The mean number of visits was 2.5 with a standard deviation of 1.4. The overwhelming majority also personally met or knew an engineer or scientist prior to the start of the program.

Table 3.
Frequency of OMSI Visits in the Past Year by Student Participants (Reported at Beginning of Year)

Number of visits	Freq. (N=63)	%
0	12	19
1	16	25
2	12	19
3	12	19
4	3	5
5+	8	13

We asked students which *Tech Challenge* activities they recall attending this year. Over 80% recalled participating in the Lego Robotics labs and attending a field trip. See Table 4. A little less than half reported attending one of the Family Night events. Given that these participation rates are lower than the attendance counts at the events themselves, it is likely that these figures under-report participation in program activities. The under-reporting could be due to student's forgetting their participation or not recognizing the event as described on the survey.

Table 4.
Frequency of Activities by Sampled Students During the 2012–2013 School Year

	Yes		No		Unsure	
Activity	Freq.	%	Freq.	%	Freq.	%
Family night at OMSI in the fall?	24	48	20	40	6	12
Family night at your school?	19	38	27	54	4	8
Lego Robotics labs at your school?	41	82	8	16	0	0
Go with your class on the OMSI field trip?	43	86	7	14	0	0
Outside of school, go with your friends or family to OMSI?	19	38	23	46	8	16

All percentages are out of the valid number of responses

CONCLUSION

A randomized sample of students in three grades three, four, and five classrooms participated in the evaluation. Sixty-four students participated in the baseline survey and 51 participated in the end-of-year survey. There were no significant differences between the pre- and post-test samples by age, grade, or gender. Survey participants' ages ranged between 8 and 11 (Mean = 9.8 years), and

there were more males than females in the sample. Students recalled participating in most program activities at the end of the year and at the beginning of the year most had previously visited OMSI prior to the program.

INTEREST AND ENGAGEMENT IN ENGINEERING AND TECHNOLOGY

To what extent and in what ways do students view engineering, science, and technology as interesting or relevant? To what extent does this reflect or differ from the program's intended outcomes?

In order to answer this evaluation question, participants were asked questions related to the following indicators:

- Perceived impact and enjoyment of the partnership engineering and technology education.
- Student, teacher, and parent perception of changes in students' interest and relevance of engineering and technology activities.
- Student engagement in engineering and technology activities.

After participation in *Rosa Parks Tech Challenge* activities, there is evidence that students perceive engineering, technology, and science as more interesting and relevant than prior to participation. Some of the changes are at the level of trends and some are statistically significant. All are in the expected direction of the program's intended outcome to increase underserved students interest in these topics.

PERCEIVED IMPACT AND ENJOYMENT

At the end of the school year, survey participants were asked to rate their level of agreement with four statements related to the perceived impact and their enjoyment of participation in *Tech Challenge* activities. For analysis, a numeric responses of "1" was assigned to the lowest rating ("Not really") and "5" was assigned to the highest ("Yes, totally"). Results were dichotomized into highest (scores of 4 and 5) and lowest (score of 1 and 2) categories.

At the conclusion of the program, 80% of participants agreed or strongly agreed with the statement that OMSI events this year increased their excitement about doing engineering and technology activities. Eighty-eight% reported "Okay" or "Yes, totally" that the activities this year were fun. See Table 5 below.

Table 5.
Students' Perceived Impact of Tech Challenge Activities

	'No Way' or 'Not Really'		'Okay' or 'Yes, totally'	
Statement	Freq.	%	Freq.	%
Helped me learn more about engineering	7	14	36	72

and technology.				
Made me more excited about doing engineering and technology activities.	4	8	40	80
Helped me see I was good at engineering.	10	20	29	58
Was fun.	4	8	44	88

Parents were also surveyed about the perceived impact of the program on students' excitement and engagement in engineering and technology topics. From the parents' perspective, the results were similar, with 94% of parents agreeing that students were more excited about engineering and technology because of *Tech Challenge* activities.

FAVORITE ACTIVITIES

When asked to describe what students liked about partnership activities this year, we saw similarities across descriptions. The most common (39%) response from students to the question 'what activity did you enjoy the most this year?' was the six-week Lego Robotics labs. The next most common (33%) response was a description of other specific activities and labs completed through the program, likely as part of the field trip to OMSI or a Rosa Parks classroom presentation. Of these, many students described enjoying the squid and cow eye dissection activities or the hands-on exhibits in the physics section of the museum.

LEARNING SOMETHING NEW

When asked to describe something new they learned this year from the OMSI activities, most students were able to describe new knowledge obtained. Many students described learning something about robotics. Others spoke about their excitement or interest in the topics in general and engineering specifically. Finally, others wrote about new understanding related to engineering careers.

CHANGES IN ENGINEERING AND TECHNOLOGY INTEREST

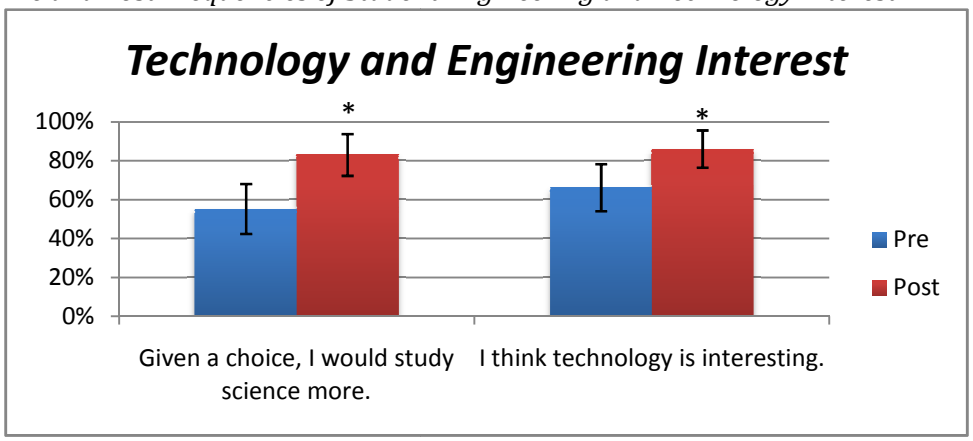
Students were asked about their levels of interest relating to engineering and technology both before and after the project to assess the amount of change. Overall, interest levels were generally more positive after their participation in the program (see Table 6). For three items, the percentage of students agreeing or strongly agreeing increased. The pattern was different for the remaining item (I like learning how things work). Here, the percentage agreeing with the statement started and remained high at 81%, however the gains were on the other end of the spectrum with fewer students disagreeing with the interest statement.

Table 6.
Pre and Post Frequencies of Student Engineering and Technology Interest

	Pre				Post			
	No Way or Not really		Okay or Yes, Totally		No Way or Not really		Okay or Yes, Totally	
Statement	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Given a choice, I would study science more.	13	22	32	55	5	11	39	83
I think technology is interesting.	17	29	39	66	1	2	43	86
I like learning how things work.	8	14	46	81	2	4	39	81
I enjoy designing and making things.	8	14	43	75	2	4	40	83

In order to better understand if the differences between the two time points were statistically significant, a two-sample test of proportion was run and confidence intervals were calculated. See Figure 1 below. After this was completed, the changes in two of the items are statistically significant with a greater number of students, after participating in the *Tech Challenge* activities, agreeing that they would like to study more science and that they find technology interesting.

Figure 1.
Pre and Post Frequencies of Student Engineering and Technology Interest



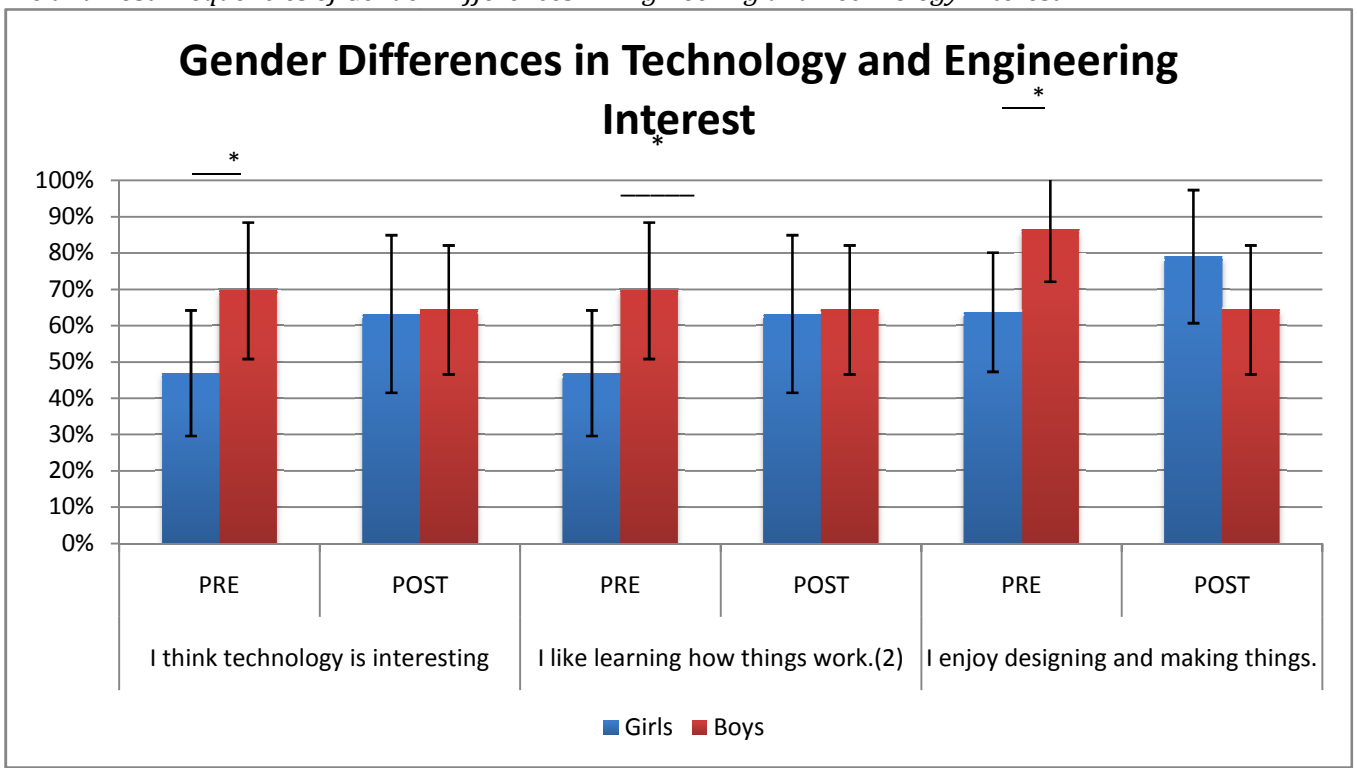
* indicates significant increase in proportion of responses from T1 to T2. ($p<0.05$)

CHANGES IN INTEREST AND GENDER DIFFERENCES

At the start of the program, there was a statistically significant difference in engineering and technology interest levels between male and female students in the sample, with male students expressing greater interest in the content area than female students. See Figure 2. At the conclusion

of the program, there is no longer a statistically significant difference in interest level between male and female students. This is an unexpected but positive aspect of the program.

Figure 2.
Pre and Post Frequencies of Gender Differences in Engineering and Technology Interest



* indicates statistically significant difference between genders (p<0.10).

CHANGES IN ENGAGEMENT

A significant indicator of interest and engagement in a subject area is how one chooses to spend their free time. Again, working from the previously validated indicators for science, engineering, and technology interest used in the AWE instruments, survey participants were asked to describe their participation in at-home or free-choice engineering and technology learning activities. Responses were categorized into low, medium, and high engagement. These findings were then compared by time point, grade, and gender. There was no significant difference or trends in participation by grade or gender and these results are not shown.

The baseline data show students were already actively doing 'low engagement' activities (e.g., watching TV shows, reading books, playing games, using the internet) but few described themselves as having invented, designed, or participated in a science fair, which were categorized for the purposes of this analysis by evaluation team as 'higher engagement activities.'

At the conclusion of the program, across almost all of the activities, a greater proportion of survey participants described greater engagement in science learning. This held for both low engagement activities (e.g., watching TV, playing games, using the internet) and high engagement activities. The greatest gain was in the proportion of students who described themselves as having 'invented something' which increased by 19%. See Table 7 below for greater detail.

Table 7.
Pre and Post Frequencies of Engagement in Free Choice Science Learning Activities.

	Pre	Post	Change
Learning Activity	%	%	%
Watched an inventors or nature program on TV or DVD.	56	62	6
Played a computer game that was about math or science or engineering.	61	75	14
Invented something.	42	61	19
Designed (thought up) and built something on my own.	44	55	11
Read a book about science or engineering or inventing.	61	59	-2
Participated in a science or engineering fair or event	38	48	10
Used the Internet to learn more about a science or engineering topic.	44	59	15

A related measure of engagement is participation in activities with others: peer and family learning. At the conclusion of the program, survey participants were also asked to describe the extent to which they have worked with others this last year on technology activities.

At the conclusion of the program, 59% of participants responded that they had worked with friends on science or engineering projects. However, less than a quarter of students described working with a family member[s] on a science or engineering project. This possibly reflects the distribution of types of activities within the programming. There was a greater amount of activities, with a higher visibility to support peer-to-peer learning (e.g., Robotics labs, field trips, classroom programs) than the family learning activities (e.g., coffees, family nights, books).

PARENTS' PERCEPTIONS OF STUDENT ENGAGEMENT AND IMPACT

From the parents' perspective, students were talking with them about engineering and technology topics during the school year. A majority (77%) of parent respondents recalled having a conversation this year with their children about the OMSI *Tech Challenge* activities. Sixty-eight percent of parents also reported that their children spoke with other family members (grandparents, siblings) and friends about the *Tech Challenge* activities.

Parents attending the Spring Family Science Night were surveyed about their and their children's experiences with the partnership. As part of the survey, parents were asked about what their children liked and disliked about the OMSI activities.

A few parents couldn't recall what the child liked (15%) or disliked and some responses were more generically positive, "he likes everything" (24%). No one described any dislikes or challenges. The most common responses (57%) were that the child liked active learning that was fun, hands on, and engaging. Such activities include science activity and activities that inspire curiosity, involve experimentation, or allow for inquiry.

Parents were also asked about what, if any, changes they observed in their children as a result of participating in the OMSI activities this school year.

When surveyed, 93% agreed with the statement that the 'activities this year made my child(ren) more excited about doing engineering and technology activities.'

A few (23%) respondents did not identify or recall any changes in their children as a result of participating in the OMSI activities. The remaining 76% all described positive changes in their children. About half described their children as being more excited, engaged in science learning, OMSI, or the world around them. Another quarter described their child as active learners or having new or different types of conversations with them.

Some illustrative examples of parent comments are as follows:

- "He learned a lot of stuff from what is inside body to how [some] machine works and what's inside car"
- "In the depth of the questions she has for her mother and myself"
- "They talk about science more"
- "Loves science"
- "More excited about how things work"

CONCLUSION

Looking across the different ways that interest and engagement were measured (Likert -scale agreement statements, open-ended responses from students, parents, and teachers, counts of at-home activities and conversations) we see strong evidence that students that participated in *Tech Challenge* activities viewed technology and engineering as interesting and relevant.

ENGINEERING AND TECHNOLOGY SKILLS

How does participation in *Tech Challenge* activities build student skills related to technology and engineering? To what extent does this reflect or differ from the program's intended outcomes?

In order to answer this evaluation question, participants were asked questions related to the following indicators:

- Student-perceived abilities related to 21st century and engineering skills
- Students' use of problem solving skills during partnership activities
- Teachers' perception of changes in students 21st century and engineering skills

After participation in Rosa Parks *Tech Challenge* activities, there is evidence that students perceive they have greater abilities related to technology and engineering. Students also were able to describe how they used engineering design and problem solving skills in their Robotics Labs. Some of these are trends and some are statistically significant. All are in the expected direction of the program's intended outcome to increase underserved students' skills related to technology and engineering.

PERCEIVED ABILITY

Survey participants were asked to rank their level of agreement with three statements related to 21st Century Skills. The survey used a five point scale with headers of "No way," "Not really," "Maybe," "Okay," "Yes, totally." For analyses, a numeric responses of "1" was assigned to the lowest rating ("Not really") and "5" was assigned to the highest ("Yes, totally"). Results were compared by pre/post, grade, and gender.

Pre- and post-test results were dichotomized into highest (scores of four and five) and lowest (score of one and two) agreement categories and then compared. A comparison of proportion statistical test was run and confidence intervals were calculated. See Table 8 and Figure 2 below.

The four perceived skills items were also adapted from the AWE assessment tool.

The three measures used were:

- I take careful steps when I am trying to solve problems.
- I am good at engineering.
- I think creatively to imagine new ideas.

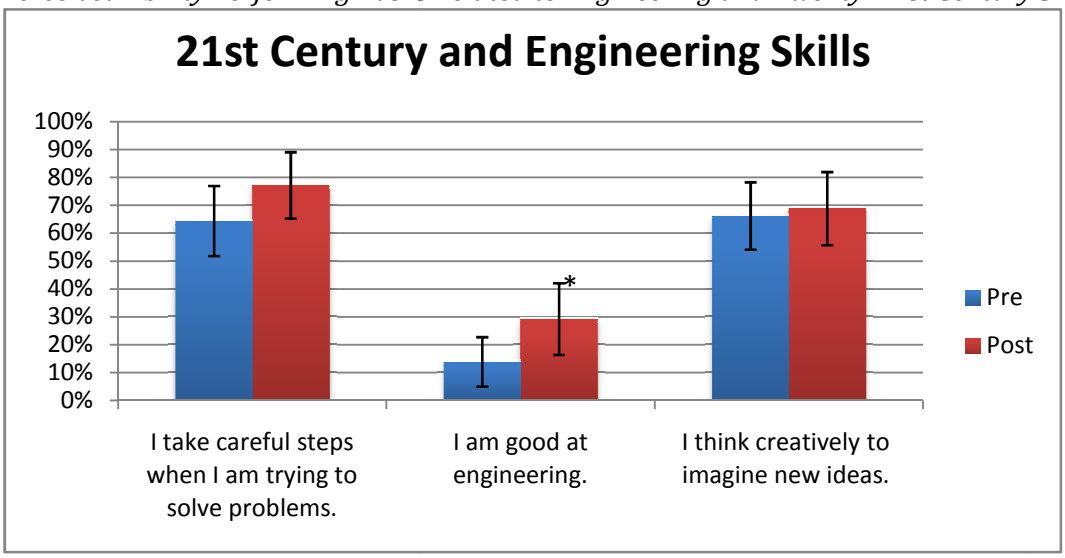
For all three of these items, a greater proportion of students at the conclusion of the partnership were in agreement than at the beginning of it. See Table 8. In all three cases, the percentage of students agreeing or strongly agreeing increased and the percentage that strongly disagreed with the statements decreased.

Table 8.
Perceived Ability Performing Tasks Related to Engineering and 21st Century Skills

	Pre				Post			
	No Way or Not really		Okay or Yes, Totally		No Way or Not really		Okay or Yes, Totally	
Statement	Freq.	%	Freq.	%	Freq.	%	Freq.	%
I take careful steps when I am trying to solve problems.	12	21	36	64	3	6	37	77
I am good at engineering.	40	69	8	14	15	31	14	29
I think creatively to imagine new ideas.	9	16	39	67	4	8	33	69

In order to better understand if the differences between the two time points were statistically significant, a two-sample test of proportion, was conducted and confidence intervals were calculated. See Figure 3 below. After this was completed, we see that 21st Century Skills items drop out in terms of significance, but the engineering skills item remains.

Figure 3.
Perceived Ability Performing Tasks Related to Engineering and Twenty-First Century Skills.



* indicates significant increase in proportion of responses from T1 to T2. ($p<0.05$)

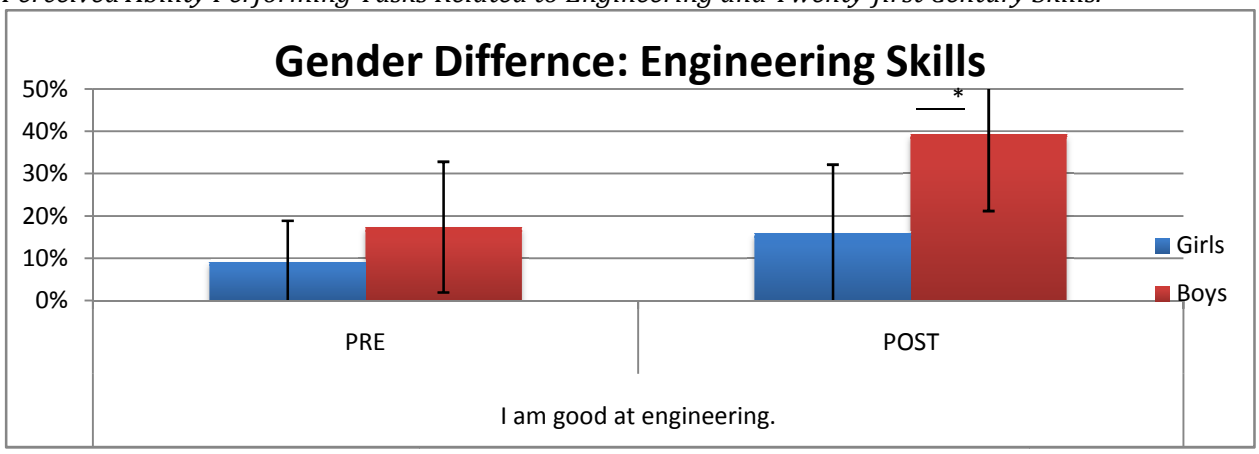
CHANGES IN PERCEPTIONS OF SKILLS AND GENDER DIFFERENCES

An unexpected finding was a gender difference that emerged at the conclusion of the partnership that wasn't visible at its inception. At the start of the program, there were not any statistically significant differences in perception of engineering and technology skill between male and female students as measured in their agreement with the statement, "I am good at engineering." See figure three. At the conclusion of the program, we see that while, both male and female students made

gains in terms of perceiving themselves as being good at engineering, more male students were in agreement than female students.

This finding should be approached with caution. It is the only item out of the six skill perception measures where we see a gender difference emerge. For the other outcomes (interest in engineering content and careers), we see the change go in the other direction, where students become less different by gender at the conclusion of the program. Thus, this could be just an outlier in terms of a finding.

Figure 4.
Perceived Ability Performing Tasks Related to Engineering and Twenty-first Century Skills.



* indicates statistically significant difference between genders (p<0.10).

PERCEIVED IMPACT: ENGINEERING SKILLS

The significant change in students' perception of engineering ability aligns with the findings from two additional questions about the students' perception of the impact of the *Tech Challenge* activities on themselves. Only asked at the conclusion of the school year, we find that 72% of participants agreed or strongly agreed with the statement that OMSI events this year helped them learn more about engineering and technology and 58% agreed or strongly agreed with the statement that OMSI activities this year helped them see they were good at engineering (See Table 5).

PROBLEM SOLVING IN LEGO ROBOTICS LABS

As a follow up to the 21st Century perceived impact questions, we asked students to describe how they addressed challenges they experienced during their Lego Robotics labs. In this question, we were looking for responses that demonstrated critical thinking skills and perseverance.

Many students were able to describe employing problem solving techniques. The majority of students described how they would stop and try to understand what went wrong. A good number, but fewer, students described asking for help from their instructor, and finally a smaller subset said they did not experience any unanticipated challenges in their Robotics Lab.

Below is a selection of illustrative quotes from student respondents:

- "[I] checked things over and re-downloaded the robot so I made sure it did the right thing"
- "I kept trying because giving up is never the answer"
- "I got really mad at myself and at the robot because it didn't do what I wanted it to do"
- "I would look at my problem and see what I did wrong"
- "I would make a new plan and try it and if it did not work I would try again"
- "Keep trying until I get it"
- "My team and I reprogrammed it"
- "I tell the teacher I need help and she would help me"
- "I asked for help and learned something"

TEACHERS' PERSPECTIVES

Teachers were surveyed about their students' and their own experiences with the partnership. As part of that survey, teachers were asked about what they perceived the impact of the partnership had been on their students.

Many teachers described a coupling of increased interest and engagement in engineering and science content with the development of students' 21st Century Skills.

Many teachers described their students as more active and engaged learners:

- "They all come to school on days when they knew we were doing integration science."
- "More focused attention when students are presented with science instruction."
- "Very engaged and excited about [the] topics OMSI presented."
- "More focused attention when students are presented with science instruction."
- "The love science even more and are more willing to inquire."
- "They were so excited to participate in the construction of engineering and robotics."

Teacher's described improved abilities with creative problem solving and working in teams:

- "They love the way things work and expressing what things will do under varying circumstances."
- "Ideas! Creative ways to solve different situations academically and socially."
- "I found students growing more confident in computer programming and collaboration. I also observed girls taking leadership whereas they ordinarily would not during other classroom activities."
- "Lots of practical cooperation in building things during "choosing" time. They are working together not just competing for resources."
- "Working in groups to solve problems. Talking it out. Excited about science."
- "They are more creative thinkers."

Finally, a few teachers' made connections to their students' career options, described new relationships between OMSI educators and students, or gave a more general description of the impact of the program:

- "Opened students' eyes to science related jobs and [the jobs] sound cool, i.e., working at Google and the cool offices, etc."
- "They always loved science, but the best part is the relationship between my students and [the OMSI Robotics educator]."
- "The kid's faces when they heard that they were going to program a robot."
- "The children benefitted greatly from these lessons."

CONCLUSION

As program developers intended, after participation in Rosa Parks *Tech Challenge* activities, students perceive they have greater abilities related to technology and engineering. These changes were identified in responses from both students and parents. Students perceived themselves to be better at engineering and more creative problem solvers. Students were able to describe how they used the engineering design cycle and problem solving in their Robotics Labs. Teachers described their students as more engaged learners (for instance they perceived students were more likely to attend school on integration/OMSI science days) and able to work cooperatively and creatively in teams.

ENGINEERING CAREER AWARENESS AND INTEREST

How aware are students of engineering careers? Are students interested in engineering careers? To what extent, does this reflect or differ from the program's intended outcomes?

In order to answer this evaluation question, participants were asked questions related to the following indicators:

- Student awareness of engineering careers
- Student knowledge of engineering careers
- Student interest in engineering careers

Students began the program with little to no awareness of or interest in engineering careers. After participation in Rosa Parks *Tech Challenge* activities, there is evidence that students have greater awareness about and perceive engineering careers as more interesting than prior to participation. Some of these are trends and some are statistically significant. All are in the expected direction of the program's intended outcome to increase underserved students' interest in engineering careers.

AWARENESS OF ENGINEERING CAREERS

Survey participants were asked to rank their level of agreement with six statements related to knowledge and awareness about engineering careers. The survey used a five point scale with headers of "No way," "Not really," "Maybe," "Okay," "Yes, totally." For analyses, a numeric responses

of "1" was assigned to the lowest rating ("Not really") and "5" was assigned to the highest ("Yes, totally").

Pre- and post-test results were dichotomized into highest (scores of four and five) and lowest (scores of one and two) categories and then compared. A comparison of proportion statistical test was run and confidence intervals were calculated. See Table 9 and Figure 3 below.

Engineering awareness items were adapted from the AWE surveys. The items reflect common misperceptions about engineering careers.

The five measures used were:

- Engineers help solve problems.
- Engineers typically work alone. (reverse coded)
- Engineers can do many different kinds of jobs.
- Engineers help make people's lives better.
- I know what engineers do for their jobs.

At the beginning of the partnership, the majority of students held misconceptions about engineering careers. They disagreed or were unsure if engineers were altruistic, were problem-solvers, or worked on a diversity of job sites. However, many (57%) recognized that engineers did not work alone. At the conclusion of the partnership, across all items, there are fewer misconceptions about engineering careers. See Table 9.

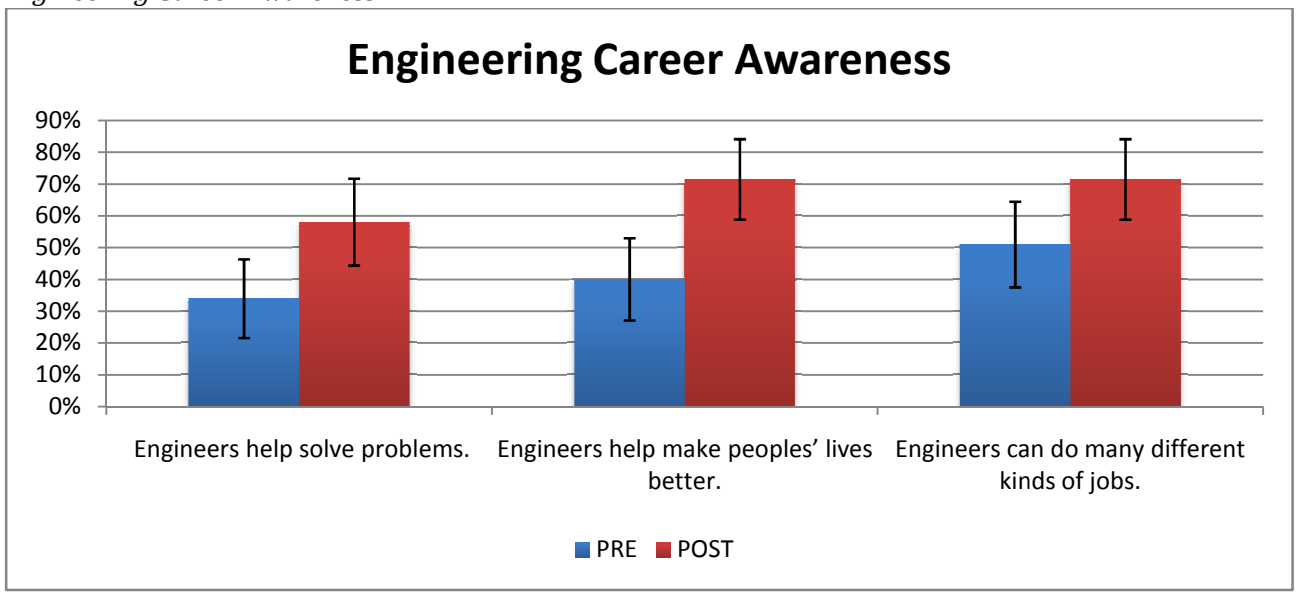
Table 9.
Engineering Career Awareness

	Pre				Post			
	No Way or Not really		Okay or Yes, Totally		No Way or Not really		Okay or Yes, Totally	
Statement	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Engineers help solve problems.	25	45	19	34	9	18	29	58
Engineers help make peoples' lives better.	18	33	22	40	8	16	35	71
Engineers typically work alone. (reverse coded)	12	23	30	57	7	14	30	61
Engineers can do many different kinds of jobs.	13	25	27	51	5	10	35	71
I know what engineers do for their jobs.	20	37	25	46	11	23	29	60

In order to better understand if the differences between the two time points were statistically significant, a two-sample test of proportion, was conducted and confidence intervals were calculated. See Figure 5 below. After this was completed, we see that three of the items are

statistically significant. The Rosa Parks Tech Partnership was particularly successful at addressing and reversing misconceptions about engineering careers.

Figure 5.
Engineering Career Awareness



* indicates significant increase in proportion of responses from T1 to T2. ($p<0.05$)

In addition to self-report of knowledge, we also asked students questions that directly measured their knowledge. In this set of questions, students were asked to identify which professionals used engineering as part of their job. The correct answer from the list was all of the above.

At baseline, 94% of participants could not correctly identify that all of the professions use engineering in their work. Mirroring the self-reported measures above, at the conclusion of the program, 21% more students could answer this question correctly.

FUTURE CAREER INTERESTS

In survey responses, we see that when students had gains in knowledge and awareness of what an engineer is, they were more excited about becoming an engineer or using engineering design in their professional lives.

Survey participants were asked to rank their level of agreement with five statements related to their interest in engineering careers. The survey used a used a five point scale with headers of "No way," "Not really," "Maybe," "Okay," "Yes, totally." For analyses, a numeric responses of "1" was assigned to the lowest rating ("Not really") and "5" was assigned to the highest ("Yes, totally").

Pre- and post-test results were dichotomized into highest (scores of four and five) and lowest (scores of one and two) categories and then compared. A comparison of proportion statistical test was run and confidence intervals were calculated. See Table 10 and Figure 4 below.

Engineering career interest items were adapted from the AWE surveys. The items reflect common misperceptions about engineering careers.

The five measures used were:

- I would like a job as a scientist.
- I would like a job as an engineer.
- I would like a job where I invent things.
- I would like to design machines that help people walk.
- I would like a job that lets me design robots.

At the beginning of the partnership, few students were interested in engineering-related careers. Only 13% agreed that they would like a job as an engineer and a few more, 29%, agreed they would like a job as a scientist. While more student's were interested in jobs that applied engineering (e.g., jobs where you invent things, design machines, design robots), at least half of the students were not interested in these careers. See Table 9.

At the conclusion of the partnership, there is far greater interest in engineering and engineering-related careers. The vast majority of students were interested in jobs that applied engineering and almost half (46%) of the students now were interested in being an engineer. Underscoring the reliability of these findings, we see that while there was an increase in the number of students interested in pursuing a job as a scientist, a related but less central focus in the *Tech Challenge* curricula, the gains were not as great.

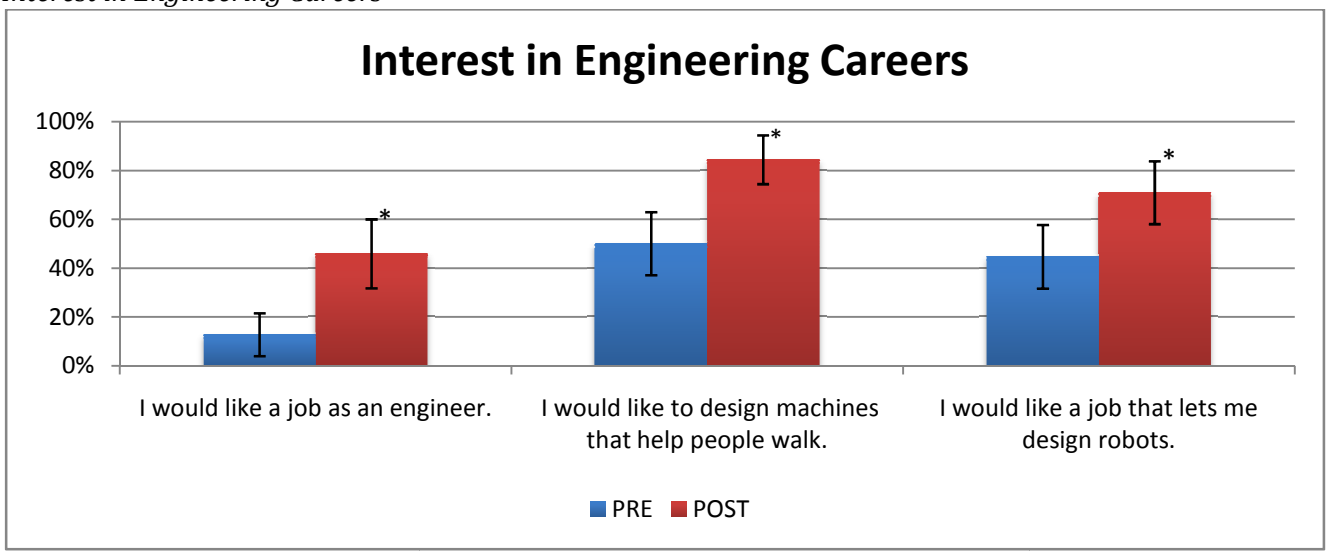
Table 10.
Interest in Engineering and Engineering Related Careers

	Pre				Post			
	No Way or Not really		Okay or Yes, Totally		No Way or Not really		Okay or Yes, Totally	
Statement	Freq.	%	Freq.	%	Freq.	%	Freq.	%
I would like a job as a scientist.	27	47	17	29	19	38	18	36
I would like a job as an engineer.	39	71	7	13	14	29	22	46
I would like a job where I invent things.	20	36	27	48	6	12	31	62
I would like to design machines that help people walk.	20	37	27	50	3	6	42	84
I would like a job that lets me design robots.	25	45	25	45	7	15	34	71

In order to better understand if the differences between the two time points were statistically significant, a two-sample test of proportion, was conducted and confidence intervals were calculated. See Figure 6 below. After this was completed, we see that a significantly greater number

of students at the conclusion of the program were interested in engineering and engineering applied jobs. The Rosa Parks Tech Partnership was particularly successful at building interest in engineering careers.

Figure 6.
Interest in Engineering Careers



* indicates significant increase in proportion of responses from T1 to T2. ($p<0.05$)

CONCLUSION

Students began the program with little to no awareness or interest of engineering careers. As program developers intended, after participation in Rosa Parks *Tech Challenge* activities, students have a greater awareness about and perceive engineering careers as more interesting than prior to participation. We see that when students had gains in knowledge and awareness of what an engineer is, they were more excited about becoming an engineer or using engineering design in their professional lives.

STAFF FINDINGS

Staff Evaluation Questions

Surveys were constructed in order to answer two evaluation questions about the impact of the *Tech Challenge* program on participating staff:

- To what extent and in what ways do teachers view engineering, science, and technology as interesting or relevant for the students? To what extent does this reflect or differ from the program's intended outcomes?
- How does participation in *Tech Challenge* activities build teachers instructional skills related to technology and engineering? To what extent does this reflect or differ from the program's intended outcomes?

These findings are based on pre- and post-testing of staff awareness, skills, and practices related to the *Tech Challenge* content before and after the partnership year.

CHARACTERISTICS OF STAFF RESPONDENTS

Survey participants were classroom teachers (Kindergarten through fifth grade) at Rosa Parks Elementary School in the 2012–2013 school year. Additionally, three English as a Second Language teacher specialists participated in the evaluation. See Tables 11 and 12.

Surveys were collected at the Partnership Kick-off Meeting in August 2012 and at the final *Tech Challenge* staff development session in May 2013. At the Kick-off Meeting, surveys were collected from all staff in attendance, including individuals in roles other than classroom teacher. Some of those roles included: student teachers, English as Second Language or Special Education Teacher Specialist, or staff in other support roles (family resource coordinator, counselor, and speech pathologist). However as these staff members were not an intended audience for the partnership professional development, and did not participate in the programs for either staff or students, they were excluded from analysis.

Table 11.

Number and Percentage of Questionnaires Completed by Grade

	Pre		Post	
Grade	Freq. (N=20)	%	Freq. (N=19)	%
Kindergarten	3	15	3	16
First Grade	2	10	2	11
Second Grade	2	10	2	11
Third Grade	2	10	2	11
Fourth Grade	3	15	2	11

Fifth Grade	3	15	2	11
ESL	3	15	3	16
Other classroom teacher	2	10	3	16
Total	20	100	19	100

PARTICIPATION IN PROGRAMMING

Staff received an average of 18.4 hours (range 11.5–20.5) of accredited professional development, comprised of activities onsite at the elementary school, in the classroom and during staff meetings, and offsite at the museum in workshops as a result of participating in the *Tech Challenge* activities. The monthly staff meetings were a regular touch-base point with 86% describing themselves as regular attendees of this meeting. This is in addition to OMSI's on-site hours and classroom observations. Staff received 15 weekly emails and almost all staff followed up with specific support requests including curriculum, research, materials, and demonstrations. OMSI provided 61 individualized supports this year, with an average of three requests per teacher.

PROGRAM EFFECTIVENESS

To what extent is the partnership seen as effective? To what extent are participants satisfied with the partnership programs? To what extent is OMSI seen as a resource?

In order to answer this evaluation question, teachers were asked:

- To rank the effectiveness of the program
- To describe the greatest success in the program
- To suggest improvements in the program
- To describe something new they learned in the program

There is strong evidence that Rosa Parks' teachers perceived the partnership as effective and were satisfied with the programming. This corresponds with similar findings in the student and parent surveys.

TEACHER PROGRAM EFFECTIVENESS

Survey participants were asked to rank their level of agreement with three statements related to the effectiveness of each of the *Tech Challenge* program. For the purpose of the evaluation, the indicators of effectiveness were:

- If it was perceived as relevant to their work as teachers at Rosa Parks.
- If it was perceived as meeting their own professional development goals and expectations.
- If it was perceived as enjoyable.

All three activities were rated overwhelmingly positively across all three dimensions (enjoyment, relevance, goal fulfillment). The vast majority of survey participants characterized the activities as

'very relevant' (71%) and 'very successful' (81%) at meeting their goals and expectations. In terms of enjoyment, there was an even split with half of participants describing it as 'very enjoyable' and the other half describing it as 'somewhat enjoyable'. Across all three dimensions there were no negative ratings.

MOST SUCCESSFUL ASPECTS OF THE PROGRAM

When asked to describe in their own words what they perceived as the most successful element of the program, teachers responded by describing both benefits for themselves as educational professionals and the benefits for their students.

For the teachers themselves, they praised the personal connection and support they received from OMSI staff and the instructional techniques they learned explicitly in staff seminars as well as from observation of OMSI's instructional techniques in the classroom programs and fieldtrips with their students.

For their students, teachers described an increased engagement and excitement about science and learning in their students. The six week Lego Robotics Lab series that was offered to all students in the school was described as particularly successful.

Programming for Family or Community was the least referenced part of the program by staff. No one described programming for parents (coffees and books) as the most successful element of the program. However, two staffers did describe the book-end family nights as the most successful part of the program. This should be expected given the possible lack of visibility of these activities by the staff and that the majority of the program resources (e.g., fieldtrips, robotics labs, professional development workshops) were devoted to student and staff activities.

Some of the type of responses about the success of the partnership included:

- "I'd do this again anytime anywhere— it was totally positive for my students! Thanks so much!"
- "There were no aspects of this relationship that was not successful."
- "I think the kids really enjoyed the awesome partnership."
- "Thank you for everything—my kids were so sad to learn they couldn't keep coming anymore. You all made a difference in my kid's lives."

SUGGESTED IMPROVEMENTS

When asked about the elements of the program that could be improved, the most common response referred to the timing of activities during the school year. Teachers suggested that OMSI offer programs for students more than twice annually or that partnership activity for teachers kick off at the beginning of the summer rather than the end of it so teachers have time to prepare during the summer. Almost half of respondents made this type of suggestion.

There was less coherence about the other types of suggestions. After timing, the next most common requests are for partnership funding for additional years, "the one year model is akin to a drug dealer, [you] get us hooked." Other more common suggestions are: change nothing, provide

additional or more explicit curriculum activities related to engineering design, or support with OMSI's traveling program online registration system. One participant suggested better support for OMSI educators with classroom management and one requested more professional development workshops.

Some of the responses in regards to the areas for the partnership to improve included:

- "I wish I could have prepared for all this the summer before, once the school year starts everything gets so busy."
- "Offer classes/travel kits 4 a year instead of 2."
- "I could have benefitted from a demonstration of how to log on and register for the traveling programs online."

Successful professional development programs should help teachers navigate existing strengths and resources in their community. Furthermore, working within existing infrastructures and strengths is crucial to the sustainability of positive outcomes. Staff and community members should be endowed with resources that will continue to be available to them at the conclusion of programs when funding has ended. Therefore, an important indicator of the success of this partnership is that at the conclusion of the program, the number of staffers that considered themselves as skilled at utilizing resources at OMSI had tripled (from 24% to 76% agreement, p=.0001). An overwhelming majority (95%) agreed that the program built on their strength as teachers and 86% agreed that the partnership complemented the school's focus on math and reading. A similar question was asked of parents, with similar positive results, and 93% of parents agreeing with the statement that "the activities this year built on the strengths in my community."

LEARNING SOMETHING NEW IN THE PROGRAM

When asked to describe something they learned this year in the program, teachers shared examples of their own and their students' learning. As individuals and lifelong learners, they described learning about the engineering design process and new facts or role models they could share with their students about engineering careers to make them more relevant. As educators, they described seeing their students learn during activities they may have previously thought too advanced (like programming) for their students. They also saw science and engineering topics as something their students enjoyed doing and also how engineering activities were a good platform for teaching students 21st Century Skills. Finally, some teachers found new ways to integrate science as an "avenue" to other content areas.

Some of the type of responses included:

- "Building the towers, the ramps, and rollercoaster were great activities to build teamwork and trial and error strategies."
- "That there are some pretty famous people—Will.i.am for example— who are engineers."
- "Science has many avenues to other content areas."
- "Engineer = make/make it work."
- "The procedures that an engineer utilizes were enlightening. Understanding programming robotics was very instructional for me."
- "How much need there is for computer engineers and their salary capabilities."
- "Robotics was great for my class."

CONCLUSION

Looking across the different ways that effectiveness was measured (Likert-scale agreement statements and in open-ended responses) we see strong evidence that teachers who participated in *Tech Challenge* activities viewed the programming as effective. The programs were perceived as relevant, enjoyable, and educational for teachers.

VALUE OF ENGINEERING AND TECHNOLOGY STUDENT EDUCATION

To what extent and in what ways do teachers value and view engineering, science, and technology as interesting or relevant for their students? To what extent does this reflect or differ from the program's intended outcomes?

In order to answer the value evaluation question, indicators of the teachers' knowledge, attitudes, and practices were assessed. These included:

- Perceived value of student engineering and technology education
- Teacher's awareness of engineering careers
- Teacher's perceived ability and frequency describing the value of engineering and technology

After participation in Rosa Parks *Tech Challenge* activities, there is evidence that staff perceive engineering, technology, and science as more interesting to their students than prior to participation. This corresponds with similar findings in the student surveys. Some of these are trends and some are statistically significant. All are in the expected direction of the program's intended outcome to increase underserved students interest in these topics.

VALUE OF ENGINEERING AND TECHNOLOGY EDUCATION FOR STUDENTS

Survey participants were asked to rank their level of agreement with two statements related to their perception of the value of engineering, technology, and science education for their students. The survey used a four point scale. Header. For analyses, a numeric rating was assigned to responses with "1" as the lowest rating and "4" as the highest. (1= Strongly Disagree; 2= Disagree; 3 = Agree; 4= Strongly Agree). Pre and post test results were dichotomized into highest (scores of three and four) and lowest (scores of one and two) categories and then compared.

The overwhelming majority of staff (more than 90% in all cases) in the partnership at baseline and again at the conclusion of the program agreed with the statement that learning about science and engineering will "help my students become engaged citizens" and that "learning about science and engineering will help my students prepare for future careers." See Table 12. There as a slight (10%) increase in agreement that "learning about science and engineering will help my students prepare for future careers" at the conclusion of the program in comparison to the beginning.

Table 12.
Pre- and Post-Frequencies of Teacher Perceived Value of Tech Challenge Programs

	Pre				Post			
	Disagree		Agree		Disagree		Agree	
Statement	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Learning about science and engineering will help my students become engaged citizens.	0	0	20	100	0	0	19	100
Learning about science and engineering will help my students prepare for future careers.	2	10	18	90	0	0	19	100

AWARENESS OF ENGINEERING AND STEM CAREERS

Similarly, the evaluation tracked the extent staff were aware of pertinent characteristics of engineering careers. Teachers were asked whether they perceived four common misperceptions about engineering careers as "true" or "false." Teachers were also given the option of 'don't know.' For the purposes of analysis, all responses of "don't know" were considered incorrect answers.

The statements and correct response were:

- Engineers typically work alone. (correct answer, false)
- A 4-year degree is required to work in science and engineering careers. (correct answer, false)
- Engineers are creative problem solvers. (correct answer, true)
- Engineering can be an altruistic pursuit. (correct answer, true)

At baseline, almost everyone could correctly identify engineering careers as 'creative and collaborative.' See Table 13. However, there was considerable agreement with the misconception of engineering careers as being 'not altruistic' (40%) as well as the misconception that all STEM (Science, Engineering, Math, and Technology) careers require a four-year college degree (65%).

At the conclusion of the program, the majority (68%) of participants answered all four questions correctly—demonstrating greater awareness of the altruistic possibilities of engineering, the diversity of STEM career pathways for their students, and a persistence of recognizing engineering as creative and collaborative.

Table 13.
Teacher Pre and Post Correct Responses about Engineering Careers

	Pre		Post	
Statement	Freq. (N=20)	%	Freq. (N=19)	%
Engineers typically work alone.	20	100	19	100
A 4-year degree is required to work in science and	7	35	14	74

engineering careers.				
Engineers are creative problem solvers.	19	95	17	89
Engineering can be an altruistic pursuit.	12	60	16	84

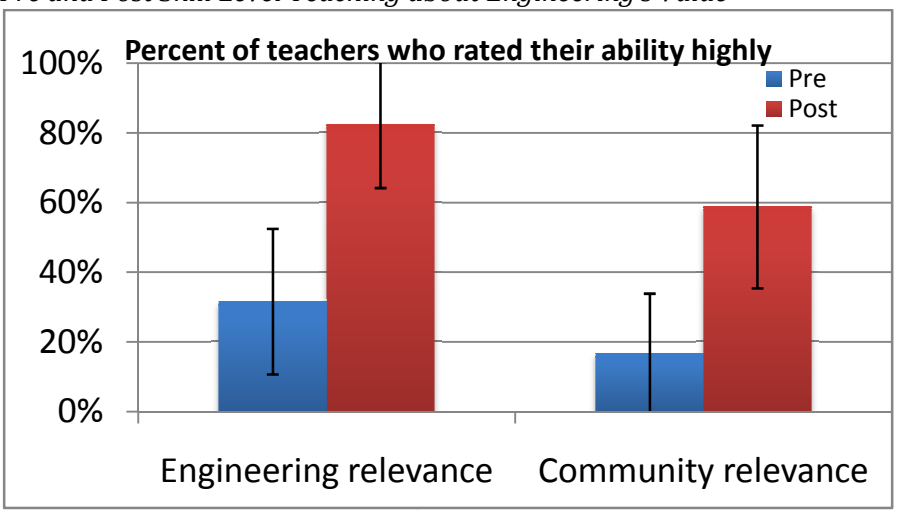
TEACHER'S PERCEIVED ABILITY DESCRIBING THE VALUE OF ENGINEERING

The staff was asked to rank their perceived knowledge and skill level related to teaching students about the value of engineering and technology. The survey used a four point scale with headers of "None," "Novice," "Apprentice," and "Expert."For analyses, a numeric rating was assigned to responses with "1" as the lowest ("None") rating and "4" as the highest ("Expert").

Pre- and post-test results were dichotomized into highest (scores of three and four) and lowest (scores of one and two) categories and then compared. A comparison of proportion statistical test was run and confidence intervals were calculated. See Tables 12 and 13 and Figure 7 below.

At the conclusion of the program there was a statistically significant increase in the teachers' perception of their ability to demonstrate how the work of engineers is relevant to our everyday lives and how learning science and engineering benefits the Rosa Parks community.

Figure 7.
Pre and Post Skill Level Teaching about Engineering's Value



Significant increase in proportion of responses from T1 to T2. ($p<0.05$)

When asked at the conclusion of the program to reflect about the frequency with which they incorporated this information into their lesson plans, the majority of respondents perceived that they had greatly increased the frequency at which they included this content in their lessons.

Table 14.
Teachers' Responses to: Before This School Year How Often Did You Do the Following with Students?

	Never %	Occasionally %	Usually %	Always %
Employ quick strategies (e.g., eye spy game, 20 questions) to incorporate science and engineering into	33	57	5	5

other content areas.				
Describe how the work of engineers is relevant to our everyday lives.	43	43	14	0
Describe how learning science and engineering benefits our community.	48	33	10	5
Utilize OMSI's resources to support student learning.	52	43	0	0

Table 15.
Teachers' Responses to: During This School Year How Often Did You Do the Following with Students?

	Never %	Occasionally %	Usually %	Always %
Employ quick strategies.	25	25	42	0
Describe engineering's relevance.	5	52	38	0
Describe engineering's community relevance.	10	33	52	0
Utilize OMSI's resources.	5	48	43	0

Table 16.
Percent of Teachers Who Responded "Usually" or "Always" to Describe Their Activities, Change From Before and During the School Year

Question	Before %	During %	Change %
Employ quick strategies.	10	42	+32
Describe engineering's relevance.	14	38	+24
Describe engineering's community relevance.	14	52	+38
Utilize OMSI's resources.	0	43	+43

CONCLUSION

Looking across the different ways that value was measured (teacher's knowledge, attitudes, and practices) we see robust evidence that teachers not only perceived the value of student's engineering and technology education, but were also able to incorporate this new information into their classroom instruction.

ENGINEERING AND TECHNOLOGY INSTRUCTIONAL KNOWLEDGE AND SKILLS

How does participation in *Tech Challenge* activities build teachers' instructional skills related to technology and engineering? To what extent does this reflect or differ from the program's intended outcomes?

In order to answer this evaluation question, teachers were asked about:

- Their attitudes related to teaching engineering.
- Their perceived ability and frequency teaching engineering and technology in their classroom.
- To describe new instructional techniques they have used.

After participation in Rosa Parks *Tech Challenge* activities, there is evidence that the elementary school staff have a more positive perception of their technology and engineering instructional abilities. The staff was also able to describe how this gain in confidence connected to changes in their instructional practices. Some of outcomes are trends and some are statistically significant. All are in the expected direction of the program's intended outcome to increase underserved staff skills related to technology and engineering instruction.

ATTITUDES RELATED TO TEACHING ENGINEERING

Survey participants were asked to rank their level of agreement with two attitude statements. The survey used a four point scale. Header. For analyses, a numeric rating was assigned to responses with "1" as the lowest rating and "4" as the highest. (1 = Strongly Disagree; 2 = Disagree; 3 = Agree; 4 = Strongly Agree). Pre- and post-test results were dichotomized into highest (scores of three and four) and lowest (scores of one and two) categories and then compared. See Table 17 below.

The overwhelming majority of staff in the partnership at baseline and again at the conclusion of the program agreed with the statements that "I want to learn more about science and engineering" and "I look forward to teaching my students about science and engineering."

Table 17.
Engineering Instruction Pre and Post Attitude Frequencies

	Pre (N=20)				Post (N=19)			
	Disagree		Agree		Disagree		Agree	
Statement	Freq.	%	Freq.	%	Freq.	%	Freq.	%
I look forward to teaching my students about science and engineering.	1	5	19	95	0	0	19	100
I want to learn more about science and engineering.	0	0	20	100	1	5	18	95

PERCEIVED ABILITY AND FREQUENCY TEACHING ENGINEERING AND TECHNOLOGY IN THEIR CLASSROOM

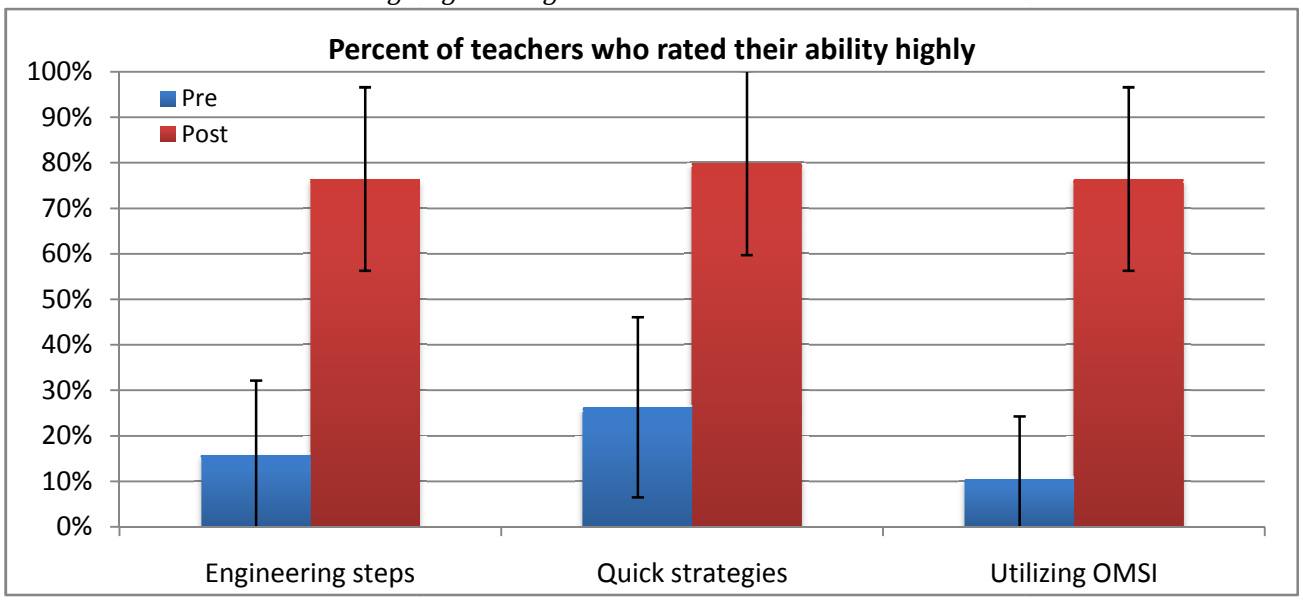
The staff was asked to rank their perceived knowledge and skill level related to teaching students about engineering. The survey used a four point scale with headers of "None," "Novice," "Apprentice," and "Expert." For analyses, a numeric rating was assigned to responses with "1" as the lowest rating and "4" as the highest.

Pre- and post-test results were dichotomized into highest (scores of three and four) and lowest (scores of one and two) categories and then compared. A comparison of proportion statistical test was run and confidence intervals were calculated. See table 15–17 above and Figure 8 below.

At the conclusion of the program there was a statistically significant increase in the teachers' perception of their ability to describe the steps of the engineering design processes and to employ quick strategies to incorporate science and engineering into other content areas.

When asked at the conclusion for staff to compare how regularly they did either of those two activities, the majority of respondents perceived that they had greatly increased the frequency at which they did that.

Figure 8.
Pre and Post Skill Level Teaching Engineering



Significant increase in proportion of responses from T1 to T2. ($p<0.05$)

NEW INSTRUCTIONAL TECHNIQUES USED

When asked to describe new instructional techniques they have employed as a result of participating in the program, teachers described both techniques for teaching engineering/the engineering design process and techniques to incorporate science into lesson plans.

An explicit focus of the partnership this year has been to empower teachers to see that science can be incorporated into many content areas and activities can be made out of anything. The hope is to inspire the inventiveness and creativity of teachers. About half of the teachers that responded to this question echoed this sentiment back.

Teachers wrote about incorporating science:

- "Science tools can be made out of anything. Resources are everywhere. It isn't as hard to put together a science lesson as I made it out to be."
- "I noticed that my students love science so the more that I incorporate it into my other areas of content, the better."

Teachers also saw connections between the sheltered instruction techniques used to engage their academically struggling students and the applied STEM education approaches they learned in the partnership. One teacher wrote how "the level of engagement during all of the OMSI activities allowed for access to struggling students in academics."

CONCLUSION

Looking across the different ways that this question was assessed (teachers' knowledge, attitudes, and practices) we see robust evidence that teachers not only are excited about learning and developing their engineering teaching skills and knowledge, but they also felt confident and were able to incorporate this new information into their classroom instruction.

PARENT FINDINGS

Parent Evaluation Questions

The survey and focus group was constructed in order to answer three evaluation questions about the impact of the *Tech Challenge* program on participating parents:

- To what extent do parents view the partnership model as effective for their own and their children's science learning?
- To what extent and in what ways do parents view engineering, science, and technology as contributing to the success of their children? To what extent, does this reflect or differ from the program's intended outcomes?
- To what extent do parents support *Tech Challenge* students' learning experiences?

These findings are based on surveying parents attending the *Tech Challenge* Spring Family Night and conducting a focus group with parents that attended the monthly Parent Coffees.

CHARACTERISTICS OF PARENT RESPONDENTS

Thirty-one attendees at the spring Family Science Night took the survey. Fifteen parents participated in the brief (15 minute) focus group at the final Parent Coffee.

Eighty-five percent of the survey respondents were female. The other 15% were male. The gender distribution was similar in the Parent Coffee focus group with 80% of respondents being female and 20% male. Most (80%) survey respondents described themselves as parents or guardians. 20% of the respondents either did not answer this question or did not describe themselves as a parent. For instance, one respondent was a grandparent. Most respondents had one (55%) or two (36%) children enrolled currently in the elementary school. Only 9% of the respondents had more than two students enrolled. The Parent Coffee focus group participants also included one grandparent.

Surveys were only available in English, however, about a quarter of survey respondents prefer to speak a language other than English at home. This was a limitation of the data collection approach. During the event, the evaluator witnessed some families, for whom English is a second language, struggling to complete the survey. Parent resource and translation staff from Rosa Parks were on-site and did assist some parents in completing the survey. The focus group, however, was conducted in English with simultaneous translation into Russian and Spanish by Rosa Parks' bilingual parent engagement staff.

Thirty-two percent of survey respondents described themselves as white. The remaining 68% described themselves as non-white. Of this a majority were African American or black (35%). Thirteen percent were American Indian or Alaskan Native, 26% were Hispanic/Latino and 3% were other (unknown). Overall, the activities reached a diverse subset of the parents at the school.

PARTICIPATION IN ACTIVITIES

Many survey respondents and their children participated in a range of activities this school year related to *Tech Challenge*. Eighty-four percent of respondents participated in field trips and 68% described using the *Tech Challenge* books. Fall Family Science Night attendance was reported by 42% of respondents. Almost half of the respondents (42%) also participated in at least one Parent Coffee.

Interestingly, many (64%) had visited OMSI this year outside of the *Tech Challenge* school functions. This is an area that would be beneficial to explore more as this is potentially an indication of OMSI as an enduring community resource and strength of the informal-formal partnership model. For greater details, please see Table 18.

Table 18.
Activities Parents and Their Children Participated in During the 2012–13 School Year

	Yes		No		Unsure	
Activity	Freq.	%	Freq.	%	Freq.	%
Fall Family Science Night at OMSI	13	42%	13	42%	2	7%
Parent Coffee where OMSI presented	13	42%	14	45%	2	7%
Receive the *Harold and the Purple Crayon* or *Galimoto* book(s)	21	68%	7	22%	1	3%
Visit OMSI for a school field trip	26	84%	3	9%	0	0%
Visit OMSI any times other than during school-related trips	20	64%	8	26%	2	7%

CONCLUSION

A diverse sample of parents, participants at the Family Science Night and the monthly Parent Coffees, participated in the *Tech Challenge* evaluation. Overall, these parents were active in the programming and participated in multiple *Tech Challenge* activities this school year.

PROGRAM EFFECTIVENESS

To what extent do parents view the partnership model as effective for their own and their children's science learning? To what extent, does this reflect or differ from the program's intended outcomes?

In order to answer this evaluation question, parents were asked:

- To rank their satisfaction with the parent/family programs.
- To rank the effectiveness of the program overall and specifically by activity format (books, coffees, and family nights).
- To describe the greatest success in the program.
- To suggest improvements in the program.

After participation in Rosa Parks *Tech Challenge* activities, there is evidence that parents attending the Spring Family Night perceive the partnership as an effective benefit for themselves and their children. All outcomes are in the expected direction of the program's intended outcome to increase underserved students interest in these topics. This corresponds with similar findings in the student and teacher studies.

SATISFACTION WITH PARENT/FAMILY PROGRAMS

Survey participants were asked to what extent they agree that OMSI's programs this year were a resource to them and whether they were would recommend this program to other schools.

For both sets of questions, the responses were positive. In terms of being a resource, OMSI was seen as working within and building on the strengths already present in their communities. Over three-fourths (77%) of parents agreed that the OMSI activities built upon the strengths in their community, and 82% agreed that the OMSI activities complemented their school's focus on math and reading. All survey respondents (100%) reported that they would recommend this partnership program to other schools.

When probed why they would recommend the program, parents described the experience as being educational and "an opportunity" for families and their children. Speaking to the strength of the program at engaging families, there was almost an equal number of responses about the program being educational for entire families as there were about it being educational for students. Many respondents highlighted the creativity in the educational approach, describing it as a good and engaging way to teach science that inspired the imagination of those that participated.

Some of the responses about the success of the partnership included:

- "Yes, it is important…The children get involved, and then this gets parents involved. It's good for both the child and parents. Brings the kid out in parents :-)"
- "It gives our kids a lot of tools to work with throughout their educational career."
- "This partnership opened doors to science and the imagination [for] students, teachers, and parents."

- "Because of the positive experience we had as a result of it. (Tonight was my first opportunity to go with them) and I thought it was great, we all had fun!"
- "Because it's a great opportunity for the children to learn and be engaged in science
- "It's just been great for the school and my student."
- "Thank you for giving Rosa Parks a good part of their science program for school year. You guys are wonderful!"
- "Thank you for the opportunity to learn a lot in easy way."

BOOKS, COFFEES, AND FAMILY SCIENCE NIGHTS

There were three types of programs developed for Rosa Parks' parents this school year: Family Science Nights (spring/fall), books, and monthly Parent Coffees. Survey participants were asked to rank their level of agreement with three to four effectiveness statements for each of the parent/family programs.

For the purpose of the evaluation, the indicators of effectiveness were:

- If was it was perceived as educational for themselves or their children.
- If it was seen as relevant to them as adults, parents, or caregivers.
- If it was perceived as fun.

For all of these measures, survey participants were asked to rank their level of agreement using a four point scale with the headers of "Strongly Disagree," "Disagree," " Agree," and "Strongly Agree." For analyses, a numeric rating was assigned to responses with "1" as the lowest rating and "4" as the highest agreement. Results were dichotomized into highest agreement (scores of three and four) and lowest agreement (scores of one and two) categories and then compared by level of agreement and type of program. See Table 19 below.

Table 19.
Percentages of Parents that Agreed by Program Type and Indicator

	Family Program Type		
	Books	Coffees	Family Nights
Effectiveness dimension	%	%	%
Fun	89	94	87
Educational	79	93	87
Relevant	79	93	77

All three activities were rated overwhelmingly positively across all three dimensions (enjoyable, educational, and relevant). Over three-fourths of respondents, with a range of 79% to 94%, agreed or strongly agreed with all statements about all program types. With each of the three programs there was least one respondent that rated strongly disagree for each statement. However, when these surveys were reviewed, it was determined that it is likely this is a respondent error. All of the open-ended responses associated were positive and did not indicate any dissatisfaction with the programs. Further looking at the pattern of their responses, they consistently rated everything lowly, which implies that the scale was possibly misread.

Comparing across the different programs and indicators we see some trends (see Table 2, in bold). There was the most congruence about the activities as being fun (compared to educational or relevant) and Coffees (compared to Family Nights and books) were the highest rated activity by program type. Relevance to them as a parent/caregiver had the least agreement.

In addition to asking respondents to rank the programs in close-ended scales, we also asked respondents to tell us in their own words, what they saw as successful or useful about each of these types of activities as well as what could be improved or was less useful.

MOST SUCCESSFUL ASPECTS OF FAMILY SCIENCE NIGHTS

When asked to describe what they liked and what they did not like about family nights, we saw similarities across responses. The main Family Science Night attribute people liked was that it was fun and educational (the most common response). The other major response was that it offered an opportunity for the family to bond or to network with other families in their community. A less common theme, but also present in the responses, was accolades for the high quality of OMSI educational experiences: the exhibits, summer programs, and Family Science Night activities. Overall, we see that parents perceived Family Nights as fun, educational, and supporting social bonds (within and between families). This sentiment was summed up nicely by one of the participants as: "It's the trifecta, being with family and friends from school hav[ing] a good time learning about science."

Some of the responses about the success of Family Science Night included:

- "That I get to spend quality time with my children and meet new friends."
- "That my children were amazed…and asked a lot of questions. They very [much] like OMSI."
- "It is a good [way] to spend time with the kids."
- "See[ing] what your kids know."

FAMILY SCIENCE NIGHTS SUGGESTIONS

By far the most common suggestion (69%) was something along the lines of do "*nothing it's great :-)"* Of actual suggestions, the pattern that did emerge was that there were two types: (1) how to enhance it by offering more; either more frequent family nights or getting more families to come to the events and (2) how to improve family nights through better crowd management. At the spring Family Science Night there was a big crowd, or as one of the participants in the coffee focus group described it, "for an OMSI event, the whole community comes out," which is a success in and of itself. However, there was a recommendation to better anticipate and manage the crowds. Suggestions included either increasing the number of activities available for families or adding waiting tables so people are more comfortable while waiting. In the Parent Coffee focus group, later that month, we heard similar recommendations about crowd management concerns. It is important to note though that overall 83% of respondents described the family nights as well-run.

BOOKS FOR FAMILIES: SUGGESTIONS AND SUCCESSES

Parents were asked to describe what was useful or could have been more useful about the *Tech Challenge* books, *Harold and the Purple Crayon* and *Galimoto*. There were no negative comments about the books. Instead, the most common descriptions of the books were that they were useful because they supported development of either their children's creativity or imagination skills or their children's English language literacy skills. Interestingly, about a third of respondents described a personal benefit for themselves as well with their creativity or English language literacy. One respondent described it as "the use of imagination and a way of thinking are good not only as a child, but when we're adult are nice to have [as well]." Given that many parents of Rosa Parks' students are English language learners themselves as well, the use of books that had been selected to support adult English language learning is an added benefit of the program.

Interestingly, as a top of mind response, the books did not elicit a great association with science learning or as a bonding activity between parents and their children. These were not completely absent in the responses but were not prevalent. This could reflect more a limitation in the study design than the lived experience of families, but in the future if program developers wanted parents to take home the message of the books as supporting science learning or family time, they may need to tweak the messaging a little.

Some of the responses about the successes of the books included:

- "Books helped to tie in history, community, and everyday life to concepts."
- "Great for imagination, not so much for education."
- "In helping a child (and parent) exercise their imagination."
- "It helped my children by learning new words and increasing reading skills."
- "The book will help to develop my children's English and reading skills."
- "I enjoyed reading them to my child and the books are good for them to learn to read."
- "Will also help me with my English skills and how to read English."
- "So my children can read it to their little brother."

COFFEES: SUGGESTIONS AND SUCCESSES

At the Parent Coffee focus group, participating parents were asked to describe what they saw as the most successful elements of the experience and areas that could be improved.

Each monthly Coffee featured a different activity with eight activities in total being completed at the end of the program. The parents in the focus group said they liked all of the activities and none needed improving. Their favorites (in order of votes) were: Watershed, Bridges/Egg Dyeing (tied), and Flubber.

There were not many suggestions shared regarding the coffee activities. The two that were shared were that the Flubber recipe can be hard to replicate because the timing is very specific and that the dye used in the egg dying activity can stain carpets.

From participating in the coffees and other OMSI programs this year, parents described a range of benefits. Many described positively the relationship between the parents at the coffees and the OMSI educator. As adults, sometimes intimidated about trying new things, they appreciated the

hands-on nature of the Coffee activities where the unexpected became not a failure but a problem to solve. Another participant described knowing more about other OMSI activities and events and taking their family to them because "I know it is an OMSI event and we are going to learn something there and it will be fun and comfortable for all of us." Finally, another participant described how she could visit the OMSI museum with her children in a different way after these activities. More than just playing together as a family there, she felt better able to explain the science behind their play. Further, because her kids are getting older they were starting to think more about their future careers, which was something she wanted to help them with and could more when they visited the museum together.

When asked if they repeated any of the specific activities they did in the coffees at home with their kids, no one present had. The activities had been designed to be easily replicated at home, employing low cost, common household materials. It is unclear from the evaluation methods employed why parents did not decide to repeat the activities at home. It can be inferred from the focus group that many parents in attendance saw the activities as a positive learning experience for themselves and got a lot out of it. Perhaps, additional supports and scaffolding would need to be built into the parent activities to support their independent at home use.

As a family experience, the Coffee activities have the potential to be highly engaging and possibly even behavior changing for families. One Coffee participant who brought his young son to the coffees described a number of changes in how they interact together as a result. He shared examples of him and his son re-reading together library books about subjects they learned about in the Coffees and having new conversations and new insights together because they did the coffee activity. Most notably, he also shared how after the nutrition activity, the dynamic of grocery shopping together changed. Where now when his son wants something unhealthy, they can talk about the number of grams of protein and sugar it has in it. They are no longer making decisions or talking about the shape or design of the box, but is it 5 grams of sugar? 2 grams of protein? Together they are able to make better healthier choices at the grocery store.

CONCLUSION

Looking across the different ways that effectiveness was measured (Likert-scale agreement statements, open-ended questionnaire responses, and a parent focus group), we see strong evidence that the parents that participated in *Tech Challenge* activities viewed the programming as effective, educational, fun, and engaging. Participants told us that activities were enjoyable but also offered parents and families a chance to learn together as a family and also as a community.

AWARENESS OF VALUE OF ENGINEERING AND TECHNOLOGY EDUCATION

To what extent and in what ways do parents view engineering, science, and technology as contributing to the success of their children? To what extent, does this reflect or differ from the program's intended outcomes?

In order to answer this evaluation question, parents were asked about the questions related to the following:

- Perceived value of student engineering and technology education.
- Perceived priority of student engineering and technology education for themselves and for the school.
- Open-ended descriptions in focus group and survey related to student success.

At the conclusion of the Rosa Parks *Tech Challenge* activities, there is evidence that participating parents perceive engineering and technology skills to be a benefit for themselves and their children. All outcomes are in the expected direction of the program's intended outcome to increase underserved parents interest in these topics.

PERCEIVED VALUE ENGINEERING AND TECHNOLOGY EDUCATION

Survey participants were asked to rank their level of agreement with four statements related to the importance and benefit they perceive in their children's technology, engineering, and science education. The survey used a four point scale with the headers of "Strongly Disagree," "Disagree,"" Agree," and "Strongly Agree." For analyses, a numeric rating was assigned to responses with "1" as the lowest rating and "4" as the highest agreement. Results were dichotomized into highest agreement (scores of three and four) and lowest agreement (scores of one and two) categories and then compared. See Table 20 below.

There was overwhelming agreement with all four value statements. Almost all (90%) of the survey participants agree with the statements that "learning about engineering will help my child(ren) become an engaged citizen." The same high proportion (90%) also agreed that "learning about engineering will help my child(ren) prepare for his/her future career."

Ninety percent of parents described their children's science education as being a priority for them. The results were slightly lower (82%) when asked about agreement with the statement that science education is a priority in their child's school. About 10% of respondents excused themselves from the question because they didn't have the answer to it.

Table 20.
Perceived Value of Student Engineering and Technology Education

	Strongly Disagree		Disagree		Agree		Strongly Agree	
Statement	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Learning about engineering will help my children become an engaged citizen.	1	4	1	4	10	36	15	54

Learning about engineering will help my children prepare for his/her future career.	2	7	0	0	11	39	14	50
My children's science education is a priority for me.	2	7	1	4	11	39	14	50
Science education is a priority in my children's school.*	2	8	0	0	12	48	11	44

* N=25; all others N=28

CONNECTING SATISIFICATION AND AWARENESS

When parents were asked in the survey and in the focus group, what they liked about the activities this year, the overarching theme in all of their responses was that the activities were good because they were good for their child, and oftentimes their own science and engineering education.

Parents told us (see above) that they have children now that love science, daughters that like to build imaginary building in their free time, and sons that ask to go to OMSI for more science and engineering games. Parents that participated in the focus group spoke about the importance of their children having new awareness about what engineering is and who can be an engineer. In these open-ended responses, we see that parents valued the partnership this year because it was educational and got their children excited about engineering and science.

CONCLUSION

At the conclusion of the *Tech Challenge* activities, parents valued the programs for the interest and education their children received about engineering. Participating parents perceived engineering and technology skills to be a benefit for themselves and their children.

PARENTAL INVOLVEMENT WITH STUDENT'S EXPERIENCES

To what extent and in what ways are parents involved and supportive of their child's engineering and technology learning experiences? To what extent, does this reflect or differ from the program's intended outcomes?

In order to answer this evaluation question, parents were asked questions related to the following:

- Parental involvement attitudes.
- Behavioral intent in student engineering and technology education.
- Open-ended descriptions in focus group and survey related to student success.

At the conclusion of the Rosa Parks *Tech Challenge* activities, there is evidence that participating parents support and intend to continue to support their children's engineering and technology learning activities. All outcomes are in the expected direction of the program's intended outcome to increase underserved students interest in these topics.

ATTITUDES RELATED TO PARENTAL INVOLVEMENT

Survey participants were asked to rank their level of agreement with four statements related to attitudes that are supportive of technology and engineering education. The survey used a four point scale with the headers of "Strongly Disagree," "Disagree,"" Agree," and "Strongly Agree." For analyses, a numeric rating was assigned to responses with "1" as the lowest rating and "4" as the highest agreement. Results were dichotomized into highest agreement (scores of three and four) and lowest agreement (scores of one and two) categories and then compared. See Table 21 below.

Some highlights from these results are that:

- 93% look forward to helping their children learn more about science.
- Slightly fewer (89%) look forward to helping their children learn more about engineering.
- 89% agree or strongly agree that the activities this year have given them strategies they can use at home.

Parents were also asked about whether they perceived their children to be excited about science and engineering activities, and 93% of the parents agreed that they were. This is important because a parent's perception of their child's interest and excitement increases the likelihood that they would seek out activities in the future to do with their child that further this excitement.

Table 21.
Perceived Value of Student Engineering and Technology Education

	Strongly Disagree		Disagree		Agree		Strongly Agree	
Statement	Freq.	%	Freq.	%	Freq.	%	Freq.	%
I look forward to helping my children learn more about science.	2	7	0	0	11	39	15	54

I look forward to helping my children learn more about engineering.*	1	4	1	4	10	36	15	54
The activities this year made my children more excited about doing engineering and technology activities.	2	7	0	0	14	50	12	43
The activities this year have given me strategies for engaging my children in science at home.*	2	7	0	0	14	50	11	39

* N=27; all others N=28

LIKELIHOOD OF PARTICIPATING IN FUTURE ACTIVITIES

Parents were also asked about their likelihood of participating in future science and engineering educational activities. See Table 5. Most parents (97%) wanted to attend another OMSI Family Night. Many wanted to try an activity from Family Science Night at home (90%) or read one of the *Tech Challenge* books to their children (94%). Fewer respondents (72%) thought they would be likely to try one of the Coffee activities at home. However, when we controlled for if the respondent had participated in a Coffee before this percentage increased to 100%.

Table 22.
Parental Science and Engineering Involvement Likelihood

	Very Unlikely		Unlikely		Likely		Very Likely	
Statement	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Attend another OMSI Family Science Night.	1	3	0	0	4	14	24	83
Try a Family Science Night activity at home.	1	4	1	4	12	43	14	50
Try a Coffee activity at home.	1	4	2	8	7	29	14	58
Read the *Harold and the Purple Crayon* or *Galimoto* book with my children.	1	3	1	3	6	21	21	72

Another indicator of family engagement and support is at-home conversations about the *Tech Challenge* content. We asked if parent's heard or talked about any of the OMSI activities, for example, family nights, Logo Robotics Labs (3-5 grade), Lego Mania Labs (K-2), field trips to OMSI with labs, OMSI classroom presentations this school year. A little more than two-thirds of parents described their child discussing the activities with themselves (77%), other family members (68%), or their friends (68%) this school year.

CONCLUSION

Looking across the different ways that parent engagement was measured (Likert-scale agreement statements, open-ended questionnaire responses, and a parent focus group) we saw some evidence that the parents that participated in *Tech Challenge* activities had and were likely to continue to support their children's science and engineering education.

DISCUSSION AND CONCLUSION

The *Rosa Parks Tech Challenge* appears to have met its objectives during the 2012–2013 school year. The project established a partnership with a minority-serving elementary school in North Portland, Rosa Parks Elementary, and provided engineering design educational programming that reached the entire student body (K-5), classroom teachers, and participating parents and family members.

The multifaceted and integrated student, teacher, and parent programs were rated by participants as effective, engaging, and critical to:

- Preparing students with skills, confidence, and personal motivation to participate in civic life and to eventually, if they desire, enter the technology workforce;
- Preparing teachers with instructional strategies and skills to delivery hands-on engineering and technology education in their classrooms; and
- Providing parents with opportunities and tools to support their child's technology learning experiences and interest in STEM careers.

The Lego Robotics labs, field trips, teacher in-services and mentorships, monthly Parent Coffees, and Family Nights all received high ratings. However, there were some negative remarks about the scheduling of activities for teachers and the organization of heavily attended family nights. Finally, while the monthly Coffee programs were successful at building strong relationships between OMSI and participating Rosa Parks parents, as well as increasing those parents' interest and awareness in engineering and science, the activities did not readily translate into take home activities. Perhaps additional supports or materials are needed to provide parents with activities they will use at-home with their children.

Programs for all three audiences were remarkable in their ability to inspire creativity and excitement. Teachers described themselves becoming more creative in their lesson plans, making "science tools out of anything." Parents, teachers, and students all described how students became more excited about science and engineering and how they became more creative in their problem-solving during the program year. Finally, parents described how by reading together with their students and by trying hands-on activities in the monthly Coffees, they enhanced their own creativity and tried new things, despite in their own words their "very-adult fear of failure."

In terms of sustainability, all three audiences perceived the program as working within and building on the strengths and resources within their community. Like the spin-art supplies and building kits that remain in the parent resource center, the lesson plans that were developed this year and will be used in future years, and the museum doors that remain open, by working within the resources and strengths of a community, benefits can persist even after funding is complete. Furthermore, because relationships between the school staff, students, and parents and OMSI staff were so strong this year—mentioned by all three audiences in their open-ended responses—and as part of participating in the program students, staff, and teachers learned new ways to navigate and utilize the resources at OMSI, these skills and relationships will also persist after the conclusion of the funding.

Ultimately, this program demonstrated the ability in an underrepresented community to increase interest in and understanding of engineering and technology careers, and build related engineering, technology, and innovation skills to contribute to preparing students for STEM careers.

APPENDIX A: STUDENT SURVEYS

BASELINE STUDENT SURVEY

OMSI is thrilled to be working with students at Rosa Parks Elementary school this year.

We want to get to know you! Here are some questions about you! It's not a test and if you want to skip a question you can. Your answers will be confidential. Thanks for telling us about you!

1. I am a: ☐ Girl ☐ Boy

2. How old are you?
   ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐ 13

3. In the past year, have you visited OMSI? ☐ Yes ☐ No

   3a. If yes, how many times have you visited?
   - ☐ 1
   - ☐ 2
   - ☐ 3
   - ☐ 4
   - ☐ 5+

4. Do you know an engineer? ☐ Yes ☐ No

5. Do you know a scientist? ☐ Yes ☐ No

6. Who do you think uses engineering in their work?
   - ☐ A bridge designer
   - ☐ An astronaut
   - ☐ A building inspector
   - ☐ None of them
   - ☐ All of them

7. Please share 3 examples of technologies that you used this morning.

a._____

b._____

c._____

8. Please mark how much you agree or disagree with each statement.

	 1 No way!	 2 Not really	 3 Maybe	 4 Okay	 5 Yes, totally!
a. I think technology is interesting.	☐	☐	☐	☐	☐
b. If I had a choice, I would not study any more science.	☐	☐	☐	☐	☐
c. I like learning how things work.	☐	☐	☐	☐	☐
d. I take careful steps when I am trying to solve problems.	☐	☐	☐	☐	☐
e. I am good at engineering.	☐	☐	☐	☐	☐
f. I think creatively to imagine new ideas.	☐	☐	☐	☐	☐
g. I enjoy designing and making things.	☐	☐	☐	☐	☐

9. Which of these activities have you done? (check all that apply):

☐	Watched an inventors or nature program on TV or DVD.
☐	Played a computer game that was about math or science or engineering.
☐	Invented something.
☐	Designed (thought up) and built something on my own.
☐	Read a book about science or engineering or inventing.
☐	Participated in a science or engineering fair or event.
☐	Used the Internet to learn more about a science or engineering topic.

10. Please mark how much you agree or disagree with each statement.

	 1 No way!	 2 Not really	 3 Maybe	 4 Okay	 5 Yes, totally!
a. I would like to be a scientist.	☐	☐	☐	☐	☐
b. I would like to be an engineer.	☐	☐	☐	☐	☐
c. I would like a job where I invent things.	☐	☐	☐	☐	☐
d. I would like to design machines that help people walk.	☐	☐	☐	☐	☐
e. Engineers help solve problems.	☐	☐	☐	☐	☐
f. I would like a job that lets me design robots.	☐	☐	☐	☐	☐
g. Engineers help make people's lives better.	☐	☐	☐	☐	☐
h. Engineers typically work alone.	☐	☐	☐	☐	☐
i. Engineers can do many different kinds of jobs.	☐	☐	☐	☐	☐
j. I know what engineers do for their jobs.	☐	☐	☐	☐	☐

Thank You!

STUDENT END OF YEAR SURVEY

1. During the 2012-2013 school year, did you….

	Yes	No	Unsure
a. Go to the family night at OMSI in the fall?	☐	☐	☐
b. Go to the family night at your school?	☐	☐	☐
c. Go to the Lego Robotics labs at your school?	☐	☐	☐
d. Go with your class on the OMSI field trip?	☐	☐	☐
e. Hear the OMSI presentation in your class?	☐	☐	☐
f. Outside of school, go with your friends or family to OMSI?	☐	☐	☐
g. Work with family members on a science or engineering project?	☐	☐	☐

2. Please mark how much you agree or disagree with each sentence.

Attending OMSI events this year….	 **1** No way!	 **2** Not really	 **3** Maybe	 **4** Okay	 **5** Yes, totally!
a. Helped me learn more about engineering and technology.	☐	☐	☐	☐	☐
b. Made me more excited about doing engineering and technology activities.	☐	☐	☐	☐	☐
c. Helped me see I was good at engineering.	☐	☐	☐	☐	☐
d. Was fun.	☐	☐	☐	☐	☐

3. Something new I learned as a result of going to OMSI activities this year was_____

4. The best thing about the OMSI activities this year was_____

5. The one thing I would change about the OMSI activities this year is _____

6. Which of these activities have you done at home or at school (check all that apply)?

☐	Watched an inventors or nature program on TV or DVD.
☐	Played a computer game that was about math or science or engineering.
☐	Invented something.
☐	Designed (thought up) and built something on my own.
☐	Read a book about science or engineering or inventing.
☐	Used the Internet to learn more about a science or engineering topic.
☐	Worked with friends on science or engineering projects.

7. Please check how much you agree or disagree with each sentence.

	 1 No way!	 2 Not really	 3 Maybe	 4 Okay	 5 Yes, totally!
k. I would like a job as a scientist.	☐	☐	☐	☐	☐
l. I would like a job as an engineer.	☐	☐	☐	☐	☐
m. I would like a job where I invent things.	☐	☐	☐	☐	☐
n. I would like to design machines that help people walk.	☐	☐	☐	☐	☐
o. Engineers help solve problems.	☐	☐	☐	☐	☐
p. I would like a job that lets me design robots.	☐	☐	☐	☐	☐
q. Engineers help make peoples' lives better.	☐	☐	☐	☐	☐
r. Engineers typically work alone.	☐	☐	☐	☐	☐
s. Engineers can do many different kinds of jobs.	☐	☐	☐	☐	☐
t. I know what engineers do for their jobs.	☐	☐	☐	☐	☐

8. Please check how much you agree or disagree with each sentence.

	 1 No way!	 2 Not really	 3 Maybe	 4 Okay	 5 Yes, totally!
a. I think technology is interesting.	☐	☐	☐	☐	☐
b. If I had a choice, I would <u>not</u> study any more science.	☐	☐	☐	☐	☐
c. I like learning how things work.	☐	☐	☐	☐	☐
d. I take careful steps when I am trying to solve problems.	☐	☐	☐	☐	☐
e. I am good at engineering.	☐	☐	☐	☐	☐
f. I think creatively to imagine new ideas.	☐	☐	☐	☐	☐
g. I enjoy designing and making things.	☐	☐	☐	☐	☐

9. In your Lego Robotics labs, when something with your robot did not work out like you hoped, what did you do?

_____

_____

_____

10. Who do you think uses engineering in their work?

☐ A bridge designer

☐ An astronaut

☐ A building inspector

☐ None of them

☐ All of them

11. I am a: ☐ Girl ☐ Boy

12. How old are you? ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐ 13

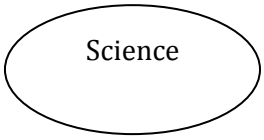
Thank You!

APPENDIX B: STAFF SURVEYS

BASELINE STAFF SURVEY

Let us start with something a little different, let us draw pictures!

1. How does teaching science make you feel? Do you like teaching science? Draw and write out your feelings about teaching science below. Draw lines to connect your ideas.



2. What are your top 3 priorities for YOUR OWN professional development this year? We want to see how we can make sure our program aligns/fits with your needs.

a._____

b. _____

c. _____

3. What will be your biggest ASSET for teaching science and engineering this year?

_____

_____

_____

_____

4. What will be your biggest CHALLENGE for teaching science and engineering this year?

_____

_____

_____

_____

5. Listed below are some of the intended learning objectives for the OMSI and Rosa Parks Partnership. For each item below, please indicate your current level of knowledge or skill. Results from this assessment will be used to improve the content and design of future professional development activities.

Knowledge/Skill Level

	None 1	**Novice 2**	**Apprentice 3**	**Expert 4**	**N/A**
a. Describing the steps of the engineering design processes (i.e. define the problem, develop a solution, testing solutions, and communicating results).	☐	☐	☐	☐	☐
b. Employing quick strategies (e.g. eye spy game, 20 questions) to incorporate science and engineering into other content areas.	☐	☐	☐	☐	☐
c. Demonstrating in my classroom how the work of engineers is relevant to our everyday lives.	☐	☐	☐	☐	☐
d. Describing how learning science and engineering benefits the Rosa Parks community.	☐	☐	☐	☐	☐
e. Utilizing OMSI's resources to support student learning.	☐	☐	☐	☐	☐

6. Please indicate the degree to which you agree or disagree with each statement below. Indicate your answer by checking the corresponding box. There are no wrong answers.

	Strongly Disagree 1	Disagree 2	Agree 3	Strongly Agree 4	N/A
a. I look forward to teaching my students about science and engineering.	☐	☐	☐	☐	☐
b. I want to learn more about science and engineering.	☐	☐	☐	☐	☐
c. Learning about science and engineering will help my students become engaged citizens.	☐	☐	☐	☐	☐
d. Learning about science and engineering will help my students prepare for future careers.	☐	☐	☐	☐	☐
e. Science and engineering education is a priority with parents in my school.	☐	☐	☐	☐	☐
f. The OMSI and Rosa Parks Parnership will complement my school's focus on math and reading.	☐	☐	☐	☐	☐
g. The OMSI and Rosa Parks Partnership will build on my strengths as a teacher.	☐	☐	☐	☐	☐

FAST FACTS!

8. Do you think the following statements are true or false?

	True	False	Don't know
a. Engineers typically work alone.	☐	☐	☐
b. A 4-year degree is required to work in science and engineering careers.	☐	☐	☐
c. Engineers are creative problem solvers.	☐	☐	☐
d. Engineering can be an altruistic pursuit.	☐	☐	☐

Please share 3 examples of technologies that you used this morning.

a._____ _____

b._____

c._____

BACKGROUND INFORMATION

What grade(s) are you teaching during the 2012-2013 school year?

☐ Kindergarten

☐ 1st

☐ 2nd

☐ 3rd

☐ 4th

☐ 5th

☐ Other:_____

What is your role at Rosa Parks Elementary School?

☐ Teacher

☐ Principal

☐ Teacher on Special Assignment (TOSA)

☐ Instructional Assistant

☐ Teacher Specialist

☐ Program Coordinator

☐ Other:_____

Any comments/suggestions?

_____

_____

_____

END OF YEAR STAFF SURVEY

OMSI Rosa Parks Tech Challenge 2012-2013 Staff Survey

1. **Did you participate in the OMSI/Rosa Parks Tech Challenge Partnership kick-off at OMSI on August 29, 2012?**

   ☐ Yes ☐ No ☐ Not sure

2. **How many of the monthly OMSI staff meeting did you attend?**

   ☐ All of them ☐ Most of them ☐ Few of them ☐ None of them

3. **About how many hours of professional development, did you earn as a result of this partnership**: _____

4. **How relevant was the OMSI/Rosa Parks Tech Challenge partnership to your work at Rosa Parks (check one)?**

   ☐ Very relevant ☐ Somewhat relevant ☐ Not sure ☐ Not very relevant ☐ Not at all relevant

5. **How well do you feel the partnership met your professional development goals and expectations (check one)?**

   ☐ Very well ☐ Somewhat ☐ Not sure ☐ Not very well ☐ Not at all

6. **How enjoyable was the partnership (check one)?**

   ☐ Very enjoyable ☐ Somewhat enjoyable ☐ Not sure ☐ Not very enjoyable ☐ Not at all enjoyable

7. What do you think were some particularly successful aspects of the partnership?

8. What are some ways that future OMSI-school partnerships could be improved?

9. Please indicate your current level of knowledge and/or skill for each of the following items.

Knowledge/Skill Level

	None 1	**Novice 2**	**Apprentice 3**	**Expert 4**	**N/A**
a. Describing the steps of the engineering design processes (i.e. define the problem, develop a solution, testing solutions, and communicating results).	☐	☐	☐	☐	☐
b. Employing quick strategies (e.g. eye spy game, 20 questions) to incorporate science and engineering into other content areas.	☐	☐	☐	☐	☐
c. Demonstrating in my classroom how the work of engineers is relevant to our everyday lives.	☐	☐	☐	☐	☐
d. Describing how learning science and engineering benefits the Rosa Parks community.	☐	☐	☐	☐	☐

e. Utilizing OMSI's resources to support student learning.	☐	☐	☐	☐	☐

10. <u>Before this school year</u>, how often did you do the following with students (check one)?

	Never 1	Occasionally 2	Usually 3	Always 4	N/A
a. Employ quick strategies (e.g. eye spy game, 20 questions) to incorporate science and engineering into other content areas.	☐	☐	☐	☐	☐
b. Describe how the work of engineers is relevant to our everyday lives.	☐	☐	☐	☐	☐
c. Describe how learning science and engineering benefits our community.	☐	☐	☐	☐	☐
d. Utilize OMSI's resources to support student learning.	☐	☐	☐	☐	☐

11. <u>During this school year</u>, how often did you do the following with students (check one)?

	Never 1	Occasionally 2	Usually 3	Always 4	N/A
a. Employ quick strategies (e.g. eye spy game, 20 questions) to incorporate science and engineering into other content areas.					
b. Describe how the work of engineers is relevant to our everyday lives.	☐	☐	☐	☐	☐
c. Describe how learning science and engineering benefits our community.	☐	☐	☐	☐	☐
d. Utilize OMSI's resources to support student learning.	☐	☐	☐	☐	☐

What is one thing you found interesting or learned about the STEM (Science, Technology, Engineering, Math) workforce **as a result of participating in the Tech Challenge partnership.**

12. What is one new classroom technique you have employed as a result of participating in the Tech Challenge partnership?

13. Please indicate the degree to which you agree or disagree with each statement below. Indicate your answer by checking the corresponding box. There are no wrong answers.

	Strongly Disagree 1	Disagree 2	Agree 3	Strongly Agree 4	N/A
a. I look forward to teaching my students about science and engineering.	☐	☐	☐	☐	☐
b. I want to learn more about science and engineering.	☐	☐	☐	☐	☐
c. Learning about science and engineering will help my students become engaged citizens.	☐	☐	☐	☐	☐
d. Learning about science and engineering will help my students prepare for future careers.	☐	☐	☐	☐	☐
e. Science and engineering education is a priority with parents in my school.	☐	☐	☐	☐	☐

f. The OMSI and Rosa Parks Partnership complemented my school's focus on math and reading.	☐	☐	☐	☐	☐
g. The OMSI and Rosa Parks Partnership built on my strengths as a teacher.	☐	☐	☐	☐	☐

FAST FACTS!

14. Do you think the following statements are true or false?

	True	False	Don't know
a. Engineers typically work alone.	☐	☐	☐
b. A 4-year degree is required to work in science and engineering careers.	☐	☐	☐
c. Engineers are creative problem solvers.	☐	☐	☐
d. Engineering can be an altruistic pursuit.	☐	☐	☐

15. What changes, if any, have you observed in your students as a result of participating in the Tech Challenge program?

BACKGROUND INFORMATION

What grade(s) did you teach during the 2012-2013 school year?

- ☐ Kindergarten
- ☐ 1st
- ☐ 2nd
- ☐ 3rd
- ☐ 4th
- ☐ 5th
- ☐ Other:_____

What is your role at Rosa Parks Elementary School?

- ☐ Teacher
- ☐ Principal
- ☐ Teacher on Special Assignment (TOSA)
- ☐ Instructional Assistant
- ☐ Teacher Specialist
- ☐ Program Coordinator
- ☐ Other:_____

Any comments/suggestions?

_____

_____

_____

_____

APPENDIX C: PARENT SURVEY

OMSI Rosa Parks Tech Challenge 2012-2013 Survey

Activities for Families

1. This 20012-13 school year did you and/or your child(ren)….

	Yes	No	Unsure
a. Attend the *Tech Challenge* Family Science Night at OMSI in the Fall of 2012?	☐	☐	☐
b. Attend a Parent Coffee where OMSI presented?	☐	☐	☐
c. Receive the *Harold and the Purple Crayon* or *Galimoto* book(s)?	☐	☐	☐
d. Visit OMSI for a school field trip?	☐	☐	☐
e. Visit OMSI any times other than during school-related trips?	☐	☐	☐

2. Based on your experiences at the family night(s), how much do you agree or disagree with the following statements?

Family Nights…	Strongly Disagree 1	Disagree 2	Agree 3	Strongly Agree 4	N/A
a. Were helpful for my child(ren)'s education.	☐	☐	☐	☐	☐
b. Were well run.	☐	☐	☐	☐	☐
c. Were relevant to me as a parent/caregiver.	☐	☐	☐	☐	☐
d. Were fun.	☐	☐	☐	☐	☐

13. The best thing about Family Nights is_____

14. The one thing I would change about Family Nights is _____

15. If you received a copy of the *Harold and the Purple Crayon* or *Galimoto* book(s), how much do you agree or disagree with the following statements?

Book(s)…	Strongly Disagree 1	Disagree 2	Agree 3	Strongly Agree 4	N/A

a. Were helpful for my child(ren)'s education.	☐	☐	☐	☐	☐
b. Were relevant to me as a parent/caregiver.	☐	☐	☐	☐	☐
c. Were fun.	☐	☐	☐	☐	☐

16. In what ways, were the book(s) useful or could have been more useful?_____

_____

17. If you attended any of the Parent Coffees where OMSI presented, how much do you agree or disagree with the following statements?

Coffees(s)…	**Strongly Disagree 1**	**Disagree 2**	**Agree 3**	**Strongly Agree 4**	**N/A**
a. Taught me something new.	☐	☐	☐	☐	☐
b. Were relevant to me as a parent/caregiver.	☐	☐	☐	☐	☐
c. Were fun.	☐	☐	☐	☐	☐

18. In what ways, were the book(s) useful or could have been more useful?_____

_____

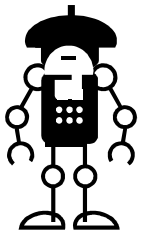
Activities for Students

19. This school year, has your child(ren) talked about any of the OMSI activities, for example, family nights, Logo Robotics Labs (3-5 grade), Lego Mania Labs (K-2), field trips to OMSI with labs, OMSI classroom presentations with…

You? ☐ Yes ☐ No ☐ Unsure

Oher family members? ☐ Yes ☐ No ☐ Unsure

His/her friends? ☐ Yes ☐ No ☐ Unsure



20. What did s/he like or dislike about the activities?

_____

_____

21. What changes, if any, have you observed in your child(ren) as a result of participating in the OMSI activities this school year?

_____

_____

Activities Overall (for families, parents, students, and teachers)

22. Please indicate the degree to which you agree or disagree with each statement below.

	Strongly Disagree 1	Disagree 2	Agree 3	Strongly Agree 4	N/A
a. I look forward to helping my child(ren) learn more about science.	☐	☐	☐	☐	☐
b. I look forward to helping my child(ren) learn more about engineering.	☐	☐	☐	☐	☐
c. Learning about engineering will help my child(ren) become an engaged citizen.	☐	☐	☐	☐	☐
d. Learning about engineering will help my child(ren) prepare for his/her future career.	☐	☐	☐	☐	☐
e. My child(ren)'s science education is a priority for me.	☐	☐	☐	☐	☐
f. Science education is a priority in my child(ren)'s school.	☐	☐	☐	☐	☐
g. The activities this year built on the strengths in my community.	☐	☐	☐	☐	☐
h. The activities this year worked well with my school's focus on math and reading.	☐	☐	☐	☐	☐
i. The activities this year made my child(ren) more excited about doing engineering and technology activities.	☐	☐	☐	☐	☐
j. The activities this year have given me strategies for engaging my child(ren) in science at home.	☐	☐	☐	☐	☐

23. Based on your experiences this school year, how likely are you to do the following:

	Very unlikely 1	Unlikely 2	Likely 3	Very likely 4	N/A
a. Attend another OMSI Family Science Night in the future?	☐	☐	☐	☐	☐
b. Try at home a science activity you did tonight?	☐	☐	☐	☐	☐
c. Try at home one of the activities you learned about at the OMSI Parent Coffees?	☐	☐	☐	☐	☐
d. Read the *Harold and the Purple Crayon* or *Galimoto* book with my child(ren)?	☐	☐	☐	☐	☐

24. Would you recommend this year long partnership program for other schools?

☐ Yes ☐ No ☐ Unsure

25. Why or why not?

_____

_____

Please tell us about yourself….

26. Are you a parent or guardian of a Rosa Parks Elementary student? □ Yes □ No

a. If yes, how many of your children attend Rosa Parks Elementary?_____

27. What language do you prefer to speak at home? _____

28. What is your gender? _____

29. What race/ethnicity do you consider yourself? (Please check all that apply.)

- □ African American/Black
- □ American Indian/ Native Alaskan
- □ Asian/Asian American
- □ Latino(a)/Hispanic
- □ Native Hawaiian/ Pacific Islander
- □ White
- □ Other: _____

30. Do you have any other comments about the activities this school year?

_____

_____

Thank you for your help!
Please return the survey to the raffle table.

APPENDIX D: PARENT FOCUS GROUP

1. Ice-Breaker: What is your special talent?
2. Your favorite coffee activity, why?
3. Your child's favorite activity, why?
4. The favorite activity to do with your child, why?
5. What do you think your child has learned or gotten out of the partnership?
6. What do you think you have learned or gotten out of the partnership?
7. If you could change one thing about the partnership, what would you change?
8. What is the most important thing to you about your child's science and technology education, generally?
    - ➔ Probe for workforce
9. What is the most important thing about science and technology education for the larger Rosa Parks elementary community?
10. What are some recommendations you have for how parents can support their children's science and technology learning experiences?