



# NASA Now

## Summative Evaluation Report

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Prepared for Pacific Science Center

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RESEARCH** 

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## EXECUTIVE SUMMARY

**Pacific Science Center (Science Center) has been a pillar of science education programming in Seattle, Washington since 1962.** Through interactive exhibits, planetarium shows, IMAX movies, and outreach, the Science Center works to inspire a lifelong interest in science, math and technology in people throughout the Pacific Northwest region.

In 2010, the Science Center joined forces with the National Aeronautics and Space Administration (NASA) through NASA Now: Using Current Data, Planetarium Technology and Youth Career Development to Connect People to the Universe. NASA Now was designed to increase the awareness, knowledge and understanding of NASA missions and science, technology, engineering and mathematics (STEM) careers among schoolchildren, teens and the general public. To accomplish this goal, the Science Center designed the NASA Now program with specific objectives and outcomes in mind for three programming areas described in the table below.

### NASA Now Objectives and Outcomes 2010 - 2015

Programming Area	Objective	Outcome
<b>Willard Smith Planetarium</b>	More than <b>200,000 child and adult visitors, and 33,000 elementary and middle school students</b> on scheduled field trips will participate in a live show in the Science Center’s Willard Smith Planetarium, showcasing NASA missions and data, as well as careers in physics, astronomy, and aerospace engineering,	Visitors and students will increase their understanding of and interest in NASA missions and data, relevant educational pathways and potential careers within the NASA enterprise.
<b>Science On Wheels (School Outreach)</b>	<b>60,000 students and adults</b> will participate in a live show during a <i>Science On Wheels</i> outreach program that highlights astronomy and NASA science and missions.	Students and adults will increase their understanding of and interest in NASA missions and data as well as careers in relevant disciplines.
<b>Discovery Corps/Track for Earth and Space Science Achievement (TESSA)</b>	<b>40 teens</b> will engage in a long-term astronomy mentoring program.	Youth will gain first-hand knowledge of astronomy, relevant educational pathways and potential careers within the NASA enterprise.

This report, created by Geo Education & Research (Geo), describes the extent to which the Science Center achieved each of these objectives and outcomes.

## Willard Smith Planetarium



Discovery Corps TESSA members in the Willard Smith Planetarium, training on the Human Space Flight NASA Now show content. Photo courtesy of Pacific Science Center.

The Science Center's Willard Smith Planetarium plays host to thousands of visitors each year. It seats 40 people in the round, with a live presenter in the center. Its intimate setting provides visitors with a uniquely personal and interactive view of the universe. Under NASA Now, the Science Center strove to reach **200,000 museum visitors, as well as 33,000 students** on scheduled field trips with a live show in the Science Center's Willard Smith Planetarium. These shows were to showcase NASA missions, as well as careers in physics, astronomy, and aerospace engineering.

To achieve this goal, the Willard Smith Planetarium **purchased a new digital projection system** that allowed it to integrate current NASA images and data into its shows, and staff **created four interactive space shows** that highlighted Mercury, Pluto, black holes and human space flight. Despite some initial hurdles, including equipment breaks, **the Planetarium ultimately reached 171,000 people with these interactive space shows.**

**These shows were well-received by audiences of all ages**, with 87% of adult respondents indicating that they would recommend the show to a friend, and students reporting that the show made them feel interested (56%), curious (52%), and adventurous (44%).<sup>1</sup> **Student interest in astronomy increased** from 72% of students before the show to 85% after, and student interest in science increased from 80% of students before the show to 88% after.<sup>2</sup> **Surveys also showed that both students and adults left the shows with new knowledge about space and NASA.** Just over 92% of adult respondents indicated that they had learned "some" or "a lot" from the show, and 88%

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<sup>1</sup> Students were asked to circle words that described how they felt after viewing the show, with an option to add their own words. Because students were allowed to circle multiple words, percentages do not add up to 100%.

<sup>2</sup> Adult surveys did not measure changes in interest. These figures encompass students who reported feeling "some" or "a lot" of interest in astronomy or science before or after the show.



indicated that “some” or “a lot” of the information was new to them. Approximately 60% of adult respondents answered content knowledge questions correctly (despite a more difficult fill-in the blank format), and 78% of surveyed students were able to name two NASA missions and the research goals of each mission.

## Science On Wheels



Manson Elementary School 1st grader exploring Space Odyssey exhibits. Photo courtesy of the Manson School District.

Science On Wheels brings science lessons and shows directly to schools across Washington State. Each participating school receives a full day of science lessons and shows designed to spark students’ interest in science and to expose them to new knowledge and ideas in the field. Science On Wheels is often the only opportunity for a school to provide this type of programming to their students because many students are low income or live far beyond the city limits. Through NASA Now, the Science Center strove to reach **60,000 students and adults** with a live planetarium show highlighting astronomy, NASA science, and NASA missions during an outreach program.

To achieve this goal, Science On Wheels purchased **two portable digital projectors** to replace the analog projectors that Science On Wheels had previously been using in its outreach planetarium shows, and staff **created four new planetarium shows** highlighting NASA images and data. Science On Wheels also updated two of its astronomy-related classroom lessons to include more up-to-date NASA content. The first lesson, *Your Place in Space*, taught students about the defining characteristics of a planet; the second lesson, *Plan it: Mars*, led students in designing a Rover mission to Mars using components from real Mars Rovers.

**Science On Wheels ultimately reached over 42,000 students and adults with these new shows and over 17,000 students and adults with its updated classroom lessons.** Both were well received by students and adults and **the planetarium shows appear to have fully met their intended outcomes of increasing student interest in and knowledge of astronomy and NASA.** The proportion of surveyed students who indicated that they had “a lot” or “some” interest in astronomy jumped from 77% before the planetarium shows to 90% after, and 88% of surveyed students were interested in

learning more about the stars and planets. When answering content questions, 63% of students correctly identified why our sun appears to be the brightest star in the sky, and 76% correctly identified the significance of the North Star. 69% of surveyed students that watched the show *Human Space Flight* correctly named at least one place that NASA may send astronauts in the future, and although only 20% of students that watched the show *The Outer Limits* could name the spacecraft that was on its way to Pluto (New Horizons), 59% of students correctly identified what New Horizons would do after it reached Pluto (continue flying past).

**NASA Now was also instrumental in helping the Science Center to reach lower income schools with Science On Wheels.** Through NASA Now, Science On Wheels supported 134 schools with a subsidy that allowed those schools to participate in the program. In many of these schools, over 75% of the students that attend qualify for free or reduced-price lunch.

## Discovery Corps and Track for Earth and Space Science Achievement (TESSA)



Discovery Corps NASA Now TESSA youth on a field trip to the Museum of Flight. Photo courtesy of Pacific Science Center.

The Discovery Corps Program, which began in 2005, allows youth to serve as science interpreters for visitors, help staff with special projects, and grow their knowledge base and interest in science. TESSA, funded through NASA Now, expands upon this program to provide a specific emphasis on astronomy and earth and space science. It also provides a subsidy to make the program a paid work experience for youth, allowing lower income and a wider range of

youth to participate over an extended period of time.

**Students apply to TESSA before or during their first year of high school, and they continue in the program throughout their high school careers.** Once accepted, youth work as paid (and sometimes volunteer) science interpreters, teaching visitors science at exhibits and in portable carts, helping staff with special projects, assisting with animal care, participating in research, teaching hands-on science lessons to children in summer programs, interacting with visiting scientists and special

guests, and helping to develop exhibits. Many of the above responsibilities are accomplished by applying and being selected for a wide variety of internships in Earth and Space Science and other fields.

**As a foundation to the TESSA program, all youth ascend a career ladder while learning various professional science interpretation and general work skills.** Some youth participate in space-related internships that specialize in science training, field trips, lectures, and presentations while accomplishing TESSA objectives and goals.

The Science Center's ultimate goal for TESSA is to create a collaborative environment to teach students about science, astronomy, life skills, and professional conduct –**TESSA serves as a career pathway for youth from backgrounds that are traditionally underrepresented in earth and space science fields.** It achieves this goal in many detailed ways.

## INTRODUCTION

Pacific Science Center (Science Center) has been a pillar of science education programming in Seattle, Washington since 1962. Through interactive exhibits, planetarium shows, IMAX movies, and outreach, the Science Center works to inspire a lifelong interest in science, math and technology in people throughout the Pacific Northwest region.

In 2010, the Science Center joined forces with the National Aeronautics and Space Administration (NASA) through NASA Now: Using Current Data, Planetarium Technology and Youth Career Development to Connect People to the Universe. NASA Now, a NASA funded program, was designed to engage and educate the public about astronomy, space, and current NASA missions through interactive planetarium shows and career programs for youth in astronomy and space science. To accomplish this goal, the Science Center designed the NASA Now program with specific objectives and outcomes in mind for three programming areas described in Table 1.

**Table 1 | NASA Now Objectives and Outcomes 2010 - 2015**

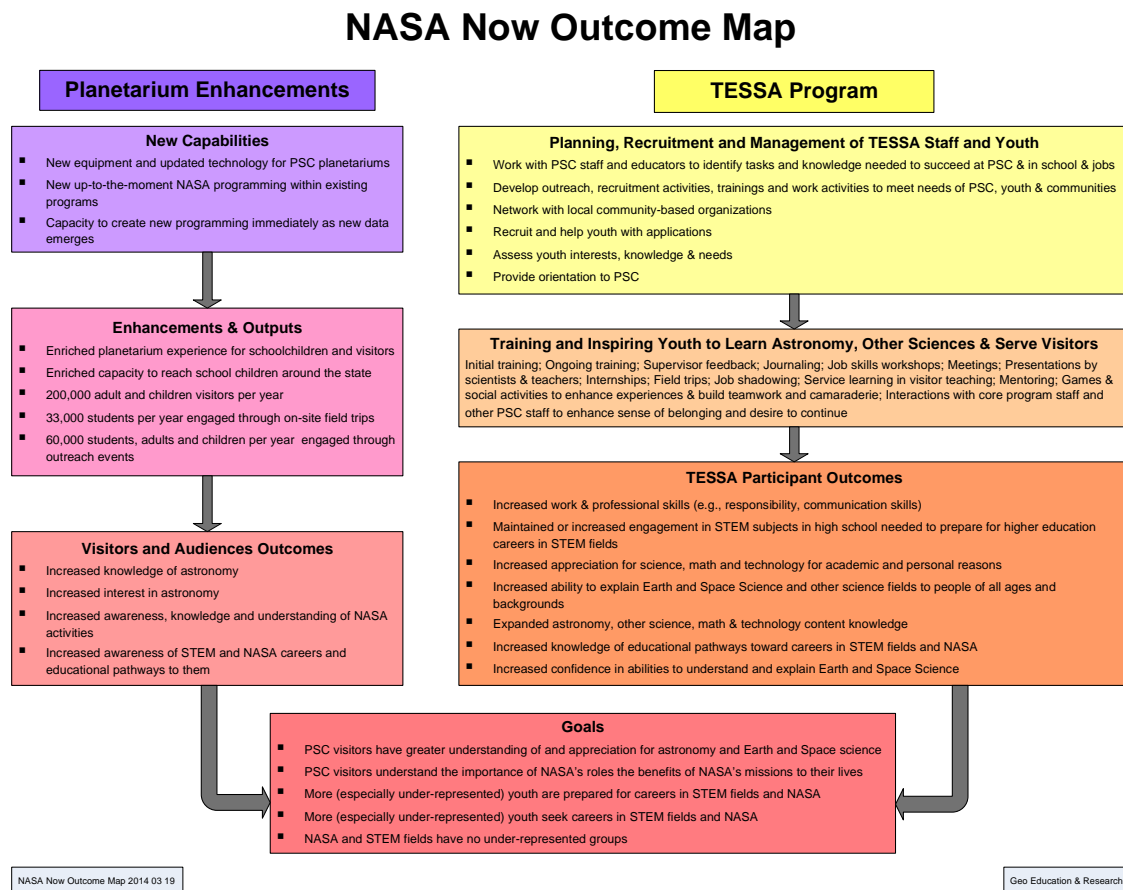
Programming Area	Objective	Outcome
<b>Willard Smith Planetarium</b>	More than <b>200,000 child and adult visitors, and 33,000 elementary and middle school students and adults</b> on scheduled field trips will participate in a live show in the Science Center’s Willard Smith Planetarium, showcasing NASA missions and data, as well as careers in physics, astronomy, aerospace engineering and related fields.	Participating students and adults will increase their understanding of and interest in NASA missions and data, relevant educational pathways and potential careers within the NASA enterprise and relevant disciplines.
<b>Science On Wheels (School Outreach)</b>	<b>60,000 students and adults</b> will participate in a live show during a <i>Science On Wheels</i> outreach program that highlights astronomy and NASA science and missions.	Participating students and adults will increase their understanding of and interest in NASA missions and data as well as careers in relevant disciplines.
<b>Discovery Corps and the Track for Earth and Space Science Achievement (TESSA)</b>	<b>40 teens</b> will engage in a long-term astronomy mentoring program.	Youth will gain first-hand knowledge of astronomy relevant educational pathways and potential careers within the NASA enterprise and relevant disciplines.

The Science Center designed NASA Now to meet all three of the major education goals stated in NASA Education’s Strategic Framework. The Science Center proposed to meet these goals by:

1. Attracting and retaining students in STEM disciplines;
2. Strengthening NASA and the nation’s future workforce by creating a career pipeline for youth (ages 14-18) from backgrounds that are underrepresented in the sciences; and,
3. Engaging Americans in NASA’s mission using state-of-the-art planetarium technology, both on-site for the museum visitors and off-site at schools and community events throughout Washington State.

See the NASA Now Outcome Map in Figure 1 for more details.

Figure 1 | NASA Now Outcome Map



Through the NASA grant, the Science Center received funding to improve and expand its planetarium shows in the Willard Smith Planetarium (the Planetarium) by purchasing more modern projection technology that allowed it to incorporate up-to-date NASA images and data into its planetarium programs. NASA Now also supported the Science Center's Science On Wheels program, which takes science education and shows directly to schools. The grant supported Science On Wheels in purchasing portable planetarium technology for its outreach programs to schools and in creating star shows and astronomy lessons for youth that highlight NASA research and images. Finally, NASA Now supported the Science Center in creating a Track for Earth and Space Science Achievement (TESSA) in its Discovery Corps program. Discovery Corps is a four-year program for high school youth that guides them in developing professional skills and a deeper knowledge of and interest in science. TESSA added an additional focus on cultivating youth knowledge of astronomy and earth and space science.

This Summative Evaluation, carried out by external evaluator, Geo Education & Research (Geo), describes the extent to which the Science Center has achieved each of NASA Now's three primary objectives and outcomes by answering six key evaluation questions:

1. To what extent did the NASA Now project enable the Science Center to promote and connect audiences to space science and astronomy, and to what extent did NASA content help in this work?
2. What types of NASA materials do visitors see, and how is the material presented?
3. What do the various audiences learn from the presentations, installations, training and/or interpreting activities?
4. How did the NASA materials assist in learning and enjoyment by the different audiences?
5. To what extent do audiences recognize and appreciate the role of NASA in providing these materials?
6. How did TESSA youth change in their four years of involvement at the Science Center?

## WILLARD SMITH PLANETARIUM ENHANCEMENTS

### Background

NASA Now's first objective was that **200,000 child and adult visitors** and **33,000 elementary and middle school students** on scheduled field trips would participate in a live show in the Science Center's Planetarium. These shows were to showcase NASA missions and data, as well as careers in physics, astronomy, aerospace engineering, and related fields. The intended outcomes were that participating visitors and students would increase their understanding of and interest in NASA missions and data, relevant educational pathways, and potential careers within the NASA enterprise.

Using live interpretation and new planetarium technology, NASA Now's long-term goal was to increase the awareness, knowledge and understanding of NASA missions and science, technology, engineering and mathematics (STEM) careers among schoolchildren, teens and the general public.

Founded in 1977, the Planetarium plays host to thousands of visitors each year. It seats 40 people in the round, with a live presenter in the center. Its intimate setting provides visitors with a uniquely personal and interactive view of the universe.

### Planetarium Enhancements & Programming

Under NASA Now, the Planetarium:

1. **Purchased a new digital projection system** to replace its 32-year old opto-mechanical system.
2. **Created four new planetarium shows** highlighting NASA images and data.
3. **Reached 143,577 child and adult visitors** as well as **27,423 elementary and middle school students and adults** with live and interactive shows highlighting astronomy and NASA.
4. **Supported 1,839 students and adults with a subsidy** through the school field trip assistance program.

With the opto-mechanical system the planetarium was able to run simple night sky shows showing a mostly static star field with apparent sky motion. Supplemental images were presented with slide projectors and as a result new images were difficult and time consuming to include in shows.

The new digital projection system allowed the Planetarium to integrate current NASA images and data into its planetarium shows. Staff developed four interactive space shows to augment its traditional planetarium offering.

The first show, entitled ***Worlds of Stone, Worlds Unknown: NASA Investigates Mercury and the Asteroid Belt*** was offered from September of 2011 to October of 2012. During this show, after working with the presenter to find planets in the night's sky, guests were introduced to the MESSENGER and Dawn missions to Mercury. Guests would then “fly” to Mercury, following the path of the MESSENGER mission, and, in an activity designed to encourage guests to explore space-related careers, guests also helped to assemble a team of scientists using “trading cards” with bios of actual MESSENGER and Dawn team members. The program finished with a discussion of what NASA learned from these missions and a viewing of recently released images from these spacecraft.

The second show, entitled ***Gravity and Black Holes***, was offered from October of 2012 to October of 2013. This highly popular show introduced audiences to NASA's cutting-edge investigations into the still-unsolved mysteries involving gravity and black holes, as well as NASA's recently launched NuSTAR mission to bring the high-energy universe into focus.

The third show, entitled ***Human Spaceflight***, ran from October of 2013 to October of 2014. This fully interactive planetarium show introduced audiences to NASA's experiences with and role in human spaceflight, from the earliest missions to future projects. Through this show, audiences investigated early spaceflight, learned about the future of how humans will get to space, and discovered the challenges of traveling in such a hostile environment. The show explored NASA's current and future plans for launching astronauts, as well as other companies' spacecraft designs.

The fourth show, entitled ***The Outer Limits: Pluto and Beyond***, began running in October of 2014 and is still offered today. This show offers audience members a glimpse into the immense scale of the universe, beginning with distances between the planets and ending with the distance between stars and between galaxies. Along the way, guests learn about NASA missions that have travelled through the solar system, including Voyager I, Voyager II, and New Horizons. Guests also learn about gravity boosts, the definition of a planet, and about Pluto in particular, and they are shown the most up-to-date images of Pluto during a discussion of New Horizons and its current mission. Visitors learn about objects in the Kuiper Belt and beyond, as well as the Oort Cloud and different ways to define the solar system. They leave with a greater understanding of Earth's place in our universe, as well as missions that explore the far reaches of the solar system.

**Each of the four NASA Now shows has been well-received by student and adult audiences alike. Among all four shows combined, 87% of adult visitors who were surveyed indicated that they would recommend the show to a friend, and 92% indicated that they learned “A lot” or “Some” from the show.**



## Challenges and Opportunities

**The Planetarium was forced to overcome some technical challenges during the NASA Now program that occasionally interfered with the staff's ability to carry out the programs.** In 2013, a problem with the projector began to occur in which one half of the screen would randomly display a different image than the other screen. This was usually followed by a computer crash. When this happened during a show, the presenter would continue to engage the audience by asking them questions and providing additional space-related information while he or she re-started the computer. In December of 2014, the projector's color wheel broke completely and the Planetarium was forced to send the entire projector out for repair. In a creative solution that allowed them to continue offering shows in the projector's absence, the Planetarium temporarily borrowed the portable projector that the Science On Wheels program had purchased through NASA Now. Since the Science On Wheels program was not scheduled for shows while the schools were out of session for winter break, the Planetarium was able to offer almost a full schedule of shows without interruption.

In 2015, the Planetarium discovered that a defective video card was the primary cause of the computer crashes that had occurred since 2013. They replaced the defective card, and as a result, the number of computer crashes has decreased significantly.

During the process of identifying and addressing these technological issues, the Planetarium implemented multiple process improvements and trouble-shooting mechanisms that have improved performance. These included:

1. Recruiting the Science Center's IT department as a regular partner in trouble-shooting and setting up computers (the Planetarium staff had previously dealt with most computer issues);
2. Adding additional fans to the server location, since the physical location of the Planetarium does not allow the servers to be placed in an official server room;
3. Weighing options for different ways to store the servers that would increase ease of access for repairs;
4. Adding a regular computer log that keeps track of all technological glitches in real time and provides a history that can inform current problem-solving approaches; and,
5. Scheduling increased numbers of maintenance and trouble-shooting days.

## Next Steps & Moving Forward

With the technological challenges of the first few years closer to being resolved, the Planetarium has begun to explore different ways of expanding its use of the new technology.

*We can now say, “You want to know what that mission to Mars was like? Here, we’ll re-create it...” Those kinds of things are now possible.*

Among other changes, the Planetarium has re-introduced Uniview software as a way to run its shows. Uniview will allow the Science Center to introduce motion and video images into its Planetarium programs (for example, the Planetarium could simulate a Mars rover landing in

detail) and to immediately incorporate new images and information into its star shows based on audience interests. If, for example, a teacher requested that the presenter focus on craters, because their class had been learning about how craters are formed, the presenter could immediately upload and incorporate images and information about craters into the show. Currently, programs are relatively set and these changes would take a significant amount of time to incorporate. With Uniview these changes could be done in minutes. Uniview would also allow the Planetarium to change its focus from Earth-based (on the Earth looking up at the stars) to space-based (in space looking back at the Earth). The Planetarium could, for example, create a show in which audiences orbit the Earth from the International Space Station.

The Science Center is also looking into the possibility of bringing in planetary scientists with the latest information from Mars, and re-creating a Mars Rover mission for visitors. The Planetarium had discontinued use of Uniview software during the period of technological difficulties because it caused the computers to crash; but the resolution of many of these issues has allowed for its re-introduction.

In addition to the use of Uniview software, the Planetarium has also continued to innovate with ideas for its traditional star shows. Within the Sky Tonight show, the Planetarium is considering developing a Cultural Advisory Board to introduce star stories from a wide variety of non-Greco-Roman cultures. During the Science Center’s Cherry Blossom Festival, for example, the Planetarium might tell all Japanese stories about the stars. The Willard Smith Planetarium is also planning a series of Lifelong Learning opportunities for adults and seniors. Currently being developed are two classes. The first is an Introduction to Observational Astronomy and the second will focus on Astrobiology and the Search for Extraterrestrial life. Neither of these classes would be possible without the digital projection system.

This is only a small selection of the possibilities that the Science Center is currently considering, and many of these ideas would not be possible without the technology that was purchased under NASA Now.

As one staff member stated, *“What NASA Now has done, in essence, is to take the Willard Smith Planetarium into the twenty-first century. The four NASA shows were outstanding, but the possibilities for the future with this technology are even greater.”*

## Demographics & Outcomes

### Demographics for All Visitors

Over the five-year NASA Now grant, the Planetarium’s initial goal was to reach 200,000 adult and child visitors and 33,000 students and adults on field trips with the new NASA Now Planetarium shows (NASA Now Objective 1). Their anticipated outcome was that the audience would increase its understanding of and interest in NASA missions and data, relevant educational pathways and potential careers within the NASA enterprise and relevant disciplines.

Ultimately, 143,577 adult and child visitors and 27,423 students and adults in school groups participated in a NASA Now show over the five-year period (see Table 2). This is lower than the initial projections, in part due to delays in set up and receiving the equipment, and in part due to the introduction of a \$3 ticket price for the Planetarium shows. While shows had previously been free, this still-inexpensive ticket price was introduced in 2010 after estimates had already been created for NASA Now. This may have affected attendance numbers. Even with this price increase, however, the NASA Now shows were able to reach over 150,000 people during the program period alone. Equipment problems noted earlier also contributed to the lower attendance since some shows were cancelled.

**Table 2 | Number of People Reached through Willard Smith Planetarium Shows**

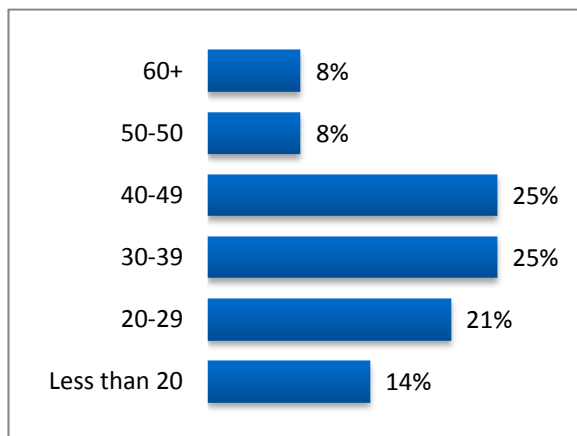
Time Frame	Child and Adult Visitors	Students	Subsidies for Students
May 2010 – April 2011	8,381	2,005	None
May 2011 - April 2012	43,445	8,270	475
May 2012 - April 2013	47,100	6,960	193
May 2013 - April 2014	27,392	6,536	323
May 2014 – April 2015	17,259	3,652	848
<b>Total Reached</b>	<b>143,577</b>	<b>27,423</b>	<b>1,839</b>

To determine whether visitors increased their understanding of and interest in NASA missions and data, the Planetarium worked with Geo to design and distribute evaluation surveys to a total of 583 adult visitors and 608 students in school groups. In addition to asking for self-reported changes in interest and knowledge, the survey also asked respondents to answer questions about NASA and astronomy that had been discussed during the program. Their collective responses are presented below. Because the difference in responses among the four shows was extremely small and not statistically significant, we have not broken down the results by show in the body of this report.

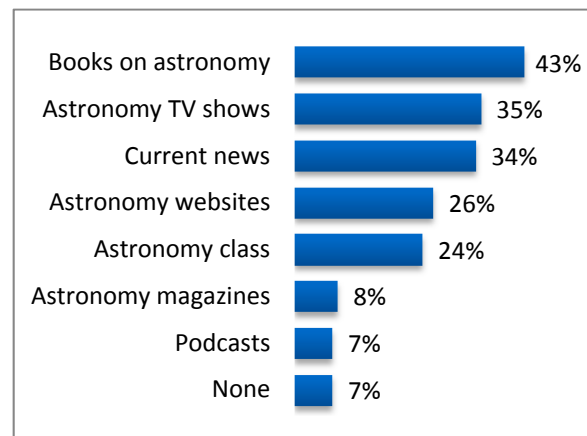
## Demographics for Adult Visitors

A total of 583 adult visitors were given and returned an evaluation survey after they viewed a Planetarium show. Both genders were approximately evenly represented, with 47% of respondents identifying as male and 53% identifying as female. Respondents ranged in age from under 20 years old to over 60 (see Figures 2), and 58% of respondents had been to a planetarium show at Willard Smith Planetarium before. They get information about astronomy from books, TV, current news, websites, and classes (see Figure 3).

**Figure 2 | Adult Respondent Ages**



**Figure 3 | Sources of Information About Astronomy Used by Respondents (Self-report)**

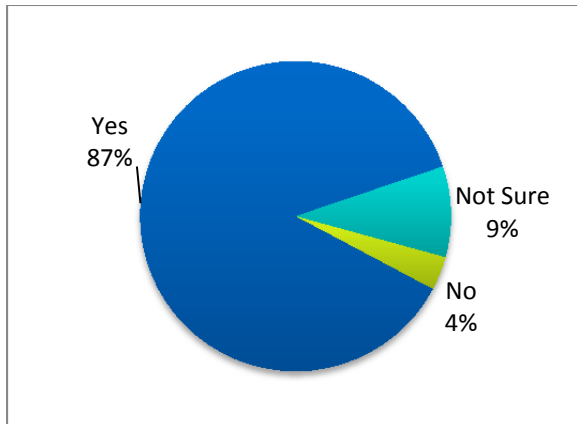


## Outcomes for Adult Visitors

### *Satisfaction with the Show*

Responses to the show were overwhelmingly positive, with **87% of respondents indicating that they would recommend the show to a friend**, another 9% indicating that they were unsure and only 4% reporting that they would not (see Figure 4).

Figure 4 | Would You Recommend this Show to a Friend?



In qualitative responses, when people were asked why they would or would not recommend the show to others, people overwhelmingly described the program as **informative, interesting, and fun**. The small percentage of respondents that made suggestions for improvement generally suggested adding more visuals – and particularly more movies and moving visuals – to the presentations. There were also a small percentage of respondents that wished for a more traditional, automated star show or a show aimed at a different age demographic – but this was limited to fewer than 5% of the comments.

### *Knowledge Retention and Learning*

After shows one and two - *Worlds of Stone* and *Gravity and Black Holes*, adult participants were asked to answer the questions: “How much do you feel you learned today?” and “How much of this information was new to you?” on a 3-point scale, with response options including “A Lot,” “Some” and “Not Much.” **92% of respondents indicated that they had learned “Some” or “A Lot,”** and **88% indicated that some or a lot of the information was new to them**. Responses were very similar for shows three and four (*Human Space Flight* and *The Outer Limits*), when an additional response option of “None at all” was added to the survey (see Table 3).

**Table 3 | Self-Reported Learning Outcomes among Adult Visitors to Willard Smith Planetarium**

	How much do you feel you learned today?		How much of this information was new to you?	
	Shows 1 & 2	Shows 3 & 4	Shows 1 & 2	Shows 3 & 4
<b>A lot</b>	47%	51%	41%	35%
<b>Some</b>	45%	42%	47%	52%
<b>Not much</b>	8%	6%	13%	11%
<b>None at all</b>	NA	1%	NA	1%

Each survey also contained at least one question that asked participants to recall specific information that was included in the show. Approximately 60-65% of respondents were able to correctly recall the answers to each question (see Table 4). Given that these questions were fill-in-the blank rather than multiple choice (which is generally considered to be easier) we consider these to be good results.

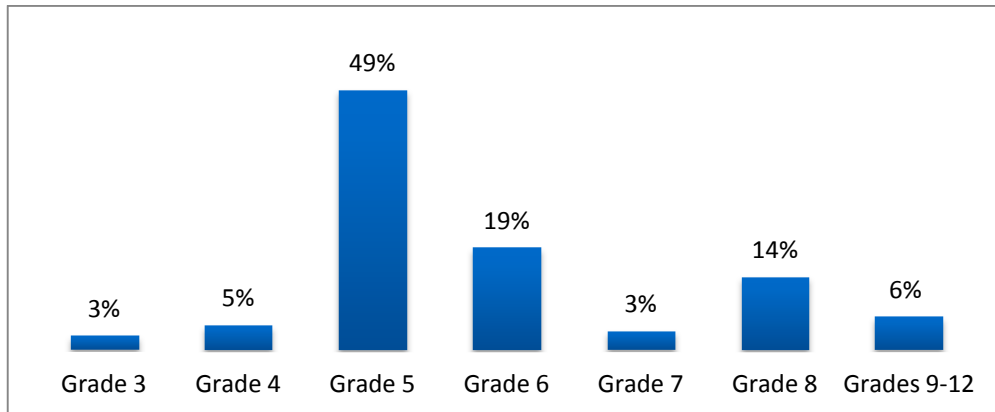
**Table 4 | Knowledge Questions for Adult Visitors to Willard Smith Planetarium Shows**

Question	% Correct
<i>Worlds of Stone</i> : Name a current NASA Mission. What is it studying?	80% correctly named at least one mission 50% named one mission <i>and</i> what it is studying
<i>Gravity and Black Holes</i> : What NASA Mission was mentioned in the show (NuSTAR)?	61% <sup>3</sup>
<i>Human Space Flight</i> : Name at least one spacecraft that can carry humans into space or has humans on it.	81%
<i>The Outer Limits</i> : Name the NASA Mission on its way to Pluto.	63% <sup>4</sup>

### Demographics for Student Visitors

A total of 608 student visitors were surveyed after they viewed a Planetarium show as part of a field trip. Both genders were approximately evenly represented, with 48% of respondents identifying as male and 52% identifying as female. They ranged in age from third to twelfth grade, with the large majority being in the fifth and sixth grades (See Figure 5).

**Figure 5 | Student Respondent Grade Levels**

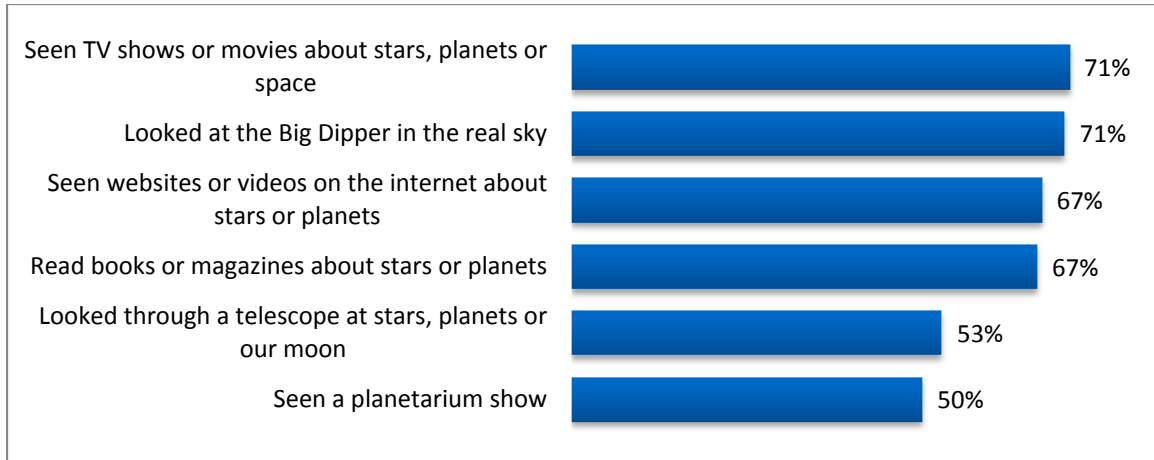


<sup>3</sup>NuSTAR and “New Star” were both accepted as correct responses, since the spelling of the mission was not emphasized in the show.

<sup>4</sup> Misspellings of New Horizons were accepted as long as they were phonetically correct, but answers that included the word “Horizons” only or that paired Horizons with the wrong word were not counted as correct.

Before the show, students were asked about their experience with several space-related activities. See Figure 6 for their responses.

**Figure 6 | Student Visitor Responses to the Question “Before this show I have...”**

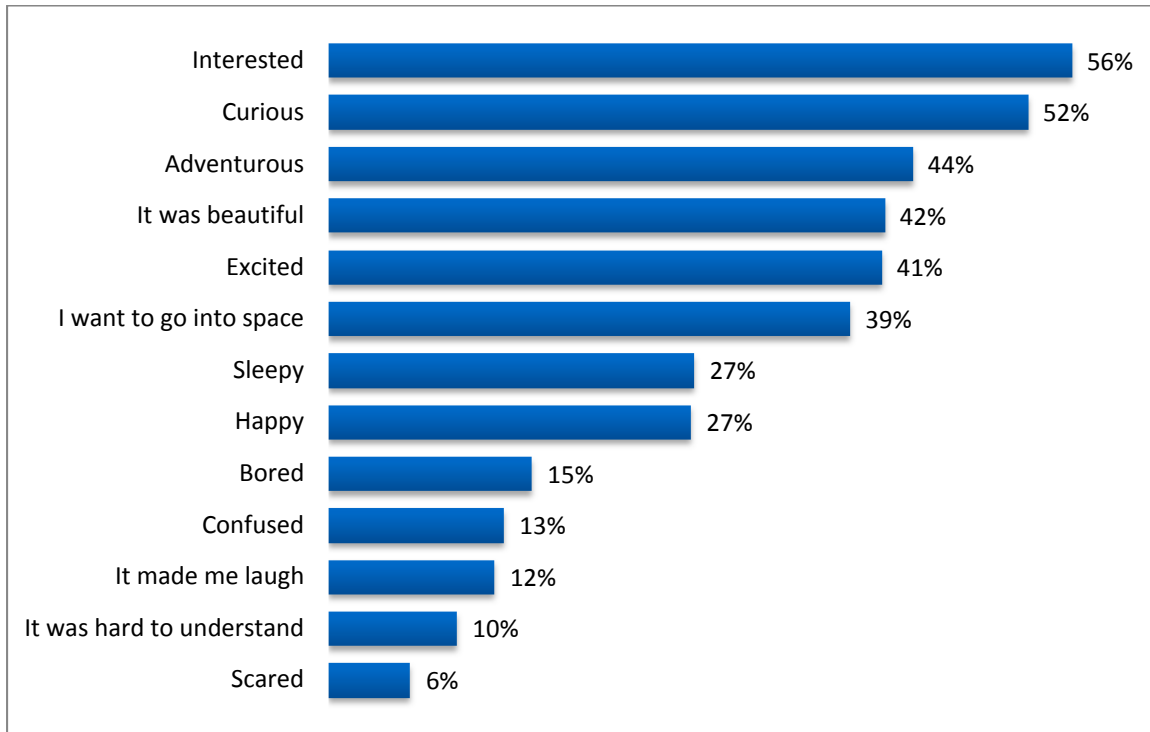


## Outcomes for Student Visitors

### *Satisfaction with the Show*

To better understand their responses to the material, students who were surveyed after shows one, three and four were asked to circle words that reflected their feelings after seeing the show. The students were encouraged to circle as many words as they wished from a list that included: excited, bored, happy, scared, adventurous, confused, curious, sleepy, interested, it made me laugh, it was hard to understand, it was beautiful, I want to go into space, and other, with an option to write in their own words. Figure 7 shows the most commonly circled words were interested (56%) and curious (52%), with adventurous (44%), it was beautiful (42%) and excited (41%) following not far behind.



**Figure 7 | Student Responses to Willard Smith Planetarium Shows**

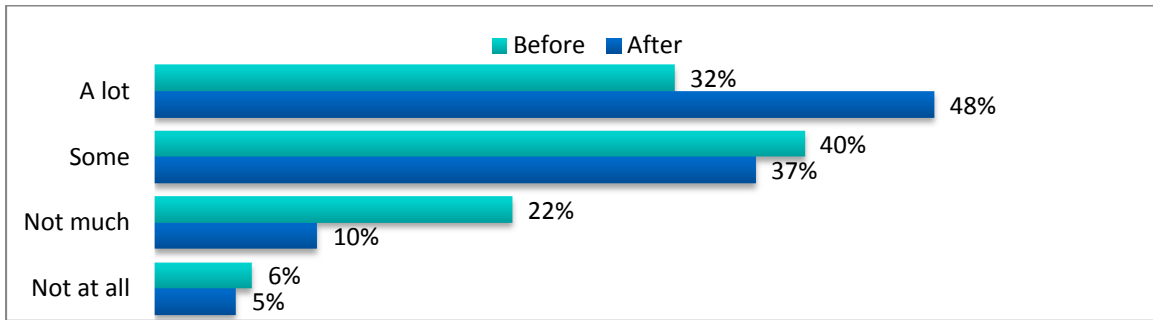
Students that were surveyed after Show Two: *Gravity and Black Holes* were instead asked the open ended question, “What did you think of the show today?” The feedback was overwhelmingly positive. Representative quotes from students include:

- “Awesome!”
- “I thought that it was interesting and makes me want to learn more about black holes.”
- “I loved it! I learned a lot! I can't wait to tell my teacher about new vocabulary words.”
- “It was cool and awesome. And I learned a lot.”

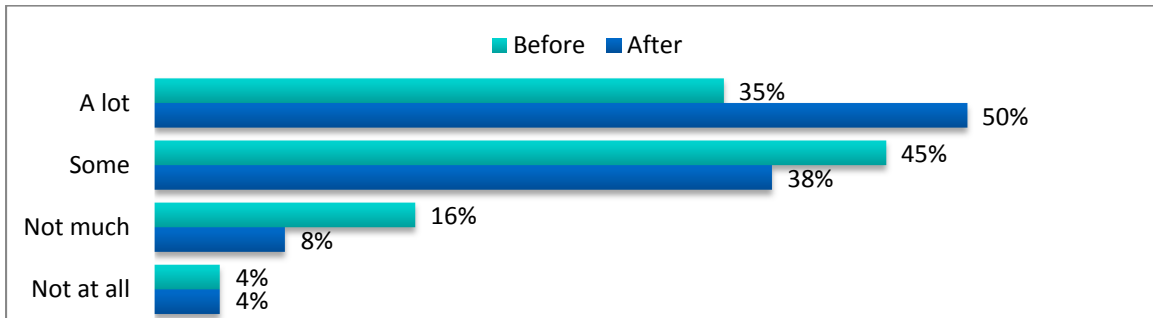
### ***Interest in Science and Astronomy***

Students were also asked about their level of interest in science and astronomy before and after seeing the planetarium show. After the show, student interest in science and astronomy increased both individually and as a group. As shown in Figure 8, the proportion of students that reported having “a lot” or “some” interest in astronomy jumped from 72% before the show to 85% after. Similarly, Figure 8 shows the proportion of students reporting “a lot” or “some” interest in science increased from 80% before the show to 88% after (see Figure 9).

**Figure 8 | How interested were you in astronomy before and after the show?**



**Figure 9 | How interested were you in science before and after the show?**



Individually, approximately one third of responding students reported an increase in their interest in science and astronomy, and approximately two thirds reported that it stayed the same. When students who indicated that they had “a lot” of interest in science and astronomy before the show were removed from analysis (because there is no way to judge an increase in their interest on this scale), 45% of students reported an increased interest in science, and 37% reported an increased interest in astronomy (see Table 5).

**Table 5 | Student Interest in Science and Astronomy Before and After Willard Smith Planetarium Show**

Change in Interest	All student respondents		All students EXCEPT those with “A lot” of interest before the show	
	Science	Astronomy	Science	Astronomy
Increase	29%	31%	45%	37%
Stay the same	64%	63%	50%	59%
Decrease	6%	4%	5%	5%

Furthermore, 83% of respondents indicated that they would like to learn more about stars and planets, and 85% of respondents indicated that they would like to see another planetarium show.

### **Knowledge Retention and Learning**

Students were not asked about self-reported knowledge gain as the adults were. Instead, to measure knowledge retention, they were asked to recall information from the program through a series of multiple choice and fill-in-the blank questions. Most did well, as shown in Table 6 below.

**Table 6 | Student Knowledge Retention after Willard Smith Planetarium Shows**

	Question	Type	Percent Correct
<b>Worlds of Stone</b>	Name a current NASA mission. What is it studying?	Fill in the Blank	45%
	There were two missions mentioned in this show. What do scientists hope to learn about through these missions?	Multiple choice	78%
	What is one job needed to get a NASA Mission to another planet?	Fill in the blank	24%
<b>Gravity</b>	What NASA mission was discussed in the show?	Fill in the blank	34%
	What do scientists hope to learn more about with the mission mentioned in the show?	Multiple choice	47%
	What is one way we can detect black holes since we cannot see them?	Fill in the blank	50%
<b>Human Space Flight</b>	How do NASA astronauts get to space now that the Space Shuttles are all in museums?	Multiple choice	30%
	Name a spacecraft mentioned in the show that can carry humans into space, or has humans on board	Fill in the blank	81%
	Name two subjects that you could study to become an astronaut, or to work in a spaceflight program	Fill in the blank	80%
<b>The Outer Limits</b>	Why is Pluto no longer considered a planet?	Multiple choice	59%
	What is the name of the spacecraft currently on its way to Pluto?	Fill in the blank	39%
	Rank these words in order of size from smallest to largest: galaxy, planet, star, universe	Fill in the blank	30%

## Summary

Despite the need to overcome initial technical and technological hurdles (including equipment breaks and a price increase for the Planetarium shows), **the Planetarium ultimately reached over 150,000 people with innovative new space shows** that highlighted Mercury, Pluto, black holes and human space flight.

**These shows were well-received by audiences of all ages**, with 87% of adult respondents indicating that they would recommend the show to a friend and students most commonly responding that the show made them feel interested (56%), curious (52%), and adventurous (44%).

**Interest in science and astronomy also increased** among those who were surveyed. The proportion of students that reported having “a lot” or “some” interest in astronomy jumped from 72% before the show to 85% after. Similarly, the proportion of students reporting “a lot” or “some” interest in science increased from 80% before the show to 88% after.

**Both self-reported and content-based knowledge appeared to increase**, with 92% of adult respondents indicating that they had learned “some” or “a lot” from the show and 88% indicating that some or a lot of the information was new to them. Approximately 60% of adult respondents answered content knowledge questions correctly (despite a more difficult, fill-in-the-blank format), and while students struggled with fill-in-the blank content questions, most were able to answer multiple choice questions correctly. **78% of those asked were able to name two NASA missions and what scientists hope to learn from each.**

Going forward, the Planetarium intends to expand its use of the new technology to reach an even greater number of people in innovative and exciting ways. Much of this is made possible by the technology purchased through NASA Now.

## SCIENCE ON WHEELS OUTREACH PROGRAM

### Background

**NASA Now’s second objective was for 60,000 students and adults to participate in a live Science On Wheels outreach program highlighting astronomy, NASA science, and NASA missions.** Its intended outcomes were that participating students and adults would increase their understanding of and interest in NASA missions and data as well as careers in relevant disciplines.

**Science On Wheels brings science education and shows directly to schools.** Each participating school receives a full day of science lessons and shows designed to spark students' and adults' interest in science and to expose them to new knowledge and ideas in the field. This is especially valuable for schools that are located outside the Seattle area and would normally be unable to send their students to the Science Center for a field trip. For these students, Science On Wheels provides their only access to the Science Center's many educational resources.

## Science On Wheels Components

Under NASA Now, Science On Wheels:

1. **Purchased two portable digital projectors** to replace the analog projectors that *Science On Wheels* had previously been using in its outreach planetarium shows.
2. **Created four new planetarium shows** highlighting NASA images and data.
3. **Updated and improved two of its astronomy-related classroom lessons** to include more up-to-date NASA content.
4. **Supported 134 schools with a subsidy** that allowed them to participate in the program.

In 2010, through NASA Now, the Science Center purchased two portable Digitalis Planetariums to replace the much older analog projectors that Science On Wheels had previously been using for its astronomy and space shows. Whereas the analog projectors had only allowed Science On Wheels to perform traditional planetarium shows in which students saw the stars and constellations rotate across the sky, the Digitalis Planetariums have allowed Science On Wheels to take students beyond this experience, integrating pictures and data from NASA missions into the programs. To take advantage of this technology, Science On Wheels educators created four ten-minute segments that highlight NASA images and data. Each of these "Current Science Segments" was adapted from one of the four shows that were developed for the in-house Science Center Planetarium. They were incorporated one of two 45-minute star shows in which students either used star maps to find constellations in the sky (through a show called "Star Search") or learned how the visible constellations change over time and space (through a show called "Worldwide Skies"). The goals of the Current Science Segments were to discuss at least one current or upcoming NASA mission in every show and to get students excited about the research.

With the new technology, Science On Wheels has also been able to take advantage of two factors:

- **Rotating content:** Presenters can now teach students about new scientific developments as they are reported. With the digital technology, NASA images from the Willard Smith

Planetarium can be uploaded and included in the Science On Wheels shows within a week. This allows facilitators to say things like “Next week, the Curiosity mission will be landing on Mars,” while using images and data to support their statements.

- **More exciting imagery:** Anecdotal data from facilitators has indicated that with a brighter star field and the ability to see real pictures of planets, galaxies and other interstellar objects, students appear more engaged and interested in the content. Student responses to each of the shows are described in detail in the Outcomes section below, but there is not enough quantitative data to compare student responses from before and after the purchase of the new technology.

Training for staff is ongoing. In the fall of 2015, Science On Wheels staff took part in a planetarium training workshop with Digitalis Education Solutions. They learned best practices for presenting frequently taught astronomy content, such as stars and constellations, planets, navigation, and moon phases. Two staff trained with a Digitalis coding specialist to learn how to script planetarium shows, which aims to make presenting the planetarium easier. These staff will take what they learned to script the most popular shows and train other educators on the system.

**In addition to the planetarium and space shows, Science On Wheels provides classroom lessons on a wide variety of science topics.** Through NASA Now, Science On Wheels updated and improved two of its astronomy-related classroom lessons to include more up-to-date content and interactive learning.

The first lesson, *Your Place in Space*, was designed for students in kindergarten through second grade. Through its ongoing evaluation, Science On Wheels had received feedback from teachers that the previous *Planets* lesson was too easy for the second graders, yet at the same time too difficult for the kindergarteners. The students had been learning about very specific characteristics of the planets, but these were characteristics that the second graders were sometimes already familiar with, while the kindergarteners did not yet fully understand what a planet is or how it fits into our solar system. Science On Wheels therefore turned that lesson into a solar system classification activity. Instead of learning specific facts about each planet, students now learn how to compare the planets and interstellar objects. First, students go over the defining characteristics of a planet, including:

1. Is it a spherical object?
2. Does it revolve around the sun or does it revolve around a planet?
3. Does it clear its orbit? (This characteristic is slightly more complicated, but it is explained to kindergarteners in a simplified way).

Students then work together to classify each of the planets as well as Pluto, the sun, a moon and an asteroid, as “A Planet” or “Not a Planet.”

The second lesson, *Plan it: Mars*, was designed for grades three through five. The previous *Plan it: Mars* lesson had been developed for the Pathfinder mission in 1997, and it was updated when the Mars Exploration Rovers launched in 2003. The lesson had not been updated to include the recent Curiosity Mission to Mars, however, and because of the way the lesson was designed, it quickly became out of date each time a new mission was launched. Educators were finding it necessary to research new missions individually in order to include them in the lesson plan. Science On Wheels therefore redesigned the *Plan it: Mars* lesson to be more up-to-date and long lasting. In the new lesson, students work together to design a Rover mission to Mars. The project is designed like a game board, and students use components from the real Rovers that exist on Mars to design their own Rover. This makes it easier to adapt the lesson to new missions (by adding additional components based on the new Rovers), and in the process, the educator discusses the history of Mars exploration and the potential future of Mars exploration with the students.

Informal feedback from both of these lessons has been very positive, although there is not enough quantitative data to make a direct comparison between the former and current versions of each lesson.

### Science On Wheels Reaches Low-Income and High-Need Schools

In addition to supporting improvements in the astronomy shows and lessons, **NASA Now was instrumental in helping the Science Center to reach lower income schools and populations through Science On Wheels.** With the subsidies offered through NASA Now, the Science Center reached out to schools that had previously been regular recipients of Science On Wheels programming but had been unable to participate in the program for several years due to financial limitations. In many of these schools, over 75% of the students that attend qualify for free or reduced-price lunch.

### Challenges and Opportunities

Fortunately, the Science On Wheels program did not experience the same difficulties with breakdowns of the technology as the Science Center’s in-house Planetarium. To the contrary, on several occasions when a breakdown occurred in the Science Center’s in-house Planetarium (and the portable projectors were not immediately in use by the Science On Wheels program), the portable projectors were used as a temporary replacement to allow shows to go on in the Science

Center’s in-house Planetarium. The new technology has required presenters to receive more training than the previous optical star ball did. To ensure that presenters are properly trained, Science On Wheels has added a slightly longer training component for presenters before their first planetarium show. Presenters practice setting up, using, and taking down the dome. They have had no problems learning to use the system.

## Next Steps & Moving Forward

In the future, Science On Wheels hopes to deepen its use of the new technology by creating coded programs that run automatically as a presenter delivers the show, freeing up the presenter to move around the planetarium and allowing the Science On Wheels curriculum experts to create transitions in the shows that would be too cumbersome to do with the manual operation method currently in use. Science On Wheels can do this with the current technology, but it will need additional paid staff time devoted to more in-depth learning of and coding in the software.

## Demographics & Outcomes

### Student Demographics

Surveys were collected from 841 students after they viewed one of the four Planetarium Shows. Both genders were approximately evenly represented, with 49% of the respondents identifying as male and 51% identifying as female. Students ranged in age from second through sixth grade (see Table 7).

**Table 7 | Respondent Demographics from Science On Wheels NASA Now Surveys**

Grade	Percent of Total Students
Second	2%
Third	17%
Fourth	43%
Fifth	29%
Sixth	9%
Total Number of Students	100%



## Student Outcomes

Over the five-year NASA Now time period, **42,274 students and adults participated in a Science On Wheels planetarium show and 17,027 students and adults were reached by the updated classroom lessons** (see Table 8).

**Table 8 | Number of Students and adults Reached Through Science On Wheels Planetarium Shows and Updated Classroom Lessons**

Time Frame	# Students and adults Reached Through Outreach Planetarium Show	# Students and adults Reached with Updated Classroom Lessons	Total
Dec 2011 - April 2012	6,244	3,414	9,658
May 2012 - April 2013	12,020	4,558	16,578
May 2013 - April 2014	10,871	5,024	15,895
May 2014 – April 2015	13,139	4,031	17,170
<b>Total</b>	<b>42,274</b>	<b>17,027</b>	<b>59,301</b>

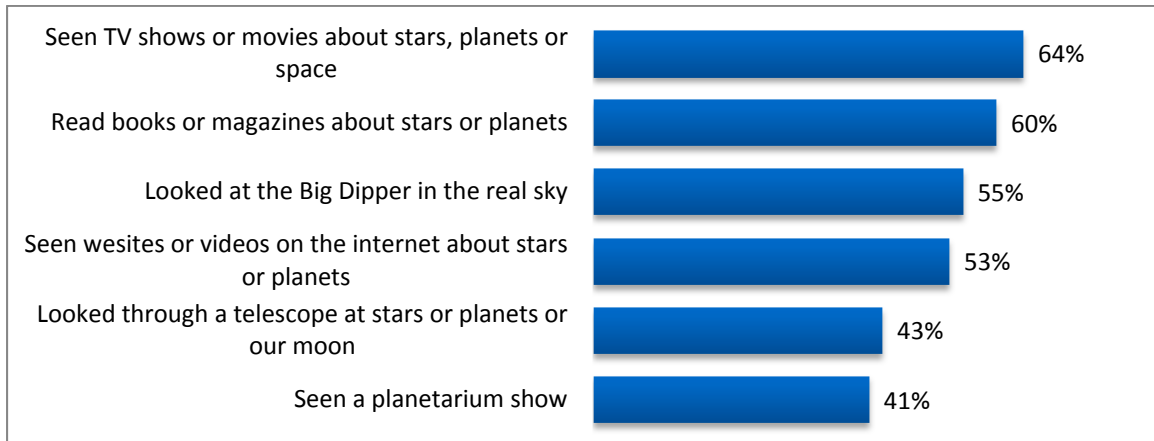
To assess the degree to which participating students increased their understanding of and interest in NASA missions and data, a total of 841 students were given and returned a post-program survey that asked them to describe their responses to the show and their interest in science and astronomy both before and after the show (see Table 9). The survey also asked students to answer questions about NASA and astronomy that were answered in the show itself, to gauge how much knowledge they retained. Their collective responses are presented below. Because the difference in responses among the four shows was extremely small and none were statistically significant, we have not broken down the responses by show in the body of this report.

**Table 9 | Number of Students by Show from Science On Wheels NASA Now Surveys**

Show	Number of Students	Percent of Total Responses
Mercury	238	28%
Gravity and Black Holes	257	31%
Human Space Flight	232	28%
The Outer Limits: Pluto and Beyond	114	13%
<b>Total Number of Students</b>	<b>841</b>	<b>100%</b>

Only 41% of the students had ever seen a planetarium show before, while 64% had seen TV shows or movies about stars, planets or space and 60% had read books about space (see Figure 10).

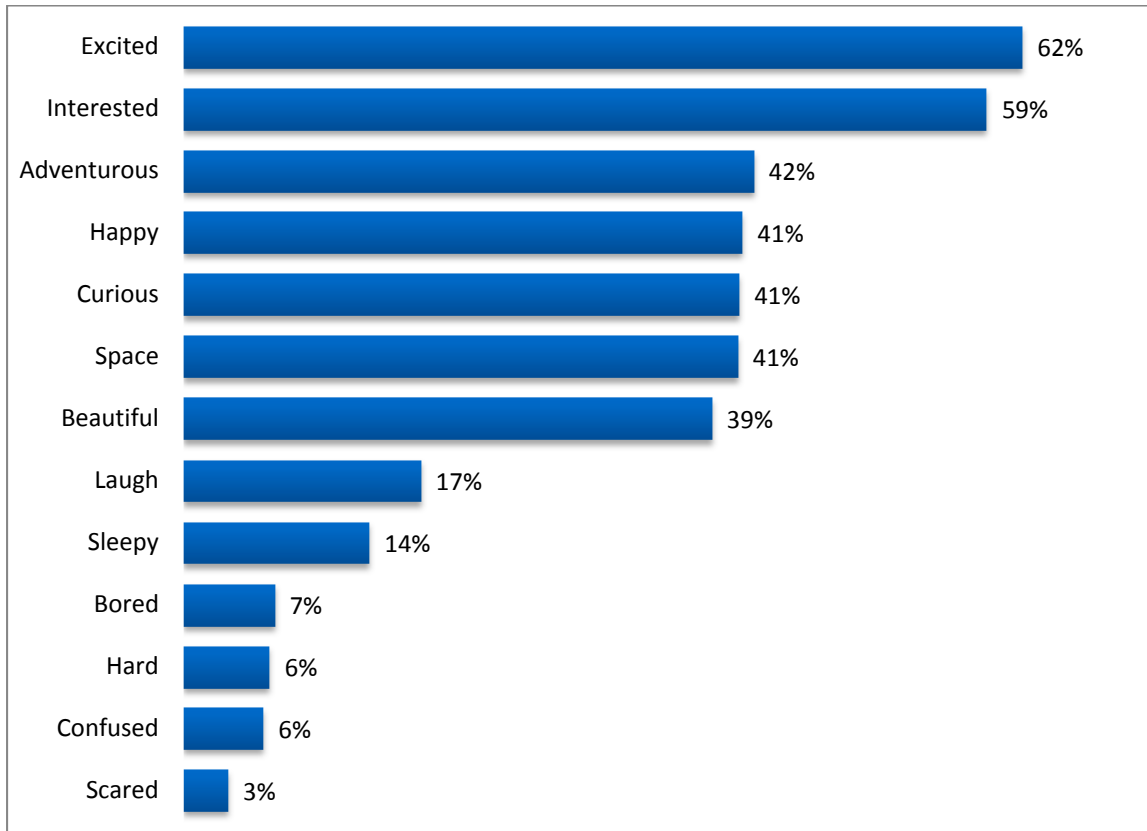
**Figure 10 | Student Responses to the Question “Before watching this show, I had...”**



### **Response to Shows**

To gauge their response to the shows, **students were asked to circle words that described how they felt after seeing the planetarium segment.** Students were allowed to circle as many or as few words as they wished from a list that included: excited, bored, happy, scared, adventurous, confused, curious, sleepy, interested, it made me laugh, it was hard to understand, it was beautiful, I want to go to space, and other (where students were encouraged to write in their own words in response). As shown in Figure 11, the most commonly circled words were excited (62%) and interested (59%).

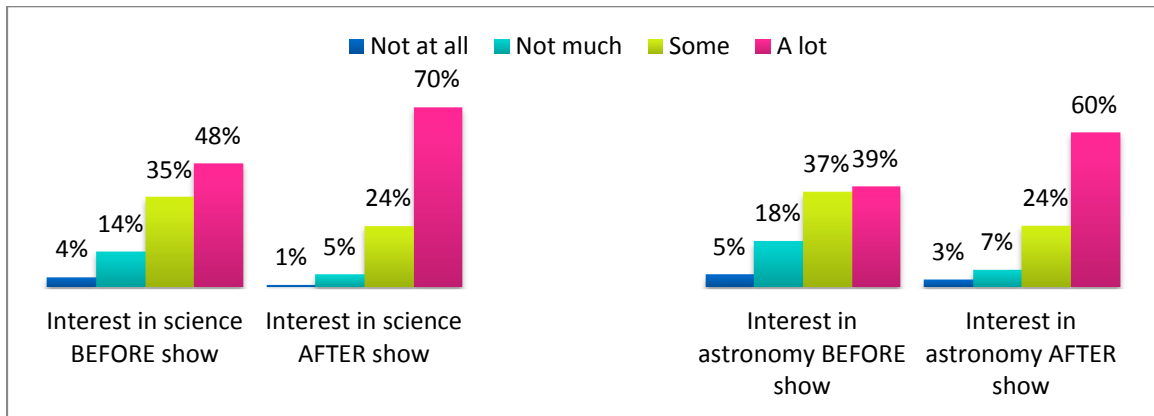
**Figure 11 | Student Responses to Science On Wheels Planetarium Shows**



***Student Interest in Science and Astronomy***

Students were also asked about their level of interest in science and astronomy both before and after seeing the planetarium show. The proportion of students that reported having “a lot” or “some” interest in astronomy jumped from 77% before the show to 90% after. Similarly, the proportion of students reporting “a lot” or “some” interest in science increased from 83% before the show to 94% after. **When the students that reported having “a lot” of interest in science or astronomy before the show are removed from analysis (because an increase in their interest level is impossible to measure on this scale), 65% of students reported an increased interest in science and 68% reported an increased interest in astronomy (see Figure 12).**

**Figure 12 | Student Interest in Astronomy and Science Before and After Science On Wheels Planetarium Show**



A large majority of the students also indicated that they were interested in learning more about the stars and planets after having seen the show (88%); would be interested in going to another planetarium (94%); and would look for the constellations they saw during the show in the real sky (84%). This indicates a high level of interest in stars, space and astronomy.

### Learning and Knowledge Retention

To assess the amount students learned, students were asked several multiple-choice and fill-in-the-blank questions that had been answered through the content of the show. While students struggled with questions that required them to fill in the blank, they did well on multiple-choice questions. Overall, student learning and knowledge retention was high (see Table 10).

**Table 10 | Student Responses to Knowledge Retention Questions after Science On Wheels Show**

Show	The North Star is important because . . . (it is always in the north)	Our Sun appears to be the brightest star in the sky because . . . (it is the closest star)
Mercury	77%	53%
Gravity and Black Holes	77%	66%
Human Space Flight	76%	66%
The Outer Limits: Pluto and Beyond	67%	73%
<b>Total</b>	<b>76%</b>	<b>63%</b>

After Show Three: *Human Space Flight* and Show Four: *The Outer Limits*, Science On Wheels added additional questions that were specific to the NASA content taught in the program (see Table 11).

**Table 11 | Student Responses to Knowledge Retention Questions after Science On Wheels Show**

Show	Question	Percent Correct
Human Space Flight	Name one place in space that NASA may send astronauts in the future (Write-in question. Accepted answers were Earth’s orbit, the moon, and Mars)	69%
The Outer Limits: Pluto and Beyond	What is the name of the spacecraft that is currently on its way to Pluto? (Write-in: New Horizons) <sup>5</sup>	20%
	After the spacecraft reaches Pluto it will . . . (Multiple Choice: Continue flying past Pluto)	59%

### Teacher Comments on Science On Wheels

Teacher feedback surveys distributed by SOW staff and completed by 234 teachers from 2012 to 2015 show positive results. Almost all (97%) said the material was sufficiently challenging for their students. Most (88%) thought the programming was “completely unique.” Nearly all teachers (99%) agreed that SOW met its goal of providing “a program that offers substantial learning opportunities that is also fun and engaging for students.” Most teachers (61%) feel the program complements what they do in the classroom and 54% feel it provides materials that are too difficult or expensive to acquire.

Comments by teachers in classrooms visited by SOW planetarium show presenters were overwhelmingly positive. Here is a sampling.

- Bringing a planetarium to class to simulate the night sky is much more effective than showing videos or pictures in class to teach astronomy. I couldn't deliver a more effective lesson than the Science On Wheels program has done.

<sup>5</sup> For this question, we accepted the answer New Horizon(s), Because the respondents were as young as second grade, we also accepted misspelled versions of the answer if they were clearly meant to indicate the correct answer. 14% of students provided correctly spelled answers, with another 6% providing correct but misspelled answers.

- Many children in our area have little or no opportunity to ever visit a hands-on science museum. They were thrilled with the freedom to explore science in the exhibit area. Also, the portable planetarium offers a very unique approach to realistic science observations.
- The graphics of the constellations and time lapse elements of the presentation were excellent for showing kids the night sky. Having kids show their excitement by rubbing their hands instead of using their voice was also a great management tool.
- [The SOW staff member] was engaging with the students, She seemed excited about the information without being too silly. She let the students have input as to the direction of the lesson, but also covered all the material in the appropriate time.
- Our school and our kids are located so far from educationally rich venues such as Pacific Science Center that having a Science On Wheels program come to us is invaluable.
- I feel like [the SOW staff member] is an educator first, who understands the diversity of students, and treats them with respect and they were fully engaged and learning. The content is important, but management is crucial and she "gets it". Sometimes guest teachers get frustrated with behaviors, but she had techniques that prevented those behaviors.
- I haven't seen a similar program that deals with space. There have been others that look at other science topics, but not one that goes as in depth as this program.
- I cannot begin to share my feelings on this program. The effect this program had on our students was astronomical and I am positive they will remember this day forever. I only wish we could have you visit more than once a year to continue encouraging a love of science and all of its possibilities.
- Many of our students will never get to have this experience as children. This allows them a look at all the possibilities out there for them.
- The Science lesson today provides different learning material, but it supports my teaching in that science is important and at is a wonderful way to explore things. LOVE Science On Wheels!
- My students are eager to get books about space to continue learning!
- This program is a wonderful way to provide the students with some very hands on science that I do not get a lot of time or materials for.
- We love the whole thing and hope we will be able to be a part of it again in the future!
- This was awesome! That is also a direct quote from a kindergartner!

## Summary

As shown in Table 12, while the total number of students reached through Science On Wheels outreach planetarium shows was under the NASA Now objective of 60,000 students and adults, the shows were extremely well received by both teachers and students and appear to have fully met their intended outcomes of increasing student interest in and knowledge of astronomy and NASA. Furthermore, the subsidies provided through NASA Now allowed Science On Wheels to reach out to students in schools that otherwise would have little or no access to resources such as this, and often do not have the time and resources to focus on science education.

**Table 12 | Outcome Summary for Science On Wheels Planetarium Shows**

Objectives and Outcomes
<p><b>Objective 2: 60,000 students and adults will participate in a live show during a <i>Science On Wheels</i> outreach program that highlights astronomy, NASA science and missions.</b></p> <ul style="list-style-type: none"> <li>• 42,274 students and adults participated in a <i>Science On Wheels</i> planetarium show</li> <li>• 17,027 students and adults were reached by updated classroom lessons</li> </ul>
<p><b>Outcome 2a: Participating students will increase their interest in NASA missions and data, as well as careers in relevant disciplines.</b></p> <p>After the show...</p> <ul style="list-style-type: none"> <li>• 88% of students were interested in learning more about the stars and planets</li> <li>• 94% wanted to go to another planetarium</li> <li>• 84% said they would look for the constellations they saw during the show in the real sky</li> </ul> <p>The proportion of students with “a lot” or “some” interest in astronomy jumped from 77% before the show to 90% after.</p>
<p><b>Outcome 2b: Participating students will increase their understanding of NASA missions and data, as well as careers in relevant disciplines</b></p> <ul style="list-style-type: none"> <li>• 63% of students correctly identified why our sun appears to be the brightest star in the solar system.</li> <li>• 76% of students correctly identified the significance of the North Star</li> <li>• 69% of students that watched <i>Human Space Flight</i> correctly named at least one place that NASA may send astronauts in the future (Earth’s Orbit, the Moon, or Mars)</li> <li>• 20% of students that watched <i>The Outer Limits</i> could name the spacecraft that is on its way to Pluto (New Horizons)</li> <li>• 59% of students that watched <i>The Outer Limits</i> correctly identified what New Horizons will do after it reaches Pluto (It will continue flying past Pluto)</li> </ul>

## DISCOVERY CORPS AND THE TRACK FOR EARTH AND SPACE SCIENCE ACHIEVEMENT (TESSA)

### Background

The Discovery Corps Program, which began in 2005, allows youth to serve as science interpreters for visitors, help staff with special projects, and grow their knowledge base and interest in science. Teens may choose to participate in the Track for Earth and Space Science Achievement (TESSA), funded through NASA Now, which expands upon this program to provide a specific emphasis on astronomy and earth and space science. It also provides a subsidy to make the program a paid work experience for youth, allowing lower income and a wider range of youth to participate over an extended period of time.

Students apply to TESSA before or during their first year of high school and they continue in the program throughout their high school careers. Once accepted, youth work as paid (and sometimes volunteer) science interpreters, teaching visitors science at exhibits and in portable carts, helping staff with special projects, assisting with animal care, participating in research, teaching hands-on science lessons to children in summer programs, interacting with visiting scientists and special guests, and helping to develop exhibits. Many of the above responsibilities are accomplished by applying, interviewing, and being selected for a wide variety of internships in Earth and Space Science and other fields.

The Science Center's ultimate goal for TESSA is to create a collaborative environment to teach students about science, astronomy, life skills, and professional conduct and to serve as a career pathway for youth that are underserved in the STEM disciplines. This section examines TESSA's success in achieving these goals.

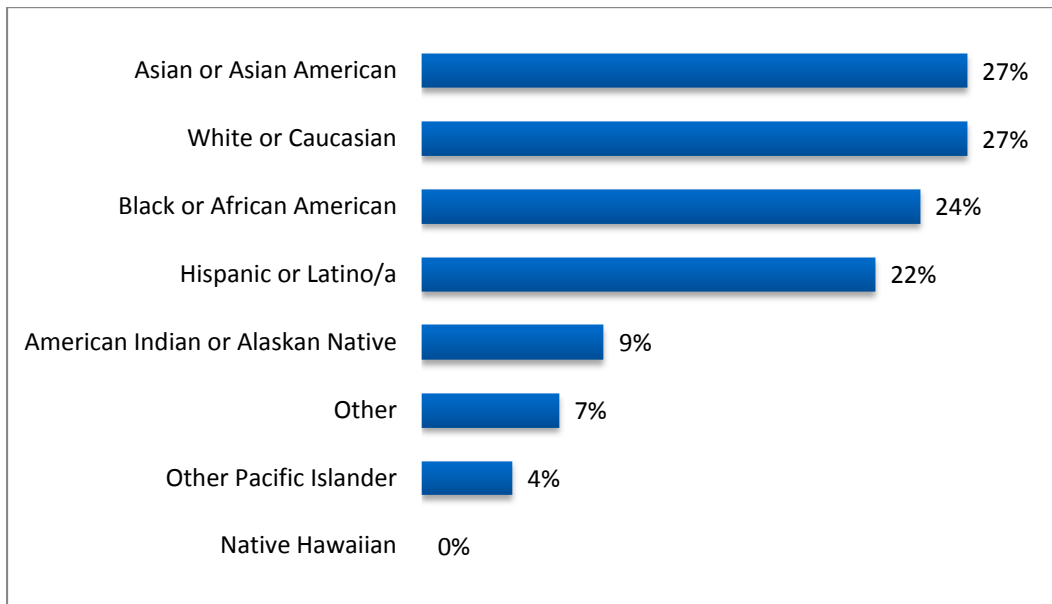
### Demographics

From its first cohort in 2011 through June of 2015, TESSA has served 45 student participants. A large majority of these students come from backgrounds that are underrepresented in the STEM fields. **Female participants outnumber males**, with females making up 64% of the participants and males comprising 36%.



**Most of the program participants are students of color**, and many identify as more than one race or ethnicity. Of the 45 participants, 73% self-identify as being in at least one minority race or ethnicity and not White/Caucasian, while 27% identify only as White/Caucasian. Figure 13 shows the distribution of self-identified racial and ethnic groups among students. Since many students identify with more than one racial or ethnic background, the numbers do not add up to 100%. For comparison, note that the 2010 U.S. Census found that 69.5% of people in Seattle identify as White only; 13.8% as Asian; 7.9% as Black or African American; 6.6% as Hispanic or Latino ethnicity (of any race); 0.8% as American Indian or Alaska Native; and 0.4% as Native Hawaiian or other Pacific Islander<sup>6</sup>. Thus the **Discovery Corps members have proportionally more racial and ethnic minorities than the general population.**

**Figure 13 | Ethnicity of Discovery Corps Members**

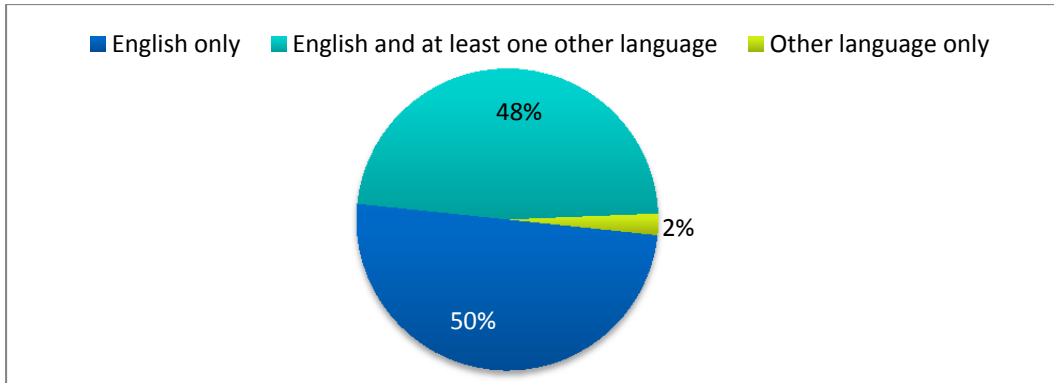


**Half of participants speak a language other than English at home** (see Figure 14, n=44). This may indicate that many participants come from families of recent immigrants or families with strong ties

<sup>6</sup> Source: <http://www.seattle.gov/dpd/cityplanning/populationdemographics/aboutseattle/raceethnicity/default.htm>. Note that the Census reporting categories differ from those reported for Discovery Corps members, especially in how they report multi-racial and multi-ethnic data.

to cultures whose primary language is not English. For comparison, note that in Seattle Public Schools, 22.9 percent of all students have non-English speaking backgrounds<sup>7</sup>.

**Figure 14 | Languages Spoken at Home**



**One third of all student participants come from low-income families** (defined as those that self-identified as qualifying for free or reduced-price school lunches) (see Figure 15). Among those in the program in June 2015, at least 47% are low income. For comparison, note that in Seattle Public Schools, 40.1% of students are eligible for free or reduced price lunch<sup>8</sup>.

**Figure 15 | Income Level Based on Qualification for Free and Reduced-Priced Lunch (n=45)**

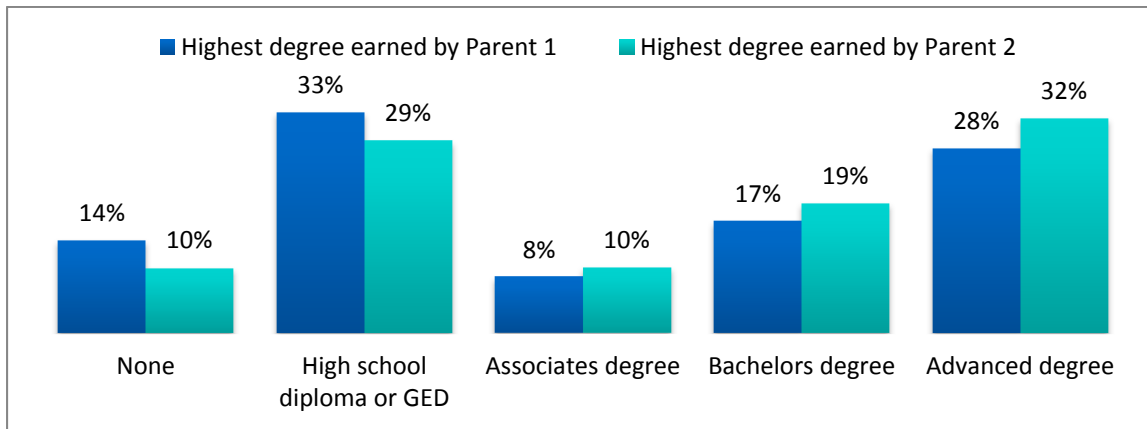


<sup>7</sup> <http://www.seattleschools.org/cms/One.aspx?portalId=627&pageId=15255>

<sup>8</sup> <http://www.seattleschools.org/cms/One.aspx?portalId=627&pageId=15255>

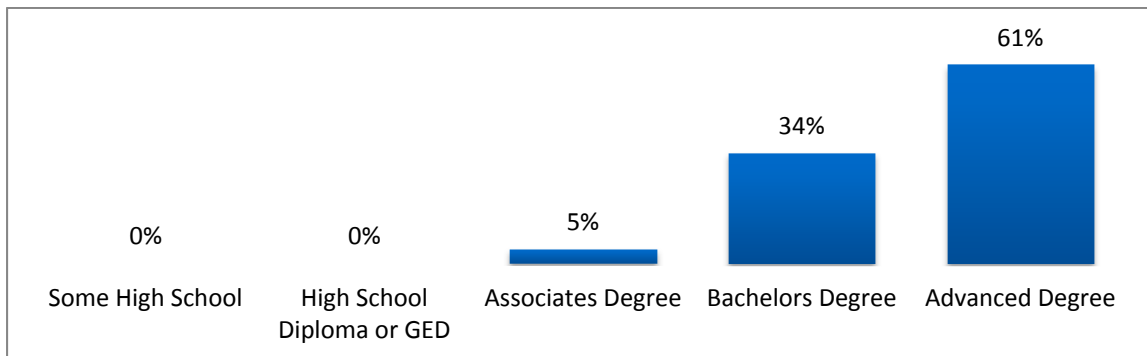
Figure 16 displays the educational background of parents for about 70-80% of the student participants. Many of the students did not know their parents' educational background. Given that the educational background of many of the students' parents is not reflected, this chart provides a limited view. It is likely that the data over-represent the percentage of higher-credentialed parents. **Among those for whom we have data, at least half have a parent who has completed either a bachelor's or advanced degree. A large majority of parents have at least a high school diploma or GED.**

Figure 16 | Education Level of Parents



At entry into the Program, the vast majority of TESSA participants reported that they planned to continue their education beyond high school (see Figure 17). **Over 95% indicated that they would like to complete at least a Bachelor's degree, and 61% hoped to earn a graduate degree.**

Figure 17 | Student Educational Goals Upon Entry to the Program (n=44)



TESSA has an 84% retention rate, with only seven participants (16%) leaving the program before high school graduation. Among these seven, three resigned within the first 100 work hours; three left during 10<sup>th</sup> or 11<sup>th</sup> grade; and one left just a few months prior to graduation. Of those who left early, six did so for personal reasons and one was asked to resign.

## Outcomes

### Gains in knowledge

#### *Astronomy Knowledge*

One of TESSA's primary objectives is to increase student knowledge of astronomy over their four years in the program.

In order to gauge the acquisition of knowledge by TESSA youth, the staff constructed a very difficult astronomy test based on a college Astronomy 101 curriculum. The test, in essence, measures how much the youth learn benchmarked to a college freshman in such a course. The test is given three times: during the first week of work (fall of freshman year); midway through the program (spring of sophomore year); and near senior graduation time (spring of year four). The test has 45 questions that require short answers; multiple choice; drawing astronomical concepts and phenomena; scientific reasoning; and interpreting star maps, charts, and graphs. Each question is graded for depth of knowledge on scales of 0-2, 0-3, or 0-4 depending on the complexity of the question and the depth and range of knowledge required to answer it thoroughly. The test is provided in Appendix B. Staff worked together to grade and review the first tests to improve consistency and reliability in scoring.

**The astronomy tests show significant gains in knowledge by students in the program** (see Table 13). A target score of 90 (2pt. avg. per question) was used as a benchmark for interpretation. This would correspond to an A- in a college course. Higher scores are possible (since some questions can be scored to 3 or 4) and many students scored higher in tests two and three.

The average score on the first test (taken by all four cohorts) was 48.5. The overall scores rose to 74.4 on Test Two and to 81.2 on Test Three. **The students' collective average score rose 53% between Tests One and Two and 67% between Test One and Test Three. As a group, the 19 students who took all three tests achieved 90% of the target.** Only 7% of the students achieved the target on the first test, but a third did so by the second; and 32% by the third. This minor drop may be explained both by "senioritis" and a reduction in the time allotted for taking the test, potentially

reducing the depth of answers and the points allotted. There was a large increase in the number of questions for which the average score was at least two. Only two questions reached this level in Test One; 13 by Test Two; and 23 by Test Three. These results show that **the collective activities are leading to significant gains in knowledge of astronomy among TESSA participants.**

**Table 13 | Astronomy Test Results Over Time**

Test	N	Avg. Score	Target Score	% of Target Reached by All Taking Test	# Reaching Target	% Reaching Target	# of Questions (out of 45) with Avg. Score of 2+
1	43	48.5	90	54%	3	7%	2
2	30	74.4	90	83%	10	33%	13
3	19	81.2	90	90%	6	32%	23

The questions that persistently had lower scores were those using a star almanac, star map, graphs, or other visual aids. This suggests that students may need more practice in the interpretation of visual data in graphics, illustration, charts, and tables.

***Astronomy Cart Knowledge***



Another place where one can see gains in knowledge is in the training and use of one of the Discovery Carts presented by some of the TESSA youth. Pacific Science Center has several of these used by adult and youth staff to explain specific types of science to visitors as they wander between exhibits. One of these is the Strange Planets Discovery Cart. It is used to engage visitors in the discussion of varied concepts such as matter, mass,

gravity, how solar systems form, the composition of various kinds of planets, ways of measuring astronomical phenomena, and planetary characteristics necessary for life in our solar system and in others. Students who want to present this cart first take a test with 44 questions on the topics they will need to explain. Then, after learning and practicing their presentations, they take the same test

again. The results of these tests for the 10 students who presented the cart are presented in Table 14.

**Table 14 | Change in Knowledge on Strange Planet Cart**

Test	N	Range of Scores	Avg. Score	Avg. Score as a % of Maximum Score
Pre-test	10	15.5-55	34.5	36%
Post-test	10	50-82	70.5	73%

The table shows that **students learn a great deal though the process of explaining material with the Strange Planet Cart**. On the pre-test (with a possible score of 96), students scored an average of 34.5 (36% of the maximum score). On the post-test, the average was 70.5 (73% of the maximum score). **The students’ average score rose 104%**.

### Interest in Science, Math and Technology

The figures below show participants’ interests in STEM areas at the beginning, middle and end of participation. Over 90% of entering students report that they enjoy learning about science and using technology and these numbers remain high throughout the program. Student interest in learning math is slightly lower, starting at 81% in the first year of high school and ending at 69% when students are seniors. This could be due to their exposure to more complex math courses as they progress through high school. Because student interest in STEM subjects is generally high throughout the program, and due to a smaller sample size in the second and third assessments, statistically significant changes were difficult to detect – but the general trends show high interest in both science and technology throughout the program (see Table 15).

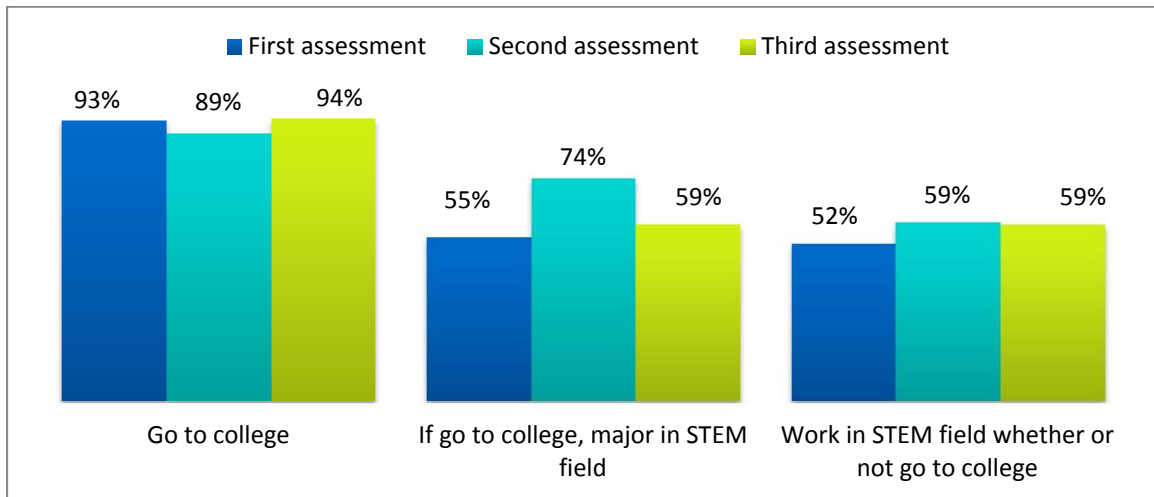
Table 15 | Interest in STEM Over Three Assessments

	Assessment	Strongly Disagree (1)	Disagree (2)	Neither Agree or Disagree (3)	Agree (4)	Strongly Agree (5)	Mean (scale 1-5)
I enjoy learning about science	1 <sup>st</sup>	-	-	2%	39%	59%	4.6
	2 <sup>nd</sup>	-	-	4%	44%	53%	4.5
	3 <sup>rd</sup>	-	-	6%	25%	69%	4.6
I enjoy learning about or working on math	1 <sup>st</sup>	-	7%	11%	46%	36%	4.1
	2 <sup>nd</sup>	4%	-	30%	47%	19%	3.8
	3 <sup>rd</sup>	6%	6%	19%	38%	31%	3.8
I enjoy learning about technology	1 <sup>st</sup>	-	-	14%	41%	45%	4.3
	2 <sup>nd</sup>	-	-	19%	37%	44%	4.3
	3 <sup>rd</sup>	-	6%	-	31%	63%	4.5
I enjoy using science	1 <sup>st</sup>	-	-	7%	32%	61%	4.6
	2 <sup>nd</sup>	-	-	26%	26%	48%	4.2
	3 <sup>rd</sup>	-	-	6%	25%	69%	4.6
I enjoy using math	1 <sup>st</sup>	2%	5%	16%	48%	29%	4.0
	2 <sup>nd</sup>	4%	-	26%	37%	33%	4.0
	3 <sup>rd</sup>	6%	6%	6%	38%	44%	4.1
I enjoy using technology	1 <sup>st</sup>	-	-	7%	29%	64%	4.6
	2 <sup>nd</sup>	-	-	-	37%	63%	4.6
	3 <sup>rd</sup>	-	7%	-	-	93%	4.8

### Future College and Career Plans

**Students began and remained college-bound with many having interest in STEM majors and careers.** In the pre-program assessment, the vast majority of students reported that they were “Very likely” to go to college (93%) and this remained high throughout the program. Furthermore, over half of entering students (55%) planned to major in a STEM field. This number increased to 74% in years two and three but then returned to 59% by the end of high school. Student intentions to work in a STEM field also increased slightly over the four years, from 52% to 59%. However, these changes were not statistically significant (see Figure 18).

**Figure 18 | Percentage of Students Who are “Very likely” to Study or Work in a STEM Field<sup>9</sup>**



<sup>9</sup> Assessment #1: n=44; Assessment #2: n=27; Assessment #3: n=17



Table 16 shows the full breakdown of student ratings over three assessments.

**Table 16 | Future College and Career Plans Over Three Assessments<sup>10</sup>**

	Assessment	Very Unlikely (1)	Unlikely (2)	Maybe (3)	Some-what Likely (4)	Very Likely (5)	Mean (scale 1-5)
<b>How likely are you to go to college?</b>	1 <sup>st</sup>	-	-	-	7%	93%	4.9
	2 <sup>nd</sup>	-	-	-	11%	89%	4.3
	3 <sup>rd</sup>	-	-	-	6	94%	4.3
<b>If you go to college, how likely are you to major in a field related to science, math, or technology (including applied science fields)?</b>	1st	-	2%	18%	25%	55%	4.9
	2 <sup>nd</sup>	4%		7%	15%	74%	4.56
	3 <sup>rd</sup>	6%	6%	12%	17%	59%	4.44
<b>Whether or not you plan to go to college, how likely are you to work in a field that uses science, math or technology?</b>	1 <sup>st</sup>	-	5%	18%	25%	52%	4.94
	2 <sup>nd</sup>	-	-	15%	26%	59%	4.18
	3 <sup>rd</sup>	-	6%	12%	23%	59%	4.35

### Staff assessments of TESSA members Professional Skills and Demeanor

As part of the ongoing evaluation process, the staff uses three different assessment tools to rate youth on their progress. An Application Checklist and Interview Checklist are used to evaluate how professional applicants appear on written forms and face-to-face interviews, using a 7-point scale from “not at all professional” (1) to “very professional” (7). These checklists are used when youth first apply to become TESSA members and again when they apply for a new position. Some youth

<sup>10</sup> Assessment #1:n=44; Assessment #2:n=27; Assessment #3:n=17

have made several applications but relatively few have more than three. For this reason, the application assessment analysis is limited to the first three applications assessed.

The Participant and Staff Observation Tool is used by staff to rate and record how well they observe Discovery Corps members doing their jobs. It helps them track students' progress with respect to 34 elements broken down into four areas:

- General work skills
- Customer service and social/public communication skills
- Operations
- Learning facilitator skills and behaviors.

The tool is used relative to the position and work of each student. These criteria vary (even for the same students at different times). Thus, it is not possible to compare changes over time; and these data are not included in this evaluation. The tool is still a useful one for internal assessment.

### ***Application Checklist***

The Application Checklist is comprised of 11 items that staff members use to rate the written applications of students applying to the TESSA, which counts as the first assessment. Students' applications are again rated when they apply to various positions within the program, serving as subsequent assessments.

**The average overall rating of students' applications consistently increases over the course of three assessments.** Figure 19 illustrates the gradual shift from lower ratings in the first assessment, to progressively higher ratings for the majority of students in the second and third assessments. **By the third assessment, all of the students scored from "generally professional" (5) to "very professional" (7).** This is quite an improvement in overall rating from the applications submitted before participation in the program, showing that **students are demonstrating progressively more professional skills in completing applications for employment.**

Figure 19 | Students’ Overall Application Ratings Over Three Assessments<sup>11</sup>

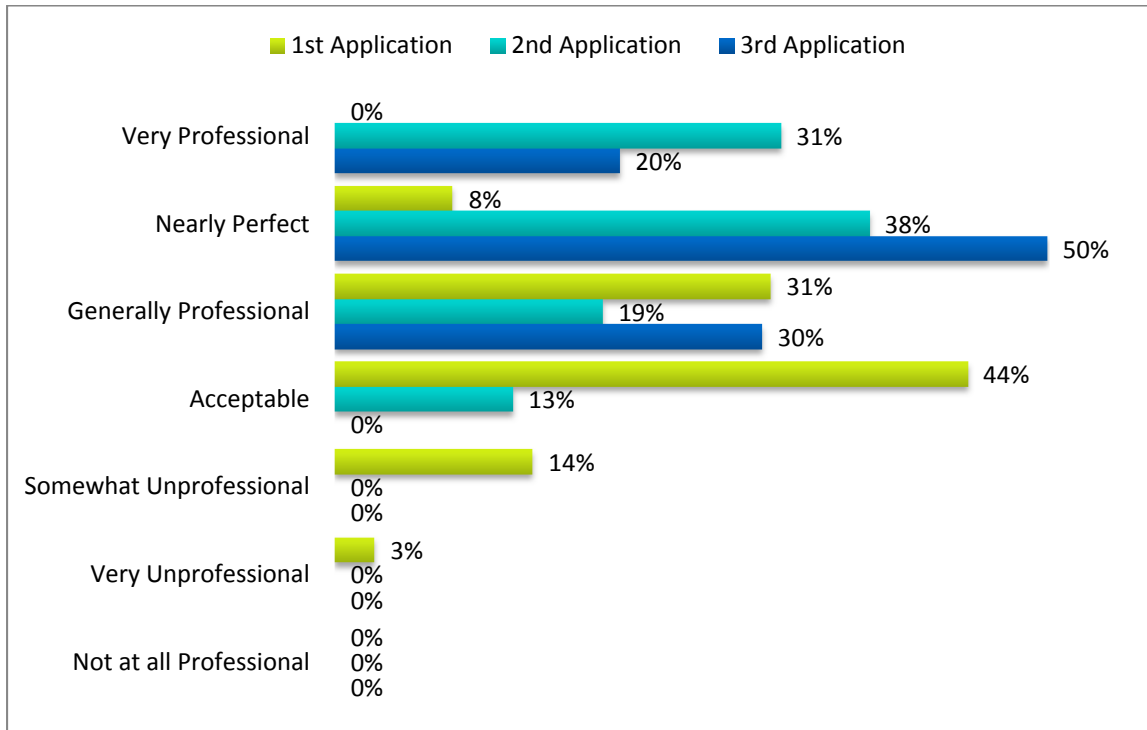


Table s A-4 and A-5 in Appendix A lists the categories in which students score the lowest and highest upon entering the program, as well as on the third assessment, which is usually conducted in the third year of participation in the program.

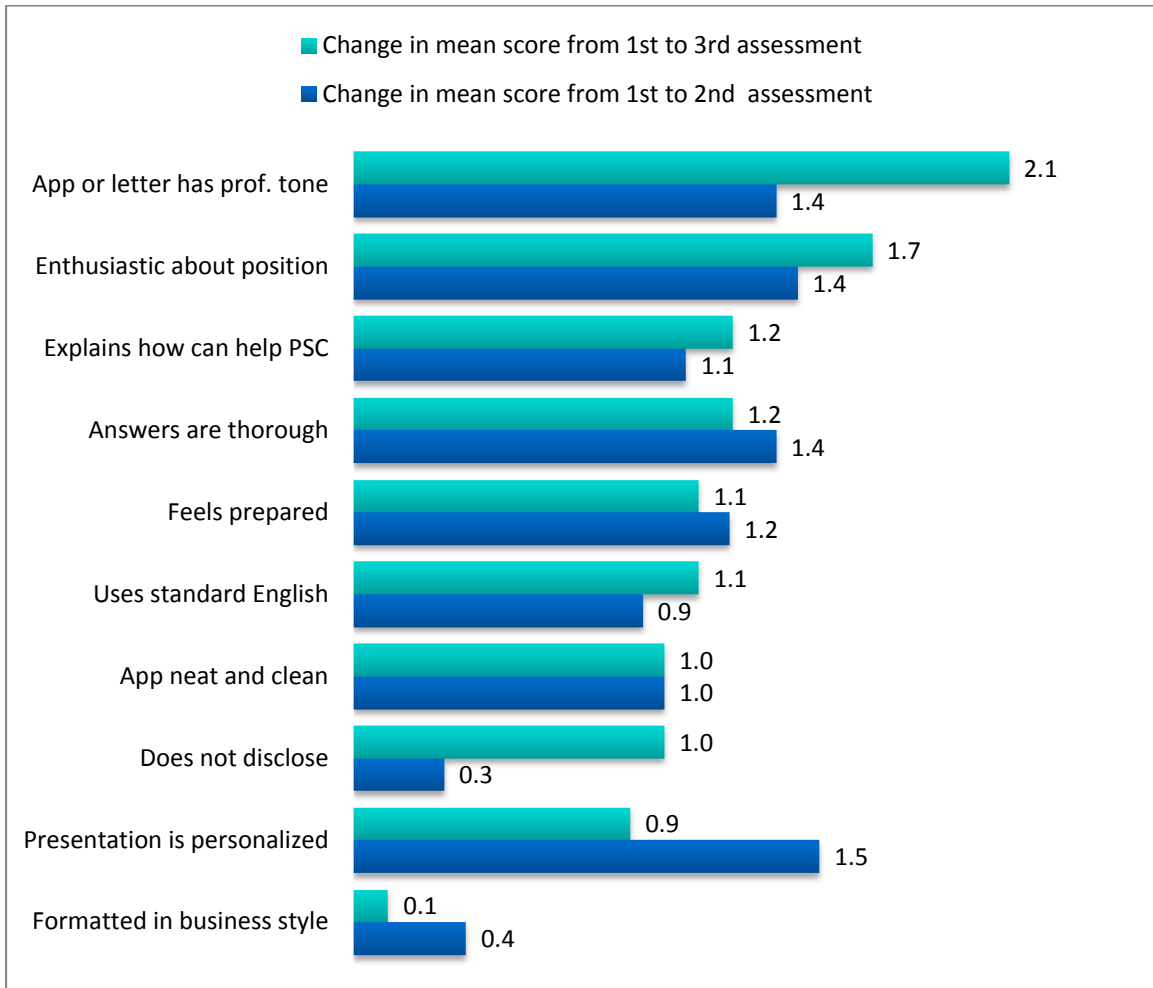
While average and overall student scores improve in all areas in the second and third applications, performance in “answering questions thoroughly” remained among the lowest (though it too improved). The category, “application formatting” showed the least amount of improvement.

**The most improved category, “application or letter has a professional tone,”** had an average score of 4.8 on the first application (on a 1-7 scale). It improved to 6.2 by the third application.

11 Application #1: n=36; Application #2: n=16; Application #3: n=10

Three of the other categories in which students showed substantial improvement were “application was enthused”, “explains how he/she can help”, and “answers questions thoroughly without writing too much” (see Figure 20).

**Figure 20 | Change in Mean Application Score from 1st to 2nd Assessment and 1st to 3rd Assessment**<sup>12</sup>



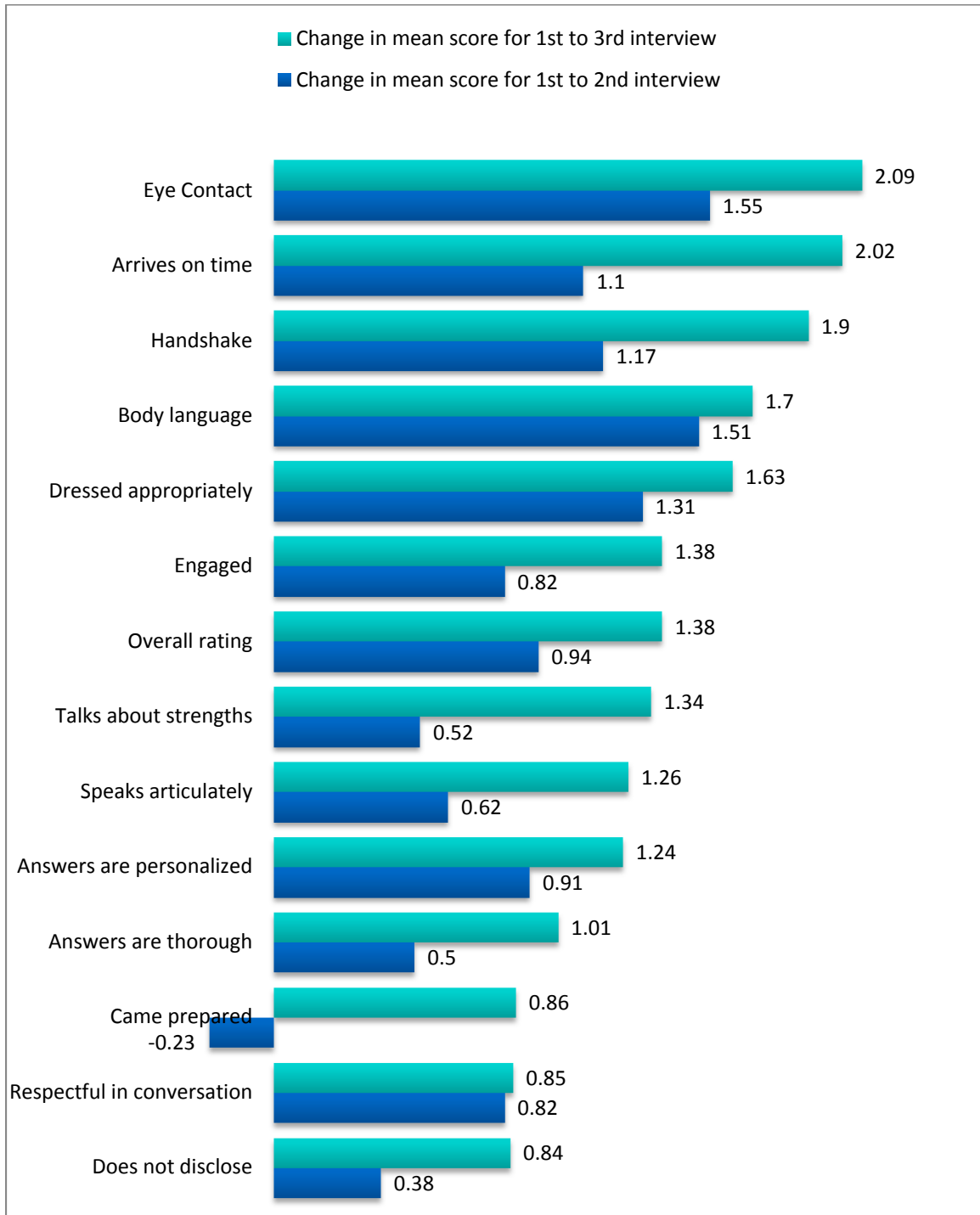
<sup>12</sup> 1<sup>st</sup> assessment: n=36; 2<sup>nd</sup> assessment: n=16; 3<sup>rd</sup> assessment: n=10

### **Interview Checklist**

The Interview Checklist was created as a tool for staff to evaluate students' performances in a face-to-face interview setting with respect to 13 items. As with the Application Checklist, the Interview Checklist is judged on a 7-point scale, with "not at all professional" as 1 and "very professional" as 7. Whereas the application process focuses on writing skills, the interview process focuses on how TESSA and other Discovery Corps members present themselves in a formal interview.

Figure 21 shows consistent and gradual improvement in the overall interview score of participants over the course of three assessments. The majority of students fall between "acceptable" (4) and "generally professional" (5) in the first interview, are rated between "generally professional" (5) and "nearly perfect" (6) in the second interview. On the third interview, half score "generally professional" (5) and half "nearly perfect" (6). None were scored "very professional" (7). This suggests that students who complete multiple interviews are continuously increasing the level of professionalism in the way they present themselves and answer questions in a formal interview setting.

**Figure 21 | Change in Mean Interview Scores from First to Second and Third Assessments**



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## Student Experiences

### *Student Self-Assessments*

Students take self-assessments upon entering the program as well as at various other times, including when they apply for new or paid positions within the program. The specific times that students complete these self-assessments vary because some students work more than others and/or apply for new positions more than others. The intervals between assessments are intended to provide enough time in a position or enough time between measurements to see changes in the students' skills or attitudes. These assessments reveal how students are changing during their time in the program. Thus, the numbers of students completing self-assessments also varies and can affect results.

### *Presentation Skills*

A primary task for all Discovery Corps members is presenting science to visitors. Within the student self-assessments, youth are asked to rate their abilities and comfort level with respect to ten presentation skills on a five-point scale, from "very uncomfortable" (1) to "very comfortable" (5). They assess themselves before, during, and near the end of their participation in Discovery Corps. Those that have been in the program longer have more ratings. **With each subsequent assessment after joining the program, students consistently feel that they have improved their skills in all of the categories assessed** (see Table 17). Detailed figures on responses by question and rating are provided in Table 17 and Figure 22. The assessment questions can be broken down into four categories:

1. Speaking (3 questions)
2. Explaining (2 questions)
3. Teaching (3 questions)
4. Interacting (2 questions)

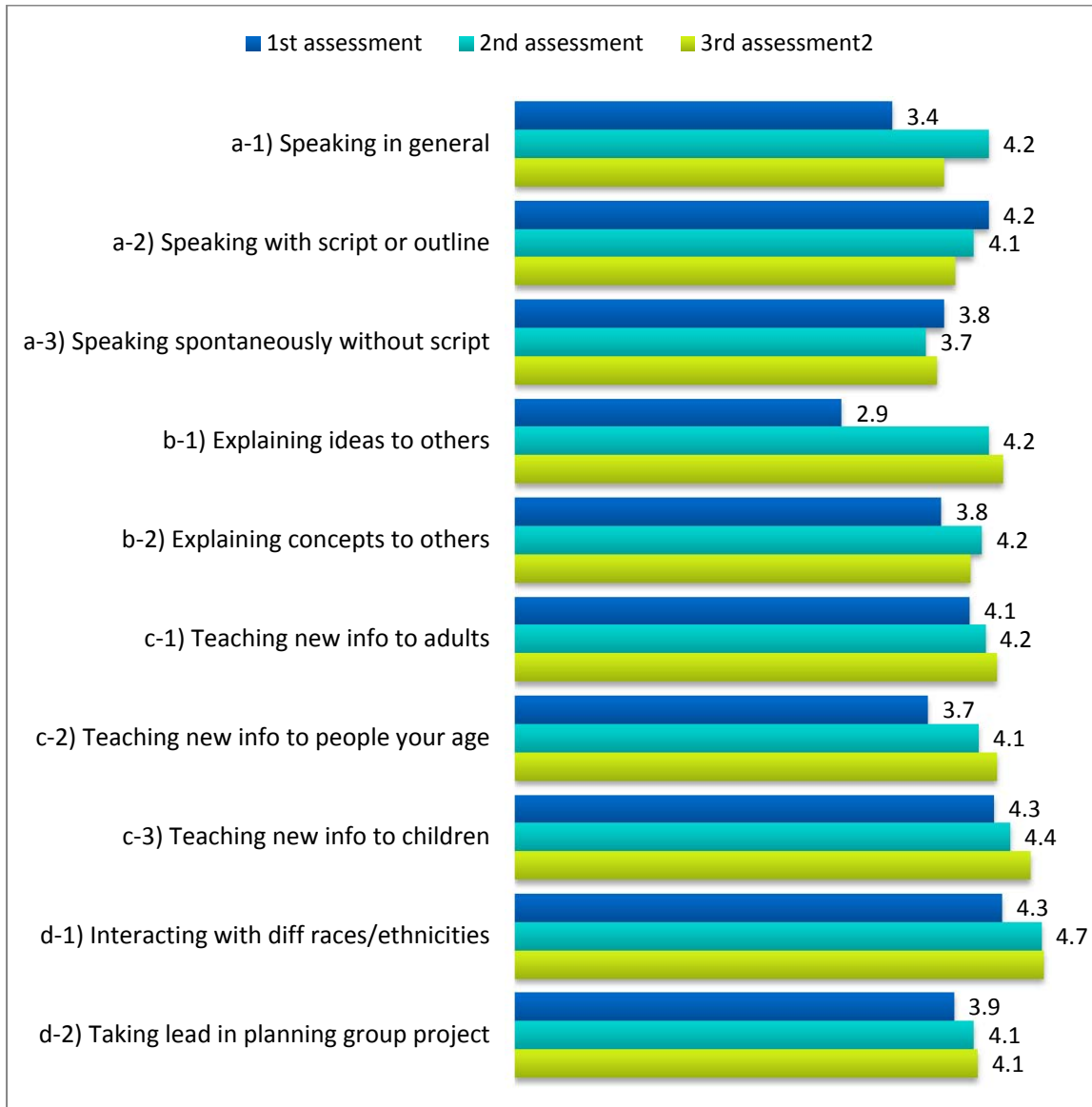
**Table 17 | Distribution of Self-Rating Scores<sup>13</sup>**

Activity	Avg. (1-5 scale) 1 <sup>st</sup> Rating (n=44)	Avg. (1-5 scale) 2 <sup>nd</sup> Rating (n=32)	Avg. (1-5 scale) 3 <sup>rd</sup> Rating (n=17)
a-1) Speaking in general	3.4	4.2	3.8
a-2) Speaking with script or outline	4.2	4.1	3.7
a-3) Speaking spontaneously without script	3.8	3.7	3.8
b-1) Explaining ideas to others	2.9	4.2	4.4
b-2) Explaining concepts to others	3.8	4.2	4.1
c-1) Teaching new info to adults	4.1	4.2	4.3
c-2) Teaching new info to people your own age	3.7	4.1	4.3
c-3) Teaching new info to children	4.3	4.4	4.6
d-1) Interacting with diff races/ethnicities	4.3	4.7	4.7
d-2) Taking lead in planning group project	3.9	4.1	4.1

<sup>13</sup> Scale: 1=very uncomfortable; 2=somewhat uncomfortable; 3=neutral/unsure; 4=generally comfortable; 5=very comfortable



**Figure 22 | Change in Students’ Mean Level of Comfort with Presentation Skills**



None of the differences in the mean ratings between the first assessment (baseline) and the second or third ratings for each skill are statistically significant. Even though improvements are evident, the small numbers of participants mean that statistically significant changes are hard to find.

A further breakdown of the level of comfort with each question from the first to the third assessment is provided in Table 18. On average, students rank their comfort level for the majority of skills in the “Neutral” range (between somewhat uncomfortable and generally comfortable) in the first and third assessments. In the first assessment, the lowest scoring items were a-1) in general,

speaking in front of large groups of strangers and b-1) explaining your ideas and opinions to others. These improved to neutral. By second and third assessments, two items (c-3) teaching new information to children and d-1) interacting with people of different races or ethnicities) improved from “neutral” to “generally comfortable.”

**Table 18 | Change in Mean Self-Ranking by Question from First to Third Assessment**

Mean Self-ranking	First Assessment (n=44)	Third Assessment (n=17)
<b>1 – Very Uncomfortable</b> <i>(mean 1.0-1.5)</i>	None	None
<b>2 – Somewhat Uncomfortable</b> <i>(mean 1.6-2.5)</i>	None	None
<b>3 – Neutral/ Not Sure</b> <i>(mean 2.6-3.5)</i>	<p><b>a-1)</b> In general, speaking in front of large groups of strangers</p> <p><b>b-1)</b> Explaining your ideas and opinions to others</p>	None
<b>4 – Generally Comfortable</b> <i>(mean 3.6-4.5)</i>	<p><b>a-2)</b> Speaking in front of large groups of strangers in situations where topic and points are scripted or outlined</p> <p><b>a-3)</b> Speaking in front of large groups of strangers in situations where the discussion points are unplanned and spontaneous</p> <p><b>b-2)</b> Explaining a concept to others</p> <p><b>c-1)</b> Teaching new information to adults</p> <p><b>c-2)</b> Teaching new information to people your own age</p> <p><b>c-3)</b> Teaching new information to children</p> <p><b>d-1)</b> Interacting with people of different races or ethnicities</p> <p><b>d-2)</b> Taking the lead in planning a project with other people</p>	<p><b>a-1)</b> In general, speaking in front of large groups of strangers</p> <p><b>a-2)</b> Speaking in front of large groups of strangers in situations where topic and points are scripted or outlined</p> <p><b>a-3)</b> Speaking in front of large groups of strangers in situations where the discussion points are unplanned and spontaneous</p> <p><b>b-1)</b> Explaining your ideas and opinions to others</p> <p><b>b-2)</b> Explaining a concept to others</p> <p><b>c-1)</b> Teaching new information to adults</p> <p><b>c-2)</b> Teaching new information to people your own age</p> <p><b>d-2)</b> Taking the lead in planning a project with other people</p>
<b>5 – Very Comfortable</b> <i>(mean 4.6-5.0)</i>	None	<p><b>c-3)</b> Teaching new information to children</p> <p><b>d-1)</b> Interacting with people of different races or ethnicities</p>

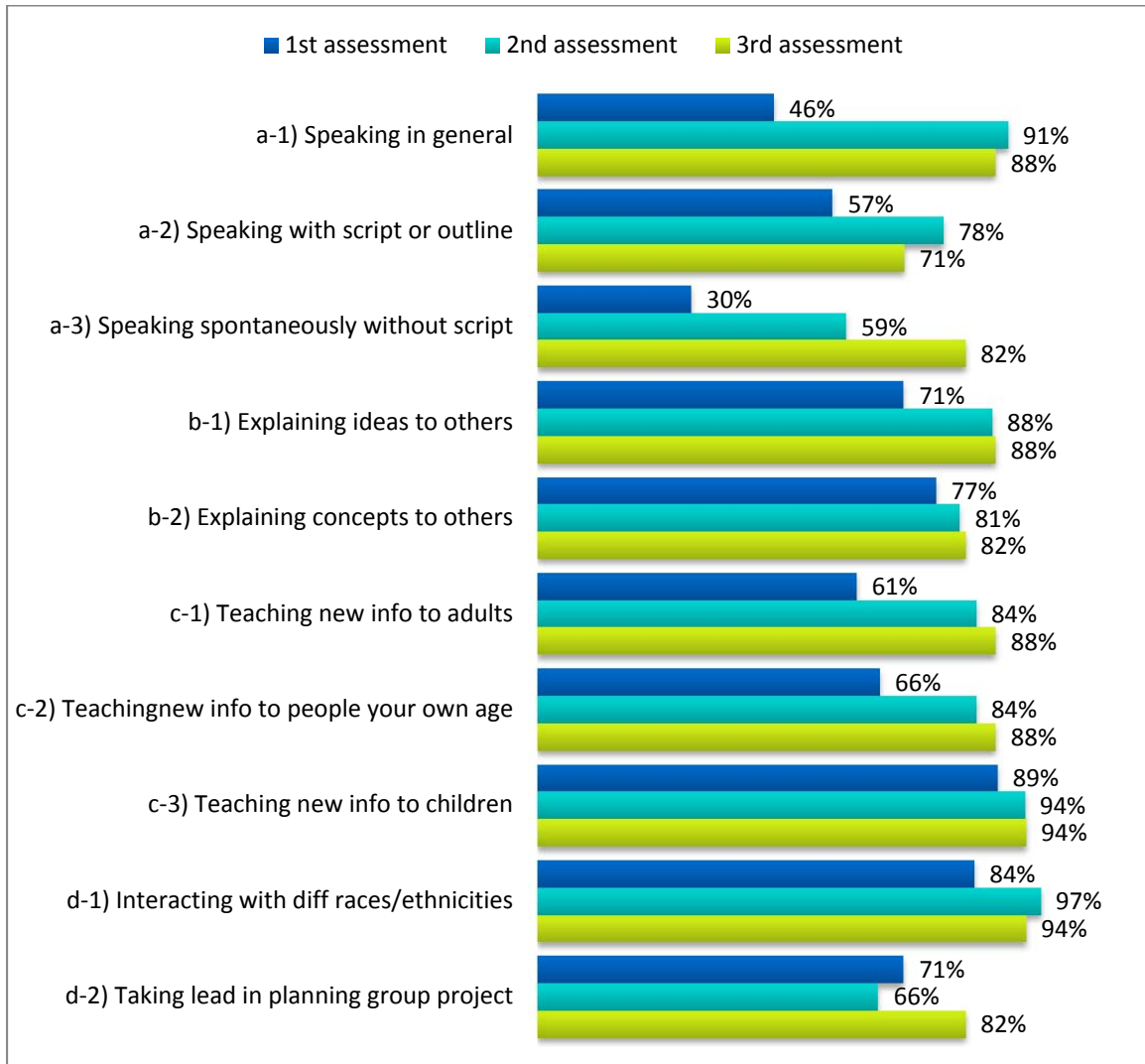
Table 19 and Figure 23 show that even though only two skills broke the 4.0 mark (c-3: “teaching new information to children” and d-1: “interacting with people of different races or ethnicities”), more than half of all youth report being either generally or very comfortable in all other skills with the exception of one (a-3: “speaking in front of large groups of strangers in situations where the discussion points are unplanned and spontaneous”). **By the third assessment, at least 60% of youth report being either generally or very comfortable with all skills except a-3.**

Table 19 | Self-Assessment of Comfort with Activities<sup>14</sup>

Activity	1st Assessment	2nd Assessment	3rd Assessment
a-1) Speaking in general	46%	91%	88%
a-2) Speaking with script or outline	57%	78%	71%
a-3) Speaking spontaneously without script	30%	59%	82%
b-1) Explaining ideas to others	71%	88%	88%
b-2) Explaining concepts to others	77%	81%	82%
c-1) Teaching new info to adults	61%	84%	88%
c-2) Teaching new info to people your own age	66%	84%	88%
c-3) Teaching new info to children	89%	94%	94%
d-1) Interacting with diff races/ethnicities	84%	97%	94%
d-2) Taking lead in planning group project	71%	66%	82%

<sup>14</sup> Percent who are generally or very comfortable. Assessment #1: n=44; Assessment #2: n=32; Assessment #3: n=17

Figure 23: comfort with presentation skills over three assessments <sup>15</sup>



In the first assessment, students are least confident in explaining ideas to others. **Students' ratings of their confidence explaining science to others improved** from 2.9 on the first assessment to 4.2 on the second and to 4.4 on the third. Similar changes are seen in several other teaching activities.

<sup>15</sup> Percent who are generally or very comfortable. Assess#1: n=44; Assess#2: n=32; Assess#3: n=17

**Large improvement also occurs in the speaking category** from the first to the third assessment. Students’ first rank their confidence in public speaking an average of 3.4, or between “somewhat uncomfortable” and “neutral.” By the second assessment, students rank themselves an average of 4.2, or between “neutral” and “generally comfortable,” a full .8 points above their original self-ranking. It declines in the third ranking, but this could be influenced by the low number of students completing a third assessment.

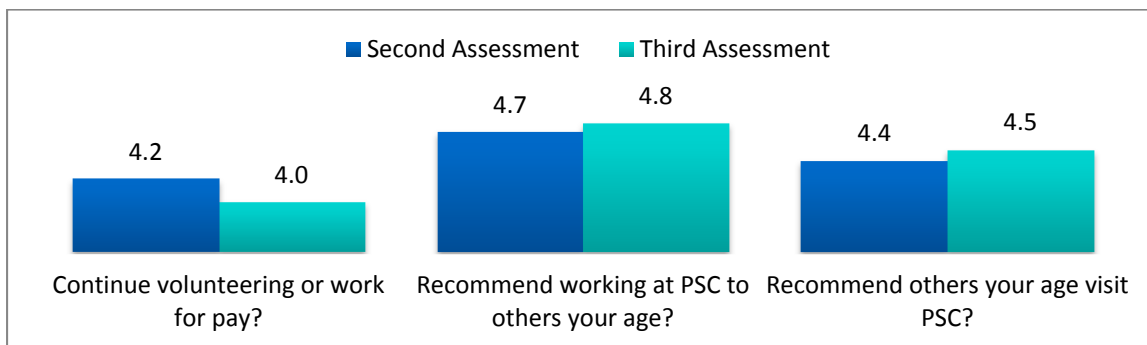
See Tables A-1, A-2 and A-3 in Appendix A for a full breakdown of percentages and means regarding student self-assessments.

### Assessment of Experience at Pacific Science Center

On their second and third self-assessments students, were asked questions about their opinions of the program and how likely they would be to recommend working at or visiting the Science Center. Three of the questions were answered with a 1-to-5 a rating scale from “very unlikely” (1) to “very likely” (5), and four were open-ended. Figure 24 and Table 5 show the mean student ratings and the distributions of responses on the three rating-scale questions:

- If it were available, how likely are you to continue volunteering or working for pay at a job like the one you have been performing at the Science Center?
- How likely are you to recommend working at the Science Center to people your age?
- How likely are you to recommend that people your age visit the Science Center?

**Figure 24 | Mean Student Ratings on Working at Pacific Science Center<sup>16</sup>**



<sup>16</sup> Assessment #2: n=27; Assessment #3: n=17

On the second assessment, a large majority (87%) wanted to continue their work. Since on their third assessments, students are ready to graduate high school and most are preparing to go to college, it is not surprising that the average declines.

Students are enthusiastic about recommending that others their age work at Pacific Science Center with 74% reporting they were “very likely” to recommend it in the second assessment and 87% in the third.

A majority of students also indicate that they would recommend that others their age visit the Science Center, although these numbers are slightly lower, probably due to the fact that many of the exhibits are geared toward younger audiences.

**Table 20 | Assessment of Experience at Pacific Science Center<sup>17</sup>**

Students indicated how likely they were to do the following:	Assessment	Very Unlikely (1)	Unlikely (2)	Maybe (3)	Some-what Likely (4)	Very Likely (5)	Mean (scale 1-5)
If it were available, how likely are you to continue volunteering or working for pay at a job like the one you have been performing at the Science Center?	2 <sup>nd</sup>	3%	-	10%	45%	42%	4.2
	3 <sup>rd</sup>	-	7%	27%	27%	39%	4.0
How likely are you to recommend working at the Science Center to people your age?	2 <sup>nd</sup>	-	-	3%	23%	73%	4.7
	3 <sup>rd</sup>	-	-	7%	7%	86%	4.8
How likely are you to recommend that people your age visit the Science Center?	2 <sup>nd</sup>	-	-	10%	39%	51%	4.4
	3 <sup>rd</sup>	-	-	7%	33%	60%	4.5

<sup>17</sup> Assessment #2: n=27; Assessment #3: n=17

The survey also included four open-ended questions:

- What aspects of your training and work at the Science Center have been most rewarding to you? Why?
- What aspects of your training and work at the Science Center have been least enjoyable to you? Why?
- What suggestions do you have for improving the training you have received at the Science Center?
- What suggestions do you have for improving the work you have been doing at the Science Center?

In general, participants like what they are learning about science; the variety of activities; and learning to work with others. They dislike repetitive tasks; inactivity during slow times; and some specific work venues. They offer a number of suggestions, including having more field trips; more hands-on learning activities; and a greater variety of activities. See Appendix A for a detailed look at the comments and suggestions given by participants.

## Student Responses from TESSA Focus Groups and Interviews

Below is a summary of responses from the TESSA focus groups and interview by question. The data came from interviews with single students and some focus groups with some of the same students. The only differences were the numbers of students present and the questions asked in each setting.

### *Focus Group Questions and Responses*

**A. You all have spent many hours studying and working here. What is the coolest thing in Pacific Science Center--the one thing that you think everyone should see?**

- | 4 Mentions        | 2 Mentions          | 1 Mention        |
|-------------------|---------------------|------------------|
| • Butterfly House | • The Iguana        | • 3D Exhibit     |
|                   | • High Rail Bike    | • Body Casting   |
|                   | • Water Outside     | • Video          |
|                   | • Pompeii Exhibit   | • reenactment of |
|                   | • Ripley's Exhibit  | the eruption     |
|                   | • Laser Dome        | • Harry Potter   |
|                   | • Bubble Fest       | Exhibit          |
|                   | • Visiting Exhibits | • The Space Zone |

***B. In what ways are you different now than when you started TESSA and how has working here helped you change in these ways? What new skills, interests or knowledge do you have as a result of being part of TESSA?***

**Program is effective in:**

- Helping shy people engage with others;
- Exposing youth to more diverse people and learn how to interact with them; and
- Helping youth develop professional presentation skills in a safe environment.

***C. Even if you thought they were challenging or even not fun, what training or work activities have been the most influential in helping you develop new skills, interests or knowledge?***

**Program is effective in:**

- Providing effective and engaging training modes;
- Combining observing and practicing makes presenting more effective; and
- Interacting with older peers who are important and helpful.

**Program could be more effective in:**

- Providing more variety in activities;
- Providing hands-on research activities that teach science and research skills; and
- Asking open-ended question to provoke more thought.

***D. What suggestions do you have for improving the TESSA Program or anything else at Pacific Science Center?***

Responses are varied and each should be considered. Many relate to making the work and educational activities more focused on earth and space science.

## ***Interview Questions and Responses***

***1. You all have spent many hours studying and working here. What is the coolest thing in the Pacific Science Center—the one thing you think everyone should see?***

Combined with Focus Group question A answers.

***2. How has working at the PSC changed you in any way (big or small)? How are you different for having volunteered here? Let's discuss these changes in specific areas.***

***2a. How have you changed in the ways you relate to strangers?***

***2ai. Inside PSC?***

**Program is effective in:**

Helping youth change, engage with strangers, develop professional skills, confidence and less shy.



**2a.ii. Outside PSC?**

**Program is effective in:**

Helping youth develop and use transferable skills that help them in school, in life and that enhance the community.

**2b. How have your work skills changed? Think in terms of work here, in school, at home or in other jobs or activities.**

**2bi. Confidence in public speaking?**

**Program is effective in:**

Helping youth develop their public speaking skills.

**2bii. Interaction with people of different ages?**

**Program is effective in:**

Helping youth learn how to talk with and explain science to people of different ages.

**2biii. Showing up on time?**

**Program is effective in:**

Helping youth improve their punctuality, but it is still a struggle for most.

**2biv. Organizing and using your time better?**

**Program is effective in:**

Helping youth improve time management at work and in other aspects of life.

**Program could be more effective in:**

Helping youth balance work and other life requirements (seems to be a struggle for most, but this is normal).

**2bv. Creative problem solving?**

**Program is effective in:**

Helping youth develop and use problem solving skills.

**2bvi. Working in groups?**

Most youth enjoyed working or got better at working in groups and learned from others while some were resistant to working in groups and preferred working on their own.

**Program is effective in:**

- Helping youth learn to work in groups.

**Program could be more effective in:**

- Giving youth opportunities to work in larger groups (mostly in pairs now) with more sustained projects and goals.

***2bvii. Working with or helping people of different backgrounds, ages, etc.?***

**Program is effective in:**

Helping youth learn how to engage and adapt to people of different backgrounds and abilities.

***2bviii. Getting your work done?***

**Program is effective in:**

Helping youth learn how to get things done and balance priorities.

***2c. Has your interest in science changed? If so how?***

**Program is effective in:**

Helping youth enhance their interest in science and explore new fields (though most were interested to begin with).

**Program could be more effective in:**

Stimulating career interest in astronomy.

***2d. Has your knowledge of science, math or technology increased? If so, how?***

**Program is effective in:**

Helping youth learn more science.

**Program could be more effective in:**

Improving youth knowledge about NASA.

***2e. Has your interest in studying science, math or technology in high school or afterwards changed? If so, how?***

**Program is effective in:**

Helping youth solidify their common interests in STEM fields.

***2f. Since volunteering at PSC, do you spend more time engaged in reading about or watching science, math or technology or using it in ways that increase your knowledge of them? If so, how?***

**Program is effective in:**

Slightly stimulating interests in STEM outside of work.

***2g. Are you more aware of careers that use science, math and technology? Which, if any appeal to you?***

The Program is effective in increasing youth's awareness of different fields of science and jobs in them. Most were interested in pursuing a science-related career although some had an interest in science but not as a career.

**3. Think about what you have done at Pacific Science Center, in school, in other activities or on your own and what you have learned about astronomy since you first joined TESSA.**

**3a. How would you rate your knowledge of astronomy before entering the TESSA program? Let's say out of 10 – where 1 is "I knew nothing" and 10 is "I knew a lot."**

Youth perceive a great increase in their knowledge of astronomy.

**3c. What are the most interesting things you have learned? [all]**

Youth show excitement about specific facts and obscure science.

**3d. What have you learned about NASA? [all]**

Most youth (especially more recent seniors) think they have learned quite a bit about NASA and they are able to mention some things that it does. A few (more in 2014) say they have not learned much.

**3e. How likely are you to pursue future work in astronomy?**

Although students understand some of the career paths open in astronomy and many think they may continue to study it, the Program is not causing them to choose astronomy as a career path.

**3f. How likely are you to pursue work in science, math or technology in any field?**

The interest may not be a change, since most had interests when they joined. For most, the Program seems to reinforce the desire to work in a STEM field, although, in 2015, some participants stated that they had no interest in a STEM career.

**3g. Would you like to work at NASA? Why or why not?**

Even though most do not see themselves in a career in astronomy, they have good feelings about NASA and can see themselves working there in other capacities.

**4. Why were you interested being part of the TESSA program? [all]**

Science teachers are big influence in telling youth about the program and encouraging them to apply.

**4a. In what ways has it met your expectations? [all]**

Primary ways deal with the work experience with little mention of the science content.

**4b. In what ways has it not met your expectations? [all]**

Responses are varied and each should be considered.

**5. How would you suggest changing the TESSA program? [also included in focus group Question D responses]**

**6. What would make it more appealing to other youth? [all]**

Responses are varied and each should be considered.

**7. What would you like to tell others who are joining TESSA or who might be considering it? [all]**

Responses are varied and should be reviewed for marking similar programs. The idea of video testimonials on YouTube seems especially effective.

**8. If you were selecting future participants for TESSA, what qualities would you look for in applicants? [all]**

Responses are varied but say a lot about what recruiters for similar programs might consider.

**9. Has participating in TESSA encouraged you to volunteer more in other places?**

Many examples of volunteer activities noted.

**10. Have you participated in TESSA activities outside of floor shifts? Why? What do you get out of it? Why not?**

Most youth say yes and give examples.

**11. Do you feel that you are part of Discovery Corps? Do you feel connected to it as part of a team?**

Responses consistently show that youth feel a part of Discovery Corps and the Science Center as a whole.

**11a. If yes, How? Why?**

**12. Do you feel that you are part of Pacific Science Center community? How is that similar to or different from how you feel about TESSA?**

Youth feel valued as part of the Science Center staff.

**12a. If yes, How? Why?**

**12b. If not or some, how can those who run it or who participate in it create a better sense of team spirit on that scale? [all]**

There are many suggestions to consider.

**13. For female youth: Do you feel that women face extra barriers if they choose a STEM career?**

Female youth are aware of ongoing discrimination and under-representation of women in STEM fields and the science and soft skills needed to succeed in STEM careers

**14. If not or some, how can those who run it or who participate in it create a better sense of team spirit?**

There are many suggestions to consider.

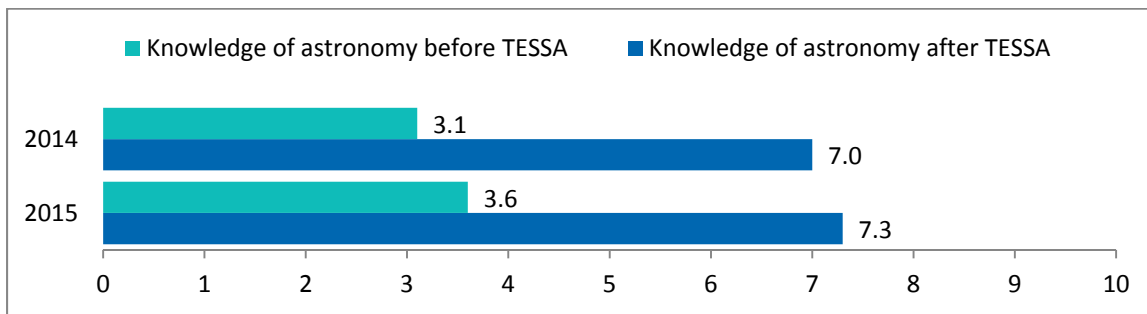
See Appendix C for the complete results from the 2014 and 2015 TESSA focus group and interview participants.

## Summary

Most students reported that they were unaware of what TESSA was before getting involved in the program, and they find out about it mostly through word of mouth. Many are encouraged by their science teachers to participate. Several students suggest that the program could be better marketed so more youth know the program exists. Most of them don't have any expectations going into the program. However, after participating in the program, they report that **TESSA is an invaluable experience that every student should be able to experience.**

Although most students are already interested in science before participating in TESSA, the program successfully gets them excited about specific facts and obscure science. **The results for both 2014 and 2015 demonstrate the effectiveness of the program in increasing student knowledge of astronomy** (see Table 25). They were asked to rate their knowledge of astronomy on a scale of one (meaning "I knew nothing") to ten (meaning "I knew a lot"), before and after entering TESSA.

**Figure 25 | Student Knowledge of Astronomy Before and After Participating in TESSA**



**In addition to an increase in knowledge of astronomy, the program seems to reinforce the desire to work in a STEM field** (although in 2015, some students have no interest in pursuing a STEM career). Even though most students do not see themselves in a career in astronomy, they have good feelings about NASA and can see themselves working at NASA in other capacities. Most of them (especially seniors) think they have learned quite a bit about NASA and they are able to mention some things that NASA does. A few (more in 2014) say they have not learned much about NASA.

**TESSA is effective at helping students to develop and use transferable skills that help them in school, in life and that enhance the community.**

Prior to participating in TESSA, most students are apprehensive and fearful of public speaking and feeling prepared to talk in front of an audience or strangers. **After being a part of TESSA, all of them increased their confidence, developed professional presentation skills and felt comfortable adapting, engaging and explaining science to a variety of people of different ages and backgrounds.**

The program also helps them learn how to get things done and balance priorities. It helps them improve their punctuality and manage their time even though it is still a struggle for most.

**Most students feel that working in groups leads to better solutions and increased knowledge about a subject and that their skills improved as a result of participating in TESSA.** Some of them still very much prefer working on their own rather than in groups because they feel that they will do a better job by themselves and like the idea that they will be accountable for their own work.

In general, participants like what they are learning about science; the variety of activities; and learning to work with others. They dislike repetitive tasks; inactivity during slow times; and some specific work venues. They offer a number of suggestions, including having more field trips; more hands-on learning activities; and a greater variety of activities.

Other areas where the program is effective include helping students develop and use problem solving skills and helping them feel a valued and part of Discovery Corps and the Science Center as a whole.

Students suggest a variety of ways to improve TESSA including:

- Providing more variety in activities
- Providing hands-on research activities that teach science and research skills
- Asking open-ended question to provoke more thought

- Helping them balance work and other life requirements
- Giving them opportunities to work in larger groups (mostly in pairs now) with more sustained projects and goals
- Assigning homework to accrue hours away from the Science Center because the time put in at the Science Center doesn't necessarily reflect the quality of what is being done
- Having a DCSI 3 so that there is more incentive once DCSI 2 is attained
- Having someone who's in Discovery Corps participate in the interview process—someone the age of a program participant that can ask questions of the interviewee to gain a different perspective.

## CONCLUSIONS

### Planetarium and Science On Wheels

Even though in the early years some technical problems with equipment interfered with the smooth running of the Planetarium periodically, the Science Center is well on its way to resolving those issues and it has plans to expand its use of the new technology even further as these issues are resolved.

Despite obstacles that prevented the Science Center from reaching as many people as was initially planned, the Science Center ultimately reached over 143,000 Planetarium visitors and over 27,000 Science On Wheels students and adults with interactive planetarium shows and lessons.

The shows were innovative and inspiring, engaging guests in designing a MESSENGER mission to Mercury, exploring black holes and dark matter, and learning about human space exploration and the mission to Pluto. Audiences left the shows with a greater understanding of space and NASA's role in exploring our universe, and with a greater sense of interest in science and astronomy than they had reported when the shows began.

### Discovery Corps and the Track for Earth and Space Science Achievement

Through the Track for Earth and Space Science Achievement (TESSA) within the Science Center's Discovery Corps, students learn about science, astronomy, and science careers. They also gain the work and life skills that they will need to succeed in college and beyond. Students almost universally

report that their experiences within the program have been positive. While students report a diverse range of interests and career aspirations (many in science), several report that they were inspired through TESSA to pursue a career in astronomy, astrophysics, or other forms of science.

Through TESSA, students have the opportunity to pursue these interests not only through their work in science interpretation, but also through internships with actual planetary scientists, assisting them with research in the field. Students have assisted scientists at the University of Washington and other institutions with real-time research on subjects ranging from exoplanets, detecting and classifying astronomical variability, working with Kepler data, on topics within astrobiology and geo-microbiology, and wide variety of other projects.

Pre- and post-program testing shows that students learn a great deal about astronomy during their four years in TESSA – enough to pass a college-level exam. Perhaps more importantly, students learn skills that will be beneficial in future academic and professional settings. They learn how to apply and interview for jobs, how to present themselves in a professional manner, and how to engage with audiences of all ages and backgrounds.

The Science Center has made an extensive and successful effort to recruit students from diverse backgrounds to the program. As a result, TESSA has served as a vehicle to teach youth of multiple ethnicities, genders, and economic backgrounds about science, and to provide them with the knowledge and skills that they will need to successfully pursue careers after they complete their education.

## RECOMMENDATIONS

### Planetarium

The Science Center has already begun to overcome the equipment challenges that presented themselves in the first few years of NASA Now. To continue along this road, and to maximize the use of the technology that is currently available, we recommend that the Science Center:

- Continue to involve the IT team in regular maintenance and troubleshooting of computers and equipment
- Continue to explore mechanisms for improved ventilation and cooling of servers
- Continue to expand use of Uniview and to follow through on ideas for future technology use



## Science On Wheels

Plans underway echo suggestions offered by teachers in surveys.

- Science On Wheels would like to work on having more culturally diverse storytelling in the planetarium to tell stories from cultures other than the ancient Greeks. The staff plan to do this by research and collaborative design. Engaging with tribal story tellers from various tribes living in Washington could provide links to local cultures.
- Science On Wheels is exploring the use of small microphones in the dome to address comments that presenters are sometimes be hard to hear.
- Science On Wheels has a goal to offer more teacher resources outside of the school visit. It has had some requests for more constellation and astronomy information, and it hopes to make more information available on its website. Presenters currently offer teachers activity handouts that they can use to engage their students in their classrooms or send home. This document is currently unchanged year-to-year. Staff plan to offer schools updated resources for any content that is presented in the classroom.

## Track for Earth and Space Science Achievement

Overall, youth were extremely satisfied with their experiences in TESSA and almost all would recommend the program to others. When asked how they might improve TESSA for others, youth had the following suggestions:

- **Even more science and career-based activities:** Many students voiced an interest in attending more science and career workshops like the ones that they already attended early the program. Of particular interest were astronomy-based science activities and career workshops with scientists who explain what they do in their work.
- **Clarify how work accomplished in different settings is linked to promotions and applications for more advanced positions.** Several students noted that they felt that they fell behind their peers in promotions and training when they participated in various internships. This discouraged some students from seeking additional internships after the completion of their first one. Improvements in the advancement system are in development, and they should clarify the process.
- **Specific job-search workshops:** Several students expressed an interest in attending job search workshops. One student stated, “We get a lot of training in how to be professional overall. But I would like to go to a workshop that actually walks us through the job search

process. Like – how do you apply for a job online? Should you do anything differently than if you can go talk to them in person? That type of thing.”

Overall, the NASA Now programming at Pacific Science Center has been a success. We feel confident that the Science Center will continue to offer high quality programming over the next few years.



## Appendix A | TESSA Detailed Table Data

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**Table A-1 | Presentation Skills Over Three Self-Assessments (assessment #1: n=44; assessment #2: n=32; assessment #3: n=17)**

	Students were asked to rate their comfort level with each of the following	Assessment	Very Uncomfortable (1)	Somewhat Uncomfortable (2)	Neutral / Not Sure (3)	Generally Comfortable (4)	Very Comfortable (5)	Mean (scale 1-5)
<b>SPEAK</b>	In general, speaking in front of large groups of strangers	1 <sup>st</sup>	2%	18%	34%	32%	14%	3.36
		2 <sup>nd</sup>	1%	13%	41%	38%	7%	4.22
		3 <sup>rd</sup>	12%	-	-	70%	18%	3.82
	Speaking in front of large groups of strangers in situations where topic and points are scripted or outlined	1 <sup>st</sup>	5%	9%	29%	32%	25%	3.64
		2 <sup>nd</sup>	2%	7%	38%	42%	11%	4.09
		3 <sup>rd</sup>	-	18%	12%	41%	29%	3.82
	Speaking in front of large groups of strangers in situations where the discussion points are unplanned and spontaneous	1 <sup>st</sup>	9%	25%	36%	25%	5%	2.91
		2 <sup>nd</sup>	9%	23%	51%	16%	1%	3.66
		3 <sup>rd</sup>	12%	-	6%	65%	17%	3.76
<b>TEA EXPLAIN</b>	Explaining your ideas and opinions to others	1 <sup>st</sup>	-	11%	18%	50%	21%	3.80
		2 <sup>nd</sup>	1%	13%	38%	42%	6%	4.22
		3 <sup>rd</sup>	6%	-	6%	29%	59%	4.35
	Explaining a concept to others	1 <sup>st</sup>	-	2%	21%	47%	30%	4.05
		2 <sup>nd</sup>	3%	8%	36%	44%	9%	4.16
		3 <sup>rd</sup>	6%	-	12%	47%	35%	4.06
Teaching new information to	1 <sup>st</sup>	-	7%	32%	48%	13%	3.68	

	adults	2 <sup>nd</sup>	4%	7%	39%	43%	7%	4.19
		3 <sup>rd</sup>	6%	-	6%	35%	53%	4.29
	Teaching new information to people your own age	1 <sup>st</sup>	-	7%	27%	39%	27%	3.86
		2 <sup>nd</sup>	1%	7%	34%	48%	10%	4.13
		3 <sup>rd</sup>	5%	4%	5%	34%	52%	4.29
	Teaching new information to children	1 <sup>st</sup>	-	5%	7%	46%	42%	4.27
		2 <sup>nd</sup>	3%	5%	24%	49%	19%	4.41
		3 <sup>rd</sup>	-	6%	-	23%	71%	4.59
<b>INTERACT</b>	Interacting with people of different races or ethnicities	1 <sup>st</sup>	5%	-	11%	25%	59%	4.34
		2 <sup>nd</sup>	1%	2%	22%	51%	24%	4.69
		3 <sup>rd</sup>	6%	-	-	6%	88%	4.71
	Taking the lead in planning a project with other people	1 <sup>st</sup>	-	5%	25%	45%	25%	3.91
		2 <sup>nd</sup>	3%	10%	40.0%	36%	11%	4.09
		3 <sup>rd</sup>	6%	-	12%	41%	41%	4.12

**Table A-2 | Application Checklist Scores (assessment #1: n=36; assessment #2: n=16; assessment #3: n=10)**

Staff evaluates each student with respect to the following	Assessment (1 <sup>st</sup> , 2 <sup>nd</sup> or 3 <sup>rd</sup> )	Not at all Prof. (1)	Very Unprof. (2)	Somewhat Unprof. (3)	Acceptable (4)	Generally Prof. (5)	Nearly Perfect (6)	Very Prof. (7)	Mean (scale 1-7)
Applicant is enthusiastic about the position (explains how position meets personal needs but not too effusive)	1 <sup>st</sup>	-	3%	8%	33%	25%	28%	3%	4.75
	2 <sup>nd</sup>	-	-	-	6%	13%	-	81%	6.56
	3 <sup>rd</sup>	-	-	-	-	10%	20%	70%	6.60
Applicant explains how he/she can help the Science Center (specific qualities he/she has that will benefit the Science Center /visitors)	1 <sup>st</sup>	-	-	28%	44%	19%	6%	3%	4.11
	2 <sup>nd</sup>	-	-	6%	25%	13%	19%	37%	5.56
	3 <sup>rd</sup>	-	-	-	40%	10%	-	50%	5.60
Applicant feels prepared (says how previous life or work experiences have helped)	1 <sup>st</sup>	-	14%	19%	31%	22%	11%	3%	4.06
	2 <sup>nd</sup>	-	-	6%	12%	19%	19%	44%	5.81
	3 <sup>rd</sup>	-	-	-	10%	30%	-	60%	6.10
Presentation is personalized (information helps unfamiliar reader get to know the applicant)	1 <sup>st</sup>	-	6%	11%	33%	28%	19%	3%	4.53
	2 <sup>nd</sup>	-	-	-	19%	6%	-	75%	6.31
	3 <sup>rd</sup>	-	-	-	-	30%	30%	40%	6.10
Application or letter has professional tone (good introduction; appropriate, respectful, formal language; thorough not wordy; concludes with seeking action - hire)	1 <sup>st</sup>	-	-	11%	42%	36%	8%	3%	4.50
	2 <sup>nd</sup>	-	-	-	6%	12%	13%	69%	6.44
	3 <sup>rd</sup>	-	-	-	-	-	10%	90%	6.90
Answers to questions are	1 <sup>st</sup>	-	8%	22%	31%	20%	19%	-	4.19

thorough without writing too much	2 <sup>nd</sup>	-	-	13%	6%	13%	6%	62%	6.00
	3 <sup>rd</sup>	-	-	-	10%	20%	30%	40%	6.00
Does not disclose inappropriate information	1 <sup>st</sup>	-	-	3%	11%	17%	14%	55%	6.08
	2 <sup>nd</sup>	-	-	-	6%	6%	6%	82%	6.63
	3 <sup>rd</sup>	-	-	-	-	10%	10%	80%	6.70
Letter is formatted in appropriate business style (e.g., has date, addresses of applicant and reviewer, phone number, signature typed and written; distinct & well-organized paragraphs)	1 <sup>st</sup>	-	6%	8%	22%	45%	8%	11%	4.50
	2 <sup>nd</sup>	-	-	-	13%	25%	31%	31%	5.81
	3 <sup>rd</sup>	-	-	-	20%	10%	40%	30%	5.80
Uses standard English conventions (few or no errors in spelling, punctuation, word choice, verb tense, etc.)	1 <sup>st</sup>	-	6%	8%	31%	31%	24%	-	4.61
	2 <sup>nd</sup>	-	6%	-	6%	-	13%	75%	6.38
	3 <sup>rd</sup>	-	-	-	-	20%	50%	30%	6.10
Application is neat and clean (legible writing or readable font; white space for note taking)	1 <sup>st</sup>	3%	3%	5%	25%	28%	19%	17%	4.97
	2 <sup>nd</sup>	-	-	-	-	6%	13%	81%	6.75
	3 <sup>rd</sup>	-	-	-	-	-	-	100%	7.00
<b>OVERALL RATING</b>	1 <sup>st</sup>	-	3%	14%	44%	31%	8%	-	4.28
	2 <sup>nd</sup>	-	-	-	13%	19%	37%	31%	5.88
	3 <sup>rd</sup>	-	-	-	-	30%	50%	20%	5.90



**Table A-3 | Interview Checklist (assessment #1: n=43; assessment #2: n=19; assessment #3: n=8)**

Staff evaluates each student with respect to the following	Assessment (1 <sup>st</sup> , 2 <sup>nd</sup> or 3 <sup>rd</sup> )	Not at all Prof. (1)	Very Unprof. (2)	Somewhat Unprof. (3)	Acceptable (4)	Generally Prof. (5)	Nearly Perfect (6)	Very Prof. (7)	Mean (scale 1-7)
Arrives on time (prompt or early; not too early; calls if delayed)	1 <sup>st</sup>	2%	7%	20%	17%	15%	29%	10%	4.61
	2 <sup>nd</sup>	-	-	12%	6%	18%	29%	35%	5.71
	3 <sup>rd</sup>	-	-	-	-	-	37%	63%	6.63
Dressed Appropriately (neat, clean, attire fits expected work role)	1 <sup>st</sup>	5%	5%	16%	33%	19%	11%	11%	4.37
	2 <sup>nd</sup>	-	-	16%	11%	16%	5%	52%	5.68
	3 <sup>rd</sup>	-	-	-	12%	25%	13%	50%	6.00
Handshake (firm, appropriate length)	1 <sup>st</sup>	3%	18%	28%	28%	7%	16%	-	3.67
	2 <sup>nd</sup>	-	11%	21%	11%	16%	15%	26%	4.84
	3 <sup>rd</sup>	-	-	-	29%	14%	29%	29%	5.57
Eye contact (professional, relaxed, not staring)	1 <sup>st</sup>	2%	5%	29%	19%	24%	14%	7%	4.29
	2 <sup>nd</sup>	-	-	5%	21%	6%	21%	47.4%	5.84
	3 <sup>rd</sup>	-	-	-	-	25%	37%	38%	6.38
Came prepared (answers are thought out; evidence of studying)	1 <sup>st</sup>	-	-	7%	23%	42%	16%	12%	5.02
	2 <sup>nd</sup>	-	-	32%	26%	5%	5%	32%	4.79
	3 <sup>rd</sup>	-	-	-	25%	-	38%	37%	5.88
Respectful in	1 <sup>st</sup>	-	-	2%	14%	28%	28%	28%	5.65

conversation (uses “thank you” or shows caring)	2 <sup>nd</sup>	-	-	-	-	16%	21%	63%	6.47
	3 <sup>rd</sup>	-	-	-	12%	-	13%	75%	6.50
Speaks articulately (avoids fillers like “um”; answers are organized clearly)	1 <sup>st</sup>	2%	7%	25%	26%	26%	9%	5%	4.12
	2 <sup>nd</sup>		5%	10%	32%	21%	21%	11%	4.74
	3 <sup>rd</sup>			12%	25%	12%	13%	38%	5.38
Answers are personalized (thorough and related to self)	1 <sup>st</sup>	-	9%	14%	41%	24%	12%	-	4.14
	2 <sup>nd</sup>	-	-	16%	21%	21%	26%	16%	5.05
	3 <sup>rd</sup>	-	-	-	25%	38%	12%	25%	5.38
Talks about strengths but does not brag too much	1 <sup>st</sup>	-	3%	21%	42%	26%	5%	3%	4.16
	2 <sup>nd</sup>	-	-	21%	26%	26%	16%	11%	4.68
	3 <sup>rd</sup>	-	-	8%	18%	26%	30%	18%	5.50
Answers are thorough without talking too much	1 <sup>st</sup>	2%	7%	24%	19%	31%	12%	5%	4.24
	2 <sup>nd</sup>	-	-	10%	32%	42%	5%	11%	4.74
	3 <sup>rd</sup>	-	-	-	25%	37%	25%	13%	5.25
Engaged (talks with enthusiasm about self)	1 <sup>st</sup>	-	4.8%	6%	38%	31%	12%	5%	4.50
	2 <sup>nd</sup>	-	5	11%	11%	21%	26%	26%	5.32
	3 <sup>rd</sup>	-	-	13%	-	25%	12%	50%	5.88
Does not disclose inappropriate	1 <sup>st</sup>	-	-	9%	12%	16%	16%	47%	5.79
	2 <sup>nd</sup>	-	-	5%	11%	6%	17%	61%	6.17

information	3 <sup>rd</sup>	-	-	-	-	12%	13%	75.0%	6.63
Body language (open, relaxed, holds self well)	1 <sup>st</sup>	2%	3%	23%	23%	28%	12%	9%	4.58
	2 <sup>nd</sup>	-	-	5%	6%	26%	16%	47%	5.95
	3 <sup>rd</sup>	-	-	-	-	43%	-	57%	6.14
<b>OVERALL RATING</b>	1 <sup>st</sup>	-	5%	24%	31%	35%	5%	-	4.54
	2 <sup>nd</sup>	-	2%	5%	15%	39%	36%	3%	5.06
	3 <sup>rd</sup>	-	-	-	-	50%	50%	-	5.50

Table A-4 illustrates the change in average application scores in each category from the first to the third assessment, moving from most improved to least.

**Table A-4 | Highest, Lowest, Most Improved and Least Improved Categories<sup>18</sup>**

Categories	First Assessment	Third Assessment
<b>Lowest scoring</b>	<ul style="list-style-type: none"> <li>Application is Prepared (4.06)</li> <li>Applicant explains how he/she can help the Science Center (4.11) -</li> <li>Answers questions thoroughly without writing too much (<i>lowest</i> at 4.19)</li> </ul>	<ul style="list-style-type: none"> <li>Applicant explains how he/she can help the Science Center (<i>lowest</i> at 5.60)</li> <li>Formatted (5.80)</li> <li>Answers questions thoroughly without writing too much (6.00)</li> </ul>
<b>Highest scoring</b>	<ul style="list-style-type: none"> <li>Applicant <b>does not disclose</b> inappropriate information (<i>highest</i> at 6.08)</li> <li>Application is neat and clean (4.97)</li> <li>Applicant is enthusiastic about position (4.75)</li> </ul>	<ul style="list-style-type: none"> <li>Application is neat and clean (<b>highest</b> at 7.00)</li> <li>Application or letter has a professional tone (6.90)</li> <li>Applicant <b>does not disclose</b> inappropriate information (6.70)</li> </ul>
	<b>Between first and third assessment</b>	
<b>Least improved</b>	<ul style="list-style-type: none"> <li>Applicant Formatted (questions 8) (<i>least improved</i> at .11) - red</li> <li>Applicant personalized (.90)</li> <li>Applicant is neat and clean (1.0)</li> <li>Applicant is does not disclose (1.0)</li> </ul>	
<b>Most improved</b>	<ul style="list-style-type: none"> <li>Application or letter has a professional tone (<i>most improved</i> at 2.11)</li> <li>Application is enthused (1.67)</li> <li>Explains how he/she can help the Science Center (1.22)</li> <li>Answers questions thoroughly without writing too much (1.22)</li> </ul>	

<sup>18</sup> Application #1: n=36; Application #2:n=16; Application #3: n=10. Answers in parentheses are means.

Table A-5 | Lowest, Highest, Least and Most Improved Interview Categories<sup>19</sup>

Categories	First Assessment	Third Assessment
<b>Lowest scoring</b>	<ul style="list-style-type: none"> <li>• Handshake (lowest at 3.67)</li> <li>• Speaks articulately (4.12)</li> <li>• Answers are personalized (4.14)</li> </ul>	<ul style="list-style-type: none"> <li>• Answers questions thoroughly without talking too much (lowest at 5.25)</li> <li>• Answers are personalized (5.38)</li> <li>• Speaks articulately (5.38)</li> </ul>
<b>Highest scoring</b>	<ul style="list-style-type: none"> <li>• Applicant <b>does not disclose</b> inappropriate information (<b>highest</b> at 5.79)</li> <li>• Respectful in conversation (5.65)</li> <li>• Prepared (5.02)</li> </ul>	<ul style="list-style-type: none"> <li>• Applicant <b>does not disclose</b> inappropriate information (tied for highest at 6.63)</li> <li>• Arrives <b>on time</b> (tied for <b>highest</b> at 6.63)</li> <li>• Respectful in conversation (6.50)</li> </ul>
Between first and third assessment		
<b>Least improved</b>	Applicant <b>does not disclose</b> inappropriate information ( <b>least improved</b> at .84) <ul style="list-style-type: none"> <li>• Applicant respectful in conversation (.85)</li> <li>• Came prepared (.86)</li> </ul>	
<b>Most improved</b>	<ul style="list-style-type: none"> <li>• Eye Contact (<b>most improved</b> at 2.09)</li> <li>• Arrives on time (2.02)</li> <li>• Handshake (1.90)</li> <li>• Body language (1.70)</li> </ul>	

<sup>19</sup> Interview #1: n=43; Interview #2: n=19; Interview #3: n=8. Answers in parentheses are means.





## Appendix B | TESSA Astronomy Test

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Name: \_\_\_\_\_

Today's Date: \_\_\_\_\_

## TESSA Astronomy Test

We are giving you this survey to help us see how you are growing in your knowledge of astronomy. We do not expect you to know all the answers or to provide perfect responses on the open-ended questions. We are interested in how much you know now and how well you can explain your answers.

***You can write on the back or use more sheets of paper if you need more space. You can draw pictures or diagrams to help you answer the questions if you would like.***

Your answers will help the TESSA staff design the program better for you and others.

***Your answers will not affect your position, employment, or pay in any way.***

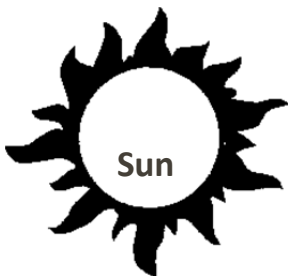
- 
1. True or False? Gravity does not exist in space. (Circle your answer.)
  2. Explain your answer.

- 
3. What is the difference between a solar system, a galaxy and the universe?

Name the planets in our solar system.

---

4. Draw a picture that shows which planets are closest to and farthest from the Sun below. You can include other objects in our solar system too if you would like.



- 
5. Why is the weather in Seattle hotter in the summer and colder in the winter? (Circle the correct answer or answers below.)
- a) The Sun sends out more solar flares that hit the Earth during the summer than in winter.
  - b) The Moon's gravity pulls on ocean water causing tide changes.
  - c) The Earth's distance from the Sun changes.
  - d) The Earth's axis is tilted.
6. Imagine that while you are working at Pacific Science Center, a 7th grade visitor asks you, "What is an eclipse?" How would you respond to her question?

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**Imagine that you want to look at objects in the sky. Then, answer these questions.**

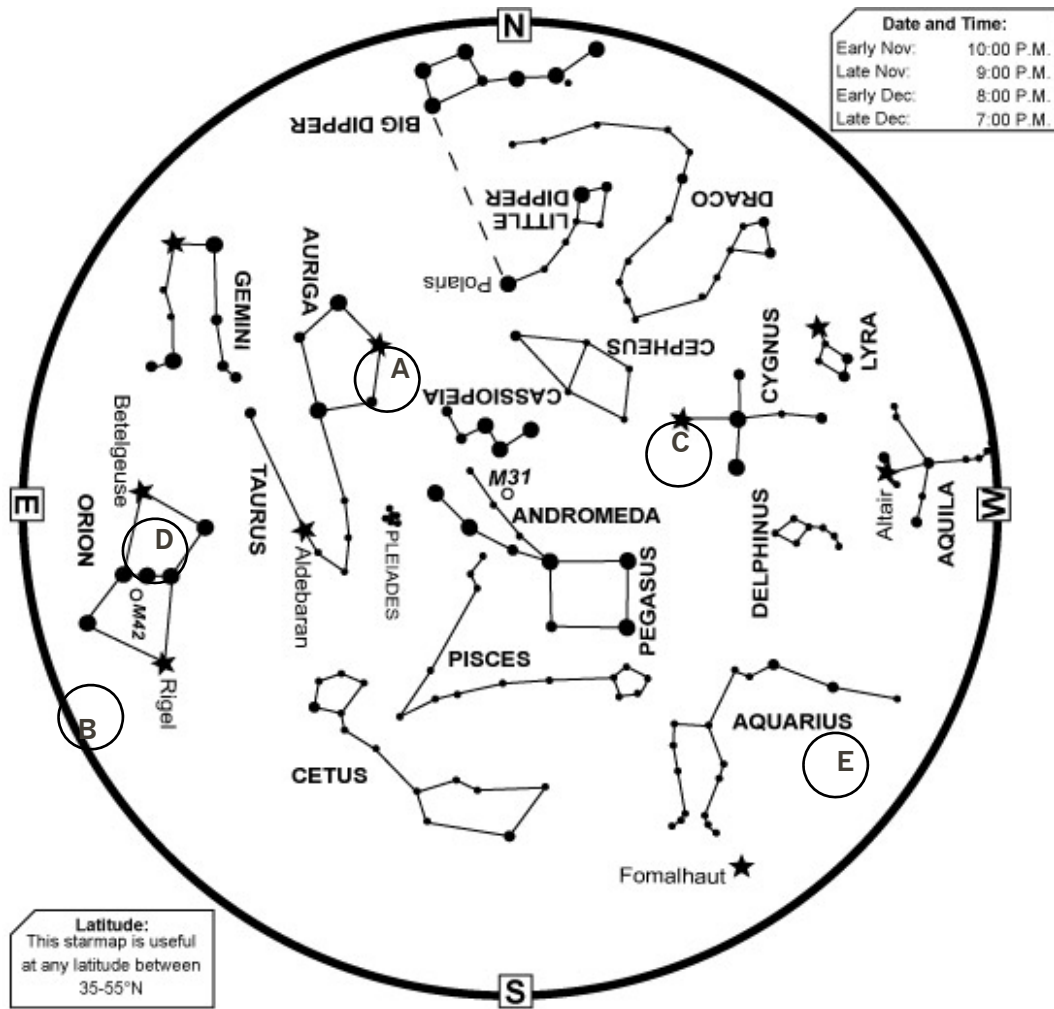
7. Circle all of the things on this list that you could detect in the sky **with only your eyes** (if you have good eyesight, glasses, or contacts):

An Airplane Flying	International Space Station	Venus	Asteroids
Milky Way Galaxy	Another Galaxy	Stars	Pluto
Solar Flares	Craters on the Moon	Aurora	Meteors
A Comet	Saturn's Rings	Neptune	Mars

8. Imagine that you are camping on a mountain. You are sitting outside on a clear night in the dark with your friend, and you can see millions of stars. You turn your flashlight on while you take a bathroom break. When you turn the light off, you notice that the stars look dimmer. What probably happened?
9. You are looking at Jupiter through the telescope when your friend asks you a question. You look away and answer her question for several minutes. When you look back in the telescope, Jupiter is not there anymore. You are sure that you didn't bump the telescope. What probably happened?

10. You want to use a telescope to look for spots on the Sun. What steps should you take to properly view the Sun?

Please look carefully at the star map below and answer the questions on this page.



11. Near the center of the map, there is a small circle labeled M31. What might that circle represent?

- a) another galaxy
- b) a comet
- c) the North Star
- d) a satellite

12. M31 is located on the \_\_\_\_\_.

- a) horizon                      b) zodiac                      c) zenith                      d) ecliptic

13. You are looking for a star called Alpha Orionis. Which of the following stars on the map could it be?

(Circle the correct answer below.)

- A                      B                      C                      D                      E

14. Imagine that you have this map and want to use it to look at the stars on October 6. Is this map still useful? If so, how? If not why not?

**Look at the 2011 Sky Gazers Almanac to answer these questions.**

15. On July 24, which planets can you see in the sky at midnight if the sky is clear?

16. What time does twilight end on Oct. 30? \_\_\_\_\_

17. What time does the Sun rise on Feb. 14? \_\_\_\_\_

18. What date in April is the Moon in first quarter? \_\_\_\_\_

19. What time does the Moon set on that date? \_\_\_\_\_

20. What are the dates of the solar eclipses in 2011?

---

21. What is citizen science? (Circle the correct answer or answers below.)

- a) when scientists study regular people in society
- b) when regular people contribute to science research
- c) when the government pays scientists to do a certain research project
- d) when science research affects the way that people vote

---

Today, your friend excitedly tells you that a special event is supposed to happen tomorrow at 10:46am. There will be a solar eclipse, and at the same time, a rare comet will pass overhead! You will not have another chance to see this comet for 150 years.

22. What information do you need to find out if you will be able to see the eclipse and comet tomorrow?

23. Where will you get this information?

24. Think of a specific current NASA mission. What is its name?

\_\_\_\_\_

25. What scientific questions does this mission try to answer?

26. How does it try to answer those questions?

27. Why should people care about it?

---

28. NASA has many instruments aboard satellites that orbit Earth. What things on Earth do instruments on satellites measure? Name as many as you can.

---

29. When you are working at Pacific Science Center, an adult visitor might ask you this question: “How does NASA’s research help society?” What would you like to tell this adult? Say as much as you like.

**For the following questions, look at the maps in Visual Aid 1.**

30. What does the color dark red symbolize on these maps? (Circle the correct answer or answers below.)

- a) The average temperature is very hot in this area
- b) The average temperature is 2°C in this area
- c) The average temperature is 2°C hotter than expected in this area
- d) The temperature shows that it is summer in this area

31. In what part of the world has the global temperature changed the most since 1900?

- a) the Tropics
- b) the Arctic
- c) the Americas
- d) Africa

32. What big conclusion can you draw about global temperatures by looking at these maps?

33. Why is this conclusion important to people around the world?

34. The scientists who make maps of temperature changes like this one are most likely \_\_\_\_\_.

- a) climatologists
- b) astrobiologists
- c) astronauts
- d) geologists

35. What steps would you take in school to become that kind of scientist?

36. A 7th grade Pacific Science Center visitor says, "I thought NASA was supposed to study outer space, like planets and stars and stuff. Why is there all this information about Earth?" What would you tell him?

**For the next set of questions, look at Visual Aid 2.**

37. What kind of information does picture D tell us that the others do not? (Circle the correct answer or answers below.)

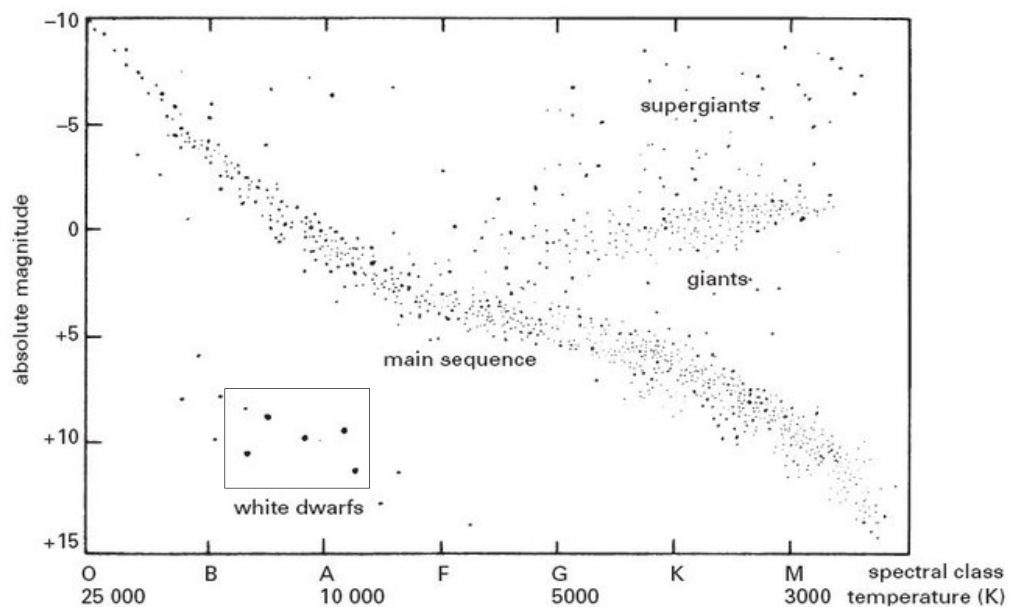
- a) How the Orion Nebula appears in visible light
- b) Which parts of the Orion Nebula are hot or cold
- c) What elements the Orion Nebula is made up of
- d) How much microwave radiation is coming from the Orion Nebula

38. Is one of these images more accurate than the others? Why do you think so?

39. Pick one of the images and explain (as you might to a Pacific Science Center visitor) what it shows and what information scientists get from this image.

---

**For the next questions, look at this Hertzsprung-Russell diagram.**



40. What information does this graph tell us?

41. Stars inside the square probably are:

a) very bright

b) medium bright

c) very dim

42. Draw an "X" on the graph where you think our Sun should be.

43. Circle dots on the graph that represent stars that might one day become supernova.

44. Here is a list of objects. Use these pages to draw pictures that might help someone understand where these 12 objects are in space. Make sure to show which are closest to Earth and which are farthest away. Label your pictures.

Airplane

Closest star to our Sun

Moon

Andromeda Galaxy

Edge of the Universe

Most stars we see

Asteroid Belt

Man-made satellite of Earth

Pluto

Center of the Milky Way

Mars

Sun

45. Was it difficult to make these drawings? If so, what made it difficult?  
Are you happy with your pictures? Why or why not?





## Appendix C | TESSA Focus Group/Interview Summary: 2014 and 2015 Graduates

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## TESSA Focus Group/Interview Summary 2014 and 2015 Graduates

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This report is a summary of response trends from focus group and one-on-one interviews conducted in 2014 and 2015 by Bill Leon and Jennifer Weaver of TESSA program participants. In 2014, there were nine respondents and in 2015 there were 17.

Response trends are ordered by question and divided into two sections; questions asked in focus groups and questions asked in one-on-one interviews. Each question has a summary. Responses are a sample from the discussion and are presented mostly in the words of the participants (unless noted). Some responses have been combined when ideas are similar.

### FOCUS GROUP QUESTIONS

**A. You all have spent many hours studying and working here. What is the coolest thing in Pacific Science Center--the one thing that you think everyone should see?**

<b>Summary</b>		
<b>4 Mentions</b>	<b>2 Mentions</b>	<b>1 Mention</b>
<ul style="list-style-type: none"> <li>• Butterfly House</li> </ul>	<ul style="list-style-type: none"> <li>• The Iguana</li> </ul>	<ul style="list-style-type: none"> <li>• High Rail Bike</li> <li>• Water Outside</li> <li>• Pompeii Exhibit</li> <li>• Ripley's Exhibit</li> <li>• Laser Dome</li> <li>• Bubble Fest</li> <li>• Visiting Exhibits</li> </ul>
		<ul style="list-style-type: none"> <li>• 3D Exhibit</li> <li>• Body Casting</li> <li>• Video reenactment of the eruption</li> <li>• Harry Potter Exhibit</li> <li>• The Space Zone</li> </ul>

## 2015 Responses

- Probably the Butterfly House. I feel like it's probably our most interactive exhibit as well as being pretty cool just in general.
- The exhibits--Pompeii, Ripley's, Iguana, visiting exhibits, and the animals.
- I like the Laser Dome.
- If you were to come here just once and have to see something, I think you have got to go see the Butterfly House and I know that's a very cliché answer but it puts you into the experience, makes you very immersed in the science...there's so many interpretation opportunities not many people know about butterflies and there's so many ways to with the butterfly topic. You can go to conservation, you can go to butterfly migration, and you can go to how they live, how they go through pupa and chrysalis, and what's the difference between butterflies and moths. There are so many scientific things you can do and it's really really neat. I think everyone should go there.
- Coming in the summer and going to Bubble Fest. Everything to do with bubbles. Stations where there's bubble art. Fun for kids and adults. Adults can be like big kids.
- The exhibits that move in and out. The research area where it's actual and ongoing research--right now it's allergies. "Tide Pool is always a fun experience for the kids. It's really hands-on, they can really touch and feel. There's an actual interpreter there to answer any questions that they have and since they're all local animals from the Puget Sound, people can actually relate to their habitat.
- The Butterflies and the High Rail Bike.
- The High Rail Bike because when they ride it they're scared. 3D exhibit. Body castings were cool. Video reenactment of the eruption. Harry Potter exhibit.
- The Space Zone – you can learn about subatomic particles, the order of the planets, how much you weigh on different planets, and the phases of the moon – so it's a bunch of things

## 2014 Responses

- Few comments

B. In what ways are you different now than when you started TESSA and how has working here helped you change in these ways? What new skills, interests or knowledge do you have as a result of being part of TESSA?

### ***Summary***

**Program is effective in:**

- Helping shy people engage with others;
- Exposing youth to more diverse people and learn how to interact with them; and
- Helping youth develop professional presentation skills in a safe environment.

### **2015 Responses**

- Before doing the TESSA program I was a lot more shy.
- Inside, I'm a lot more willing to go up to them [strangers] and ask them if they need directions or start a conversation about something cool. Outside the science center. I look at everybody differently. Instead of random strangers that I should be avoiding...if needs finding directions, I help.
- I'm a lot more comfortable talking to strangers or my friends.
- I find it easy to talk with everyone.

### **2014 Responses**

- Now know how to teach and portray information to someone else in clear ways.
- I know how to talk with people professionally and to different types of people; in different environments.
- The science center has taught me how to start conversations with others with an objective in mind (e.g., teaching someone something).
- I have confidence in talking to different people; working with diverse, eclectic groups of people; I would not have had this experience otherwise.
- When I first started, I was really shy and in a shell; When I first came into the program, I was pretty timid and wasn't super confident.
- ...but over these last three years all those qualities [being shy, not outgoing] have changed about me. Nowadays I'm much more able to approach people that I haven't talked to before and now feel more comfortable, especially when I'm speaking to strangers.

- Meeting others and getting to know Portia and Josh better helped me break out of my shell; I'm not shy in public anymore.
- I am far more confident when talking with strangers.

### C. Even if you thought they were challenging or even not fun, what training or work activities have been the most influential in helping you develop new skills, interests or knowledge?

#### **Summary**

##### **Program is effective in:**

- Providing effective and engaging training modes;
- Combining observing and practicing makes presenting more effective; and
- Interacting with older peers who are important and helpful.

##### **Program could be more effective in:**

- Providing more variety in activities;
- Providing hands-on research activities that teach science and research skills; and
- Asking open-ended question to provoke more thought.

#### 2015 Responses

- All of the first trainings especially when you first get promoted – it's nerve wrecking but really useful.
- The Touch a Brain Cart it was the first one-on-one. Tide pool was too swamped. It helped me develop ideas and adapt to the other person. I learned a lot from the space cart. Have some things with more deeper look at space...pocket courses.
- I also liked the Card workshop because before I wasn't really sure of what to say without having people lose interest. It helped me organize my thoughts.
- Shadowing helps a lot.
- Some of the discussions are too basic in a training and I just say what I'm supposed to say. The thing that Matt did with the open-ended question was really good. Presenting in front of people is really important if that's what you're going to do.

#### 2014 Responses

- Shadowed older coworkers, learned their tricks
- The TESSA presentations on the floor helped in gaining more interest in science field

- Older peers seemed confident, prepared, outgoing, charismatic, humble - could see them setting an example; ...showed me that this was something that was attainable
- Everything they teach us is understandable
- Role playing; visitor and interpreter; OK to mess up, figure out what to say to an actual visitor
- Games; fun but with overarching concepts - like answering questions positively

## D. What suggestions do you have for improving the TESSA Program or anything else at Pacific Science Center? [all—some from interviews too]

### **Summary**

Responses are varied and each should be considered. Many relate to making the work and educational activities more focused on earth and space science.

### 2015 Responses

- The learning curve could be a little steeper because the first part is about customer service and the second part is about science. Sometimes I'm at a higher level but I'm being treated like I'm at a lower level and if the people working here were allowed to talk with different people and they could tell them that they were ready to move on to a different level, that would be better.  
*(Interviewer Question-Is there anything that would make it easier for you to go up to someone and tell them that?)* I think because in Discovery Corps we are all treated as one level we are not allowed to individually go up.
- Before I got promoted to the position I am now, I missed the training date so it took about a month or so. I think they are doing a great job of exposing us to the science of stuff but I feel like if they would let us attend events more frequently, we would learn more about and have thoughts on what we would want to do in the future.
- Talking to a lot more people and to the mass public is always going to be a little uncomfortable to the person so I don't think there's any way that TESSA can stop that feeling from occurring but if there was a way I think that's something.

- I really enjoy the program and think that it's great to be able to work with the adult staff instead of having our own little thing in the corner. We get to be part of the Science Center. The only thing I would suggest is working in the planetarium but they already started that. I know some kids that are interested in working on the stage so that might be the next step for the program.
- I really like this program because it gives you opportunities to do things, like internships. If I wasn't in Discovery Corps I would not have been able to do an internship. The [internship I did] was super fun. I could use what I learned here and could teach little kids. The people really care about us and give recommendations and suggest things to attend. I really don't like the pre- post-test things. You learn things but not stuff that you can answer in the test. It would be better to test us on things that are more specific. *(Interviewer Note-When the recorder was off she said after TESSA, she really liked astronomy because if it wasn't for TESSA, I don't think I would really care.)*
- The survey where you check the knowledge should be done somewhere in the middle so you can see better how the person has grown. Have someone who's in Discovery Corps be part of the interview to get a different perspective--someone my age that I could ask questions.
- *(Interviewer Question-What would make this program good for other participant?)* Needs to be improvement on space if we're focusing on space that's what we signed up for. A variety of carts would be good.
- *(Interviewer Question-What do you think about the career ladder?)* I think it's really good but when I did my internship I missed out on things and others were so much farther ahead. If they could make the program more individual it would be nice. Make it more content and hours based. Sometimes you don't have the hours but you work just as hard.
- *(Interviewer Question-How could moving up be made more content based?)* Keep track of Kudos. Have homework so you could track progress for hours without being there to get hours. Hours don't prove anything as far as what people are doing. It has to be based on what people did in the time. "Quality over Quantity."
- *(Interviewer Question-How different is your life now than before you started as a result of working at Pacific Science Center?)* I feel like it's a positive manner. It's fun to tell people that you work there. I don't like negative things, I try to find the positive.
- *(Interviewer Question-What would have made your experience even cooler?)* I feel being able to do certain positions earlier rather than having to do all of those checkouts, it should be open and do the things to proceed rather than waiting no matter where you are. If I got to see a light show in building 3--never have seen one. I want to see a laser show.



- *(Interviewer Question-Other comments?)* I feel like Portia and Josh do a good job and make things fun and help us to succeed. Have fun learning and interacting with people because you become a more people person.
- Favorite part about TESSA are the people, I love the people because they're so energetic about science and enthusiastic and really giving and happy, well maybe not all the time, they're like drama kids. Seeing all of that and saying, 'I like it too.'
- *(Interviewer Question-Other suggestions?)* The opportunities and the structure and different levels and there's more responsibility added at each level. It's difficult if you are going to have internships and Discovery Corps because you're not able to move up with your classmates. I would make it so our supervisors have more control over who they push up and keep down. There are some people who didn't do much but kept getting moved up because they learned their pieces but nothing else.
- *(Interviewer Question-What are the types of requirements?)* Set an amount of hours before you can move up. I would love it if we could do more stage shows and demos would be awesome because I know some people who really could. Not having positions we don't need like to do? Having more positions throughout the Science Center. Add a bunch more and eliminate some that aren't needed.
- There's a set an amount of hours before you can move up. I would love it if we could do more stage shows and demos would be awesome because I know some people who really could. Not having positions we don't need like to do. Having more positions throughout the Science Center. Add a bunch more and eliminate some that aren't needed.
- *(Interviewer Question-What would help to learn more about careers?)* The steps involved in getting a career and ways to find connections in a field. The type of internships and the steps in between. Used to have guest speakers and workshops outside of the Science Center but now lack speakers especially in TESSA. There aren't enough internships for astrology-- bring back partnerships and establish connections.

## 2014 Responses

- Floor work - more TESSA activities there
- At the beginning we waited to do things; let people choose what to do
- More variety; not as many activities in TESSA as in Discovery Corps with astronomy
- Gets repetitive
- My knowledge of space and earth sciences developed more outside through study or already existed; don't really feel like my understanding changed that much
- Liked close observation exercise in year one; would like more things like that

- Documentation of activities at first; presentable to a college; stopped but would have been useful to show to school
- Thought TESSA would be more involved on the floor
- More field trips (3 mentions)
- After trips, relate event to work at the Science Center - do presentation to people; staff, Discovery Corps, and visitors
- Tangibly relate outside events to work
- Follow through on projects; essay on a NASA mission started but stopped
- Not spending too much or too little time on things - moon crater exercise was too long
- More individual opportunities to really focus on NASA and astronomy
- More direction on projects; make it even more distinctively focused on NASA and astronomy
- Now fewer opportunities to do things outside of the Science Center
- More floor-related activities
- More career information
- Do more science based stuff; visit scientists; have them come here
- Do movie in planetarium
- NASA should fund it more so other kids can do it
- More opportunities to do fun projects; only started doing projects when they came up (messenger and rover happened)
- Include Apollo program and older things (Gemini pod)
- Different shirts for TESSA to distinguish us
- Learn more about space (after learning other things at the Science Center)
- In the summer, TESSA tasks are repetitive; have to change it to make it more interesting for me and others
- Need more variety of space-related things
- You get both Discovery Corps and TESSA experience; now more merged; place more emphasis on earth and space
- Do a lot of earth and space science activities but could do more; same as Discovery Corps at first, later less focused on space
- Greater emphasis on earth and space science; TESSA advertised as more specialized; more positions and time devoted to that
- Have more opportunities to do projects with other TESSA mentors
- Time to talk and come up with new things to do on the floor

## INTERVIEW QUESTIONS

1. You all have spent many hours studying and working here. What is the coolest thing in Pacific Science Center—the one thing you think everyone should see?

Combined with Focus Group question A answers.

2. How has working at the Science Center changed you in any way (big or small)? How are you different for having volunteered here? Let's discuss these changes in specific areas.

2a. How have you changed in the ways you relate to strangers?

2ai. Inside the Science Center?

### *Summary*

**Program is effective in:**

Helping youth change, engage with strangers, develop professional skills, confidence and less shy.

### 2015 Responses

- I've changed a lot from just growing and learning new things and exploring, and, you know, going on the field trips, making new friends here, and just having interactions with the guests. When I first started I was more shy, and not so much out there and just very shy and I just kept to myself; but just seeing other people interact with them and people in SIP and you know the other programs and seeing how they interact and seeing how they could just talk to them, it taught me a lot by visually watching them. I was more shy then, and now I can speak to the groups and go up and doing different things, so that's one of the big changes. And you know I've learned a lot, I'm moving up.

- I'm like a completely different person. When I first started the program I was really shy, I wouldn't do anything, on breaks I wouldn't even go into the break room because I didn't want to have conversations with people but after a good six months, everyone is so welcoming that it is easy
- Public relations skills are a big thing – I think talking to people one-on-one is a lot different – talking to someone conversationally at an exhibit or talking to a large group...How I relate to people in a job setting or in an interactive setting is a lot different. That's probably the biggest skill I've learned.
- Inside, when I first started, we had to do – you know pocket sciences and...I was more like, you know, not afraid, but not like out there enough to go up to somebody but then you know visually watching people like I said and just shadowing and you know seeing how other people interact with guests gave me, you know, like if its ok for them to do it I should do it too, so yeah.
- I am definitely more willing to talk to people I don't know. (Now, she will go up to people instead of just them coming up to her)
- It's help with just talking with people and not having a specific script.
- Here I have to have more of a professional side. That's the only difference.
- More confidence
- I have to be extroverted. Public speaking is definitely better. I'm comfortable and confident in public speaking. Workshops are really helpful.
- More proactive with talking with people even outside of PSE.
- In school there are a lot of presentations you have to do and you can't just learn it all here. You can't read something for an hour and expect to know everything about. You have to research it so that you can teach it and talk about it. You learn a lot from other people.

## 2014 Responses

- When I first started I was hesitant to talk to people; more comfortable
- Roving to engage people; it's ok if they say no (don't feel rejected anymore, accepting rejection
- First it was scary to approach people you don't know; now I feel totally comfortable approaching strangers; they are here to have a good time and I am important to that
- Prepared to give an answer
- Learning that saying that "I don't know" is ok
- Now after having conversations with people, they turn out to be completely different from what I first imagined them being

- Need to be yourself around people who don't know you; makes conversations more genuine
- One of the most central parts of working at the science center is the connections you make with your fellow colleagues

## 2a.ii. Outside the Science Center?

### *Summary*

**Program is effective in:**

Helping youth develop and use transferable skills that help them in school, in life and that enhance the community.

### 2015 Responses

- Outside of the Science Center I'm more of an introvert. It takes energy for me to talk to people and I have to kind of work myself up to do it and if I actually want to...I wouldn't say that that's change a lot because that's just how I've always been, but if I do talk I know how to calm myself down enough to talk, like if I'm nervous. Inside I have to be extroverted because that's kind of what my job title is: Extroverted Smiley Person who can tell you about stuff. So I just practice. I heard this one tip that if you smile for a long time it will make you feel happy. So I always have to go in a room and just smile to myself. It's really freaky, like, if someone walked in and saw me going (makes face) – but that's just one tip I've learned. So just trying to be extroverted and talk to people is something that is different here that is not outside.
- Outside, I would say I'm more open to people asking me questions, and I've learned more things just because I'm older now, and like I said not being so shy, like breaking down , and you know actually having conversations.
- Even outside the science center, if people generally look lost or if they need help or if they have questions, I'm more willing to help them.
- More proactive with talking with people even outside of PSE
- I go to summer camps and make friends there. It helped me to make friends by being comfortable going up to strangers and asking them what they were interested in.
- It's easier for me to guide new people in the outside group I lead. At a summer camp and there are dangerous things and are far away from emergency service so you sometimes need to tell kids not to do dangerous things. I can incorporate things I learn here there.

## 2014 Responses

- Now I love engaging in conversations on the street
- More articulate (e.g., choose words more carefully)
- More easy going
- More accepting of others
- Not afraid of questions
- Skills help in school; now speak up in class
- In school; I now have more leadership skills - can present my ideas as an option and solicit others' input to make it personal to us; In school; more confident in interactions
- When I see someone confused in a store I try to help
- Compliment people; see what we have in common
- Transitioning small talk into objective context and information

2b. How have your work skills changed? Think in terms of work here, in school, at home or in other jobs or activities.

2bi. Confidence in public speaking?

### ***Summary***

**Program is effective in:**

Helping youth develop their public speaking skills.

## 2015 Responses

- Public Speaking is, like, off the roof now. Like I said I was always that shy kid, and now my confidence in speaking to people is, I can have, like, a full on conversation and I have a great time interacting with guests so it's really gotten better.
- Oh I can definitely do it now. Three years ago if someone had told me that I would be talking in front of people once a week I would be like – 'No way, no I'm not'.
- My public speaking is definitely a lot better. I probably could have said something in public before but it would have been a little bit embarrassing and I'm sure that I would have said something that I would have regretted saying, and also I would have been probably more dependent on pre-written stuff. Now I can probably speak to someone or a large group of

people pretty confidently. You kind of have to learn how to calm down. And that's kind of an important thing I've learned here. There might only be one event where you're public speaking but there's always going to be group control, crowd control, stuff like that. Tide Pool you have a microphone and you're talking to a large amount of people. So that's been helpful.

- *(Interviewer Question- What do you think has been useful in helping you learn how to do that?)* A lot of the workshops that we've done here actually. I love training here because there's lots of food, funny ice breakers and you kind of get to sit around a lot. I mean you're learning stuff but it's not like you're working. And you get paid time for it, which is nice. So Workshops are fun. I'd say that they were really helpful. I remember Matt ran this workshop about open-ended questions, and so he started out with an open-ended question and he didn't really talk about what he was going to say, and we started talking, and at the end we were like – oh, that was a whole presentation! You tricked us! It was really cool.
- I take my time when talking with the guests. My communication skill improved more.
- I feel like that's what TESSA has given to me, being able to take really really complex knowledge and ideas and change it and be able to explain it to people using reality.
- Shadowing and working with someone helps a lot.
- Speaking in front of large groups is still a challenge for me but I feel like it depends on the environment I'm in. If I'm in a classroom and I know all of my classmates, and reading out loud or in front of the class that's not really a big thing. Now if I'm out on the public, I get stage fright and my knees start to shake. Once you have some authority, I feel they're going to listen and it's easier to talk to people...so I don't have to worry about having to get their attention.
- I have more confidence when talking with people.
- I definitely can do it now.
- It's easier now. Easier to explain heavy content to little kids by breaking it down.

## 2014 Responses

- Now I really really enjoy talking in front of large groups of people
- Yes; still have fear of embarrassing self or messing up but now can do it more comfortably
- Talking to professor in running start is easier (as well as other people in authority)
- Now class president; in high school for the past four years - easier to get a group's attention; get quiet first instead of trying to talk over them

## 2bii. Interaction with people of different ages?

## Summary

### Program is effective in:

Helping youth learn how to talk with and explain science to people of different ages.

### 2015 Responses

- I've always had a connection around my age group, so that's never been an issue. But with older people, I don't have any problems speaking to people but I was just so shy about it. So I mean – just the shyness, I would have, like, sweaty hands and I would be so nervous to talk to people. I don't know why, and I don't have a problem speaking to people [now]– any race, any age.
- It's easier now because before I had difficulty explaining heavy content to little kids because they don't have the background to understand it. But now I would say that it helps me understand it even more to be able to break it down and explain it to them, and I can pretty much talk to anyone of any age.
- I don't know I've never really thought about how much that's changed. With ages it's definitely changed. If you ask me if I like children, I won't say yes but I won't say no. I mean it's kind of ridiculous if someone says to you 'Do you like children' and it's like 'Well, I don't like everybody so why would I like children? They're just smaller people'. As someone who's relating with the public, since you're representing an institution instead of just yourself, you kind of have to take some pride in that and make sure that you don't say anything that's going to offend people. So that can be kind of difficult sometimes when handling children. So I feel like that's changed a lot. With older people it's easy generally, I'd say.
- I'm more willing to talk with people and join in instead of waiting until someone asks my opinion.
- I find it easy to talk with everyone
- That's easy too. I can relate to my age group or groups in between.
- Got over shyness.

### 2014 Responses

- Communication skills have changed in huge ways
- The science center attracts such a diverse audience; 5-70 year olds; I have had to adapt my speaking; figure out how to talk to diverse audiences
- Learned to connect with kids based on age so they understand what I'm saying



- Learned how to tailor information to their interest and help them get something out of it
- More comfortable talking with children
- Boy with mental disability - students worked with him; learned how to work with him (he was excited about everything and was able to get as much out of the experience as the others)
- Confidence with adults; seemed odd to explain things to adults now it's not weird to teach them

## 2biii. Showing up on time?

### *Summary*

**Program is effective in:**

Helping youth improve their punctuality, but it is still a struggle for most.

### 2015 Responses

- I would say making it to work on time has improved a lot, because when I was younger I didn't know because you know I was young and it was my first real job, and it's really improved, because I was so young, and you know, I was late a lot, and I just really didn't understand it a lot. And now that I've gotten older and I've grown a lot and I've had a chance to do different jobs and things like that, you know still holding this one down, it's improved a lot. Time, you know, trying to make it there early, like here I always try to be on time and stuff so it's improved.
- I'm definitely more punctual now. I think in my first year I was late all the time because I was really bad at estimating [how much time things would take] but now I try to give myself a good thirty minute gap of extra time so I'm not late. And it's definitely helped me outside the science center too, not being late for college interviews and going to other things – just being punctual.
- Finding where the buses and alternate routes helped.
- Being on time if really important. Time management is important because it affects other people and it gets everything messed up. Not as distracted.
- I'm better at showing up on time.
- Improved showing up on time and time management. Mostly due to the fact that I was being held accountable. If I want to move up, they look at those things. If there wasn't any consequence or reason for being on time I would be late all the time.

- I'm definitely more punctual now. Better at estimating time to get to work and giving extra time. It's helped me outside PSE too.

## 2014 Responses

- Most (i.e., 95%) of the time but still a struggle
- It's been kind of a hassle for me
- Yes; used to not understand the reason for it

## 2biv. Organizing and using your time better?

### *Summary*

**Program is effective in:**

Helping youth improve time management at work and in other aspects of life.

**Program could be more effective in:**

Helping youth balance work and other life requirements (seems to be a struggle for most, but this is normal).

## 2015 Responses

- Just talking to Portia and Josh and them kind of being on my about it, because I really didn't understand why, but now that I'm older, they've taught me, 'You have to be there on time, and that shows respect'. It's respectful to be on time, especially at an establishment like your job, and working and you're getting paid for it, so it's kind of like – you have to do that.
- It's definitely helped me manage my time more efficiently and to decide how much time I should put into what.
- Organizing my time is a lot different. When you have to punch in on a time clock, you know if you're late or not. So trying to be on time is important to me. And so I'd say that that's improved. I'd say that probably most things professionally have improved. Especially since this is the first job I've ever had. I came with no skills and now I have a lot that I could actually put on a resume. Yea showing up on time has definitely improved, and punctuality and stuff like that. It's important to me generally to be on time but I know that its numbers if you're two seconds late it's not going to kill someone. But I'd say time management has improved as well. I know if I'm going to be late or if I'm not going to show up to call someone, so that's helped.

- *(Interviewer Question-What was useful to you in making those changes?)* Just the fact that I was being held accountable. Since I'm being held accountable and since this is my job, if I want to move up or do something different or just in general learn something new, they look at if you've been on time; they look at – we wrote reports and stuff, before you take a break you have to write reports about time. So they look at that and we'll do reminders and they look at that if they're offering promotions. So the fact that you're held accountable about whether or not you're going to move up or stay where you are is probably the biggest part (of what helped me to improve). If there wasn't any consequence and there wasn't any reason for me being on time, I'd be late all the time.
- I prioritize a lot better with homework.
- I'm not as distracted.
- I don't waste my time doing things that don't benefit me and that I want to do.

## 2014 Responses

- Helpful to have time dedicated to developing life skills that was outside of school work and sports
- Yes; this challenged me - I have to watch schedule every day because of school and work in addition to other activities
- One of the challenges has been balancing working minimum hours and making sure I have a solid presence here and that I'm moving forward while also balancing my other interests outside of the science center
- Learned how to better balance my life

## 2bv. Creative problem solving?

### **Summary**

**Program is effective in:**  
Helping youth develop and use problem solving skills.

## 2015 Responses

- I've always been a good problem solver.
- There's a lot of problems solving and Pacific Science Center.

- I think the most important thing to do with a problem...the first thing you need to do is see what you want as a result. (Continues to discuss problem solving approach; already had this coming in.) Look at what you want for the result to know how to solve the problem. **The solution will present itself, once you know what your goal is.**

## 2014 Responses

- I have learned to stay calm and collected so you can understand that everything is going to get better
- Now I look around the problem and think about different approaches; Now I am faster at finding a solution
- Still challenging at times but now I will engage and not ignore
- At the science center, things happen that you don't expect to; never trained for exact situation but need to assess situation very quickly and solve problems

## 2bvi. Working in groups?

### **Summary**

Most youth enjoyed working or got better at working in groups and learned from others while some were resistant to working in groups and preferred working on their own.

**Program is effective in:**

- Helping youth learn to work in groups.

**Program could be more effective in:**

- Giving youth opportunities to work in larger groups (mostly in pairs now) with more sustained projects and goals.

## 2015 Responses

- Very much improved on working with groups. I've always been a good problem solver, but groups – I was always shy, because I didn't know anybody here, and coming in alone, but being with the groups and seeing that nobody really knew each other but we were all interacting and stuff, so I would say yea, that's improved too also.
- (*Interviewer Question-What do you think has helped you to change in that way?*) Just watching other people's interactions, like my fellow colleagues at work and seeing how they interact with everyone, inspired me to be like them basically in a way.

- I go to a STEM school so we do a lot of group work. That and the Science Center have helped to get more comfortable with group work.
- Working in groups helps me think outside of the box and come up with solutions to problems that people don't necessarily see because they're like one track minded.
- I'm really bad at working in groups...it's that other people don't do work my way...especially in school, I want to make sure that if I'm doing work, it's going to be an A. So, if you're going to write a bunch of stuff and it sounds really nice but it's not what it's supposed to be, I am going to go in and change it. So that's just kind of what I'm going to do. I usually will take the leadership role when I'm working in groups, but I've been trying to work on cutting that back. The science Center's been kind of helpful with that because there is already a hierarchy set up. So it's like, these are the people who will teach you what you need to know. It's pretty easy here because most people are pretty driven and kind of know what they're supposed to be doing. And they're pretty intelligent usually.
- I enjoy working in groups. I like hearing different ideas from everybody and putting them all together into one big solution.
- I don't do a lot of group work. You shadow people and it's good to know there are others to rely on and ask that know more stuff. Can't completely rely on yourself you can learn from others.
- I never was a fan of group work. I feel mediocre about it. Nothing's going to change that. I don't like depending on people or them depending on me.
- LANCAT was a good example of working with a group of teens where we able to take different parts and put all the things together to have a solid thing instead of just one person doing everything and it being all scratched together.
- I tend to like to work by myself because I have all of the responsibility and everything is going to get done because if it's not it's my fault and there's no one else to blame. But I feel like here everyone has the same objective, the same goal to reach and want to do things great manner so working in groups here is easy.
- I've improved on working in groups.
- Really bad about working in groups. Other people don't do work my way. If I'm doing work it's got to be an 'A' and I will change it so that it is an 'A'. I've been trying to work on that. It's easier here because people are intelligent here.
- I go to a STEM school and I'm definitely more comfortable working in groups and thinking outside the box.
- Enjoys working with all groups

## 2014 Responses

- Enjoy it
- Working with diverse groups makes it better.
- Work to optimize each person's strengths and minimize their weaknesses.

## 2bvii. Working with or helping people of different backgrounds, ages, etc.?

### *Summary*

**Program is effective in:**

Helping youth learn how to engage and adapt to people of different backgrounds and abilities.

## 2015 Responses

- Everyone thinks differently. I went to a school where there were a lot of backgrounds...I've shadowed people and they all have different approaches to the same thing. You can be working on the same activity and each group works a different way or explains things a different way. You can adapt your own style but can take from all of these different people and all these different ways and make it your own. The great thing about Pacific Science Center is that it's not just one age group, you have multiple age groups and they all see stuff differently because everyone's different."
- The great thing about Pacific Science Center is that it's not just one age group, you have multiple age groups and they all see stuff differently because everyone's different.
- When I was younger I was comfortable interacting with toddlers and adults but not teenagers because those are my peers. Being in TESSA and being employed at Pacific Science Center, I've learned to connect with the teens and with all different age levels and to be able to give them the knowledge for their age level. Start at a base and expand. Like asking a little kid, do you know what a star is? Do you know that the sun is a star? Okay, so let's go off of that...
- It changes you because you want to adapt to the visitors...it's not about me, it's about them.
- No problem working with different groups.

- It hasn't changed that much but with ages it's changed. Children are basically small adults that haven't learned how to stuff all these things that we call manners away yet. So, that's a difficult thing you have to learn to deal with...with older people it's easier.

## 2014 Responses

- Sometimes have to correct for cultures
- Try to be more comfortable - when they have accents, learn not to judge
- I don't get frustrated; calm and collected
- Used to just repeat information if they didn't understand at first; but now can cater information better; With ESL folk - speak more slowly and use more of a basic vocabulary, find someone else, or translate
- People with disabilities; learn what you have in common
- Because the staff is so diverse, it desensitizes you to people from other backgrounds; helps you focus on the real person

## 2bviii. Getting your work done?

### **Summary**

**Program is effective in:**

Helping youth learn how to get things done and balance priorities.

## 2015 Responses

- Don't be afraid to ask for help. That's one thing I learned. And let them know if you feel like you don't know something and you know it's going to keep you behind, like being on time, and ask for help and ask them to explain what's really going on in detail so you can be on time or have the work done on time – so just don't be afraid to ask for help and don't be afraid to speak up.
- (*Interviewer Question-What activities have been most influential?*) So when you're in Discovery Corps you get promotions and you move up, and those trainings teach you so much that you need to know when you're going to the next level, and you just have to be alert and listen and make eye contact and listen to what they're telling you because it's going to help you in the future when you move to new positions and stuff. Some of the most useful things (I've learned) is they teach you how to learn your carts...and how to have

better interactions with the guests Also, I'm making sure that I use my time efficiently, and if I need help I am making sure that I don't inconvenience someone so I let them know ahead of time – hey, I might need this or that because this needs to be done by this day.

- Training or work activities that have been most influential
- Most trainings have been useful for me. Sometimes I feel like the less helpful things are some of the discussions (model discussions in trainings). Some of the questions that are asked are pretty easy to answer, and they are pretty broad and vague. Sometimes they make for good discussion, but I would say that most of the time they don't. But things that are really helpful are like the thing that Matt did with the training with the open-ended questions. It was really cleverly done, where he was engaging us in the strategy that he was trying to explain and letting us figure it out.
- Pressure and having to present something to people forces you to learn something really well.
- You're never really going to do it quite as fast as you would if there was a deadline. So if you are going to present something to someone, you are going to make it good, and you're going to make it nice and you're going to learn how to present something well because your peers are watching you and you don't want to be embarrassed. So I think that that's good and I don't think that that's a bad under pressure thing.
- I'm more willing to ask for help and ask people who know more about things...instead of just looking on the Internet.
- I try to procrastinate less. I was a bad procrastinator back in the day. I try to be more organized. I'm getting better and improving. Looking at the results I get when I procrastinate helped me change, you either pay now or you pay later.
- I've come up with a structured way to do it. I have a list of tasks and homework, I write them down in priority and to them in that order.
- I just know that it's required of me. If you have a job, you just have to get it done. I do it because it's natural and it's the right thing to do.
- Don't be afraid to ask for help and for explanation of what they want.
- I'm better as asking people for help.

## 2014 Responses

- I had a lot of things to improve; I am committed but priorities (homework, TESSA, sports)
- Yes; better time management helps make it easy to do different activities
- Gave me opportunities to grow and change, especially in the communication area
- Can't procrastinate because at work things need to get done; don't want to disappoint others



## 2c. Has your interest in science changed? If so how?

### **Summary**

**Program is effective in:**

Helping youth enhance their interest in science and explore new fields (though most were interested to begin with).

**Program could be more effective in:**

Stimulating career interest in astronomy.

### 2015 Responses

- It' definitely opened up my eyes to different fields of science. My dad used to be a doctor [so I always thought I would be one too] but now it's like – I don't have to just pick one thing that I like. I can study tons of stuff and still have different interests.
- I've always had a big interest in science. I'd say it's grow a lot because I've learned so much doing the carts and going to the planetarium shows it really teaches you a lot and it kind of makes you more curious and if you are curious, you know, you're at the Science Center so there are people you can ask questions to so my curiosity for science and learning has increased.
- I've always really like science. I feel like it's become more definite in what I've become interested in. I am more of a fan of – not life science but physical science and I feel like that's really been (made clear) to me through learning about the two different types. So choosing between Interpret Zone, I would much rather do Space than RAM (Reptiles Amphibians and Mammals) – I really like space. It's so much easier. Well, I think it's not so much easy as just – based on something. Have you ever played the "Why Game"? (J: No) It's like when you're talking to someone and they're like "Why? Why? Why?" So with Physical Science, you can play that game for like an hour. With life science you can play that game for like 20 minutes before getting to physical science. Physical Science is pretty much what life science is based off of, and that's cooler to me because it's like – Wow! That's kind of the basis of everything. Because Science is basically just a method for finding out the answers to questions logically, so it's cooler to find out an answer to a deeper question, which could lead to the answers to a bunch of other questions. It's more straightforward.
- You get exposed to a lot of things that you didn't even know you could be interested in like I knew a bit about astronomy, but I always thought, it seems like it's a lot of work. It's too hard. It's really complicated. But coming to the science center just opened up my eyes and I realize that it's not that hard, and if you really want to do it you can learn it.

- I can't remember what I wanted to do before I joined the Science Center but it wasn't a sciencey field but since I joined TESSA program especially, I learned more about astronomy and have talked to several scientists and found out that's what I want to do. Helps research the stars.
- I'm kinda interested in computers more. I do like computer science and engineering...you learn pretty cool stuff here from other people activities.
- I'm so interested in science now. I have a microscope at home, I go out and look at the stars...I'm all over the Pluto mission. It's crazy. I'll go online, I'll research...when I'm on Tumblr I subscribe to all of the science things. It's great. It's awesome.
- It's increased my interest in science but not in just one specific area.
- It really solidified my thoughts and my future plans. Now I'm sure that I want to at least study at least something in science. I think also that Discovery Corps provided me with good opportunities. Over the last summer, I did an internship at UW that also helped spark my interest in science." Microbiology internship testing microbe stuff surviving in space, counting cells and which could survive better.
- Didn't help but school did. TESSA helped me enjoy it more because there aren't any tests.
- Interest has grown in science.
- It's become more definite that I'm interested in science. Physical science, not Life Science. I didn't know the difference before I was here because it gives you answers to more deeper questions.
- Opened up my eye to different kinds of science.

## 2014 Responses

- Always have been interested; I was curious and wanted to learn more
- Changed how I feel about science (coming from a Christian background); different to accept theories such as evolution and the Big Bang
- More open to astronomy now; want to know more because there is so much to know
- Yes; more interested in astronomy and physics; see people engrossed in them makes me more interested

## 2d. Has your knowledge of science, math or technology increased? If so, how?

### **Summary**

**Program is effective in:**

Helping youth learn more science.

**Program could be more effective in:**

Improving youth knowledge about NASA.

### 2015 Responses

- It's definitely grown. At school now I am much more willing to take classes that I had never even heard of just because they sound cool. It's made me prone to trying new things.
- I've learned a lot, because when I first started I thought I knew more than I did and then you know like I said having colleagues that know more about it and just observing them and learning from them, [My knowledge of science] has really grown a lot.
- *(Interviewer Question-What has been most useful in increasing your knowledge of science?)* Definitely going to the planetarium shows because they teach you a heck of a lot of stuff in there.
- *(Interviewer Question-Are you a part of the planetarium internship right now?)* I did it years ago, like my first or second year here before it was even an internship. And . . . every week I worked I was basically always in the planetarium working with the planetarium and we had this script written down for me, so I'm familiar – like I used to be in there all the time and they would give us a script – write down a script and we would read it, so I had a little part. And we weren't even supposed to do it, like they didn't train us on it, and they just kind of threw us in there basically, but it was fun.
- What I think science is has changed. I think a lot of time people don't have a very good understanding of what Science is. Science is not a collection of facts – it's not a noun. It's a process. It's a process of finding out things logically. "IF this doesn't work it means ABC. If this does work it means ABC." And it's not boring. It's creative. The thing about science is a lot of people think that Science isn't creative. But it's not uncreative. There's creative problem solving – Right? There's nothing more creative than showing a way to solve something. Like – math is creative. Everybody solves it one way and you solve it another. That's another example of creativity. Science is also creative, and it's a process. It's not one branch of fact or a branch of knowledge. It's not a branch of anything, it's not a noun, it's a

process. So when someone sees, like, bubbling tubes, that's not science. That's bubbling tubes of whatever. It's not the same thing.

- I know I've learned a lot from the scientists I've talked to and they know a lot more than I do so I ask them questions and learn about all kinds of things.
- I think it's more about science. I've definitely learned stuff about science. In school it's sort of lame. I learned stuff here that makes it easier to learn in school. Likes to figure out what stars are made of from the color.
- I've learned new concepts. There are certain things I learned more about but Pacific Science Center improved my knowledge. Didn't know about sun spots and how the planets were formed.
- Maybe not math because we don't do much math here. Every single time I come, I talk to my coworkers, I look at a piece of material on the signs over there and I learn something new every time and it becomes common knowledge.
- Just walking through the Science Center, from the planetarium to Well Body. There are so many different things you can learn in between. It's just being aware of your surroundings, listening and looking and just reading for yourself...and just being a sponge.
- I learned a lot. I thought I knew more than I did. Going to the planetarium show increased knowledge.
- What I think science is has changed. Science is not a collection of facts; it's a process of finding out stuff logically. **There's nothing more creative than showing a way to solve something.**
- I've grown. At school, I'm more interested to take classes I haven't heard of and try new things.

## 2014 Responses

- I can't even explain how much I've learned at the science center
- In astronomy, yes
- I want to be a resource for friends on astronomy
- Yes; definitely - especially the carts program (extra solar planets); now specialize in this area
- I have learned the majority of the things that are offered here at the science center
- Yes; increased because just searching only gave an overview but now I study more in depth and know more about a certain topic

## 2e. Has your interest in studying science, math or technology in high school or afterwards changed? If so, how?

### Summary

**Program is effective in:**

Helping youth solidify their common interests in STEM fields.

### 2015 Responses

- I've learned a lot about them. They're always having these meetings – like, oh, you've got to sign up to go to so and so place. They have those things all the time here, so I've learned a lot about that.
- *(Interviewer Question-Do any of them appeal at this point?)* For me not so much. Like – I love science that's one of my passions, but me, I don't think I want to have a career in science. I mean that's like a hobby that I do, that I'm into that none of my friends are really into like that. Like being here, it's something that I enjoy, and I don't do it because of the pay, I do it because I enjoy it....I do want to open my own business, so that's one of my main goals. I want to open up a barber shop. I know it's totally, like, different from all of this over here but that's just one of those things that I've always wanted to do since I was a kid...I sometimes feel like I have to do something in this field, but it's like, maybe I don't want to but you can still be interested in it...I just, I like it, I'm interested in it, but that's not something I want to do career-wise, so.
- I was really interested in doing that when I came here, so it hasn't really changed. It hasn't really increased or decreased, but it's become more specific. After working here, I know more about a scientist's job, especially since there have been really cool presentations about that – so I know more about the job of a scientist. So I would say I wouldn't want to be a biologist but maybe being a Physicist might be cool. You'd never get to go outside, which would suck – so, weighting the pros and cons of what I want to do after this job or in continuation of this job.
- *(Interviewer Question-What has been helpful in learning this?)* We had one guy from UW – he was working on Kepler data, and all the Science Center presentations are really cool, especially the summer ones. But he did a really cool presentation about how they're trying to determine the size of a planet. Like – in the formation of a solar system, what makes something a gas giant or a rocky planet? Where's that demarcation point? And so they're looking at all these different graphs of all these different planets, and transits of planets

around the sun, and they're like 'Ok, is if it's this size, it must be like this.' So I could kind of get the general feel of its work. There's a lot of computer stuff, which I'm not the biggest fan of, but wouldn't mind learning, and then the actual research part was cool because it was new – that's something I really liked. And there was teamwork for sure, because it was a really big team; and there's not really going to be a lot of science that isn't a team exercise. And there's a lot of teamwork that he described in his presentation of what they were doing as a group. So I kind of got a general feel of that....I don't really have a good idea of life sciences jobs because you kind of sign up for the presentations you want to go to so the life sciences ones I never really want to go see them.

- I'd like to get involved in computer programming.
- I really started to like astrology.
- More into reading things they are trying than I would have ever been. I enjoy it now and do it because I like it.

## 2014 Responses

- Ongoing interest in astronomy; always something new to learn
- Still taking astronomy, geology, physics; love learning about the cosmos and how it was created
- Want to be a barber but always have a love for astronomy
- Exposure of science outside the classroom made me want to study in college

2f. Since volunteering at the Science Center, do you spend more time engaged in reading about or watching science, math or technology or using it in ways that increase your knowledge of them? If so, how?

### ***Summary***

**Program is effective in:**

Slightly stimulating interests in STEM outside of work.

## 2015 Responses

- It's change a lot now that social media is more popular – I can learn more about following NASA, or any science based website or things on social media...so seeing that all the time when I'm scrolling down my timeline [for work] I'm always quick to click it up and see what's going on out there. There are a lot of cool aps. There's one that NASA has and you have this card – my supervisor was showing it to me, I was supposed to download it - and you can use it on somebody else's phone and it shows you the satellites out there it's weird, I forgot the name of it...
- I'm definitely more into reading articles about current events in science and new things that they're trying now than I would have ever been in my life. I enjoy it now. [Before] was like – well, if I have to do it I'll do it. But now nobody has to ask me – I just want to do it anyway.
- I used to do that before. It's probably decreased, but not because of the science center just because of my workload as a high schooler. We have to read so much for school anyway that I can't really read [outside of school] as much as I would like to. I still do read a lot but it's not the same amount at all as I did in middle school. Like in middle school I would read a book a week at least – maybe two or three but now it's like – wow, I read a book! Yay, I did it! I love to read, but I can't really do it anymore...It's just kind of impossible for me to find time.
- I do more activities like Teen Science Café. When I learn things here, I go do more research.
- I would if I had free time. Sometimes I watch science shows but don't read outside of school unless I have to.
- It's changed so much. My coworkers will tell me about this really cool science movie or something and I'll go watch it and then I'll learn more about science that way. There's so many different ways to learn about science...it's not just this one concrete 'you have to learn it in a school facing a clipboard and whatever', that's not what science is. Science is learning and exploring and having curiosity and going out there and figuring out 'oh, that's how that works'. It's really neat.
- Since social media it's increased a lot. A NASA app that shows you the satellites.

## 2014 Responses

- In astronomy - pick up astronomy magazines, not scared of the material, more confident in abilities to understand it
- Yes; am an avid YouTube watcher (follow 5-6 channels) - can relate them to work and teach friends about butterflies
- Follow NASA on social media

- More in tune to science technology news

## 2g. Are you more aware of careers that use science, math and technology? Which, if any appeal to you?

### **Summary**

The Program is effective in increasing youth's awareness of different fields of science and jobs in them. Most were interested in pursuing a science-related career although some had an interest in science but not as a career.

### 2015 Responses

- Yes because there are so many people here with such diverse backgrounds – meeting meteorologist in space area
- It's definitely opened up my eyes and made me want to find out more about other fields
- Right now I'm really into astrophysics. It's what I'm thinking about majoring. But I still love biology and chemistry and math but right now that's what I'm interested in.
- I've learned a lot about them. They're always having these meetings – like, oh, you've got to sign up to go to so and so place. They have those things all the time here, so I've learned a lot about that.
- *(Interviewer Question-Do any of them appeal at this point?)* For me not so much. Like – I love science that's one of my passions, but me, I don't think I want to have a career in science. I mean that's like a hobby that I do, that I'm into that none of my friends are really into like that. Like being here, it's something that I enjoy, and I don't do it because of the pay, I do it because I enjoy it....I do want to open my own business, so that's one of my main goals. I want to open up a barber shop. I know it's totally, like, different from all of this over here but that's just one of those things that I've always wanted to do since I was a kid....I sometimes feel like I have to do something in this field, but it's like, maybe I don't want to but you can still be interested in it...I just, I like it, I'm interested in it, but that's not something I want to do career-wise, so.
- Astronomy
- Astrophysicist
- The solar panels were interesting. I didn't know people went to install solar panels. The solar panel thing is kind of cool because you get to help people out and help the future of the



earth. I would like to help the planet and make a positive impact but I don't know how to do that.

- I think it's really cool that we have scientist come in and teach. I want to go into the study of Life Biology.
- It's pretty cool to see all of the different sciences out there. Pretty much science applies to just about everything.
- I got greater knowledge of careers (3 mentions). If someone would give a presentation on careers in science that would be good because there has to be more than just stuff about test tubes. A workshop about careers would be good to there could be a discussion about a profession.
- Learned a lot about careers through reading. Love science but I don't think I want to have a career in science. I want to open up a barber shop.
- Not interested in science career (2 mentions). There are too many years of school.
- Made me want to find out more about other fields. Astrophysics but still love biology, chemistry and math.

## 2014 Responses

- Yes; science in the spotlight - you get to see broader types of science and applications as well as topics that were new
- Yes; we have received many presentations and fieldtrips that introduced various new career paths
- Yes; exposure to different aspects of science such as meteorological science

**3. Think about what you have done at Pacific Science Center, in school, in other activities or on your own and what you have learned about astronomy since you first joined TESSA.**

**3a. How would you rate your knowledge of astronomy before entering the TESSA program? Let's say out of 10 – where 1 is "I knew nothing" and 10 is "I knew a lot."**

## **Summary**

Youth perceive a great increase in their knowledge of astronomy.

### 2015 Average

3.6

### 2014 Average

3.1

## 3b. How would you rate your knowledge now on the same scale?

### 2015 Average

7.3

### 2014 Average

7.0

## 3c. What are the most interesting things you have learned? [all]

## **Summary**

Youth show excitement about specific facts and obscure science.

### 2015 Responses

- I learned that – ok so you know how we have telescopes out there in outer space orbiting around the earth? Did you know when they are tracking planets that they actually use a light meter? Like, it goes out there and you see, like, a star and then you'll know it's a star and you'll know that there's a planet orbiting around it because it shows you on the graph what's going on and I learned how to keep memory of the planets in order. Before, I knew the names of them but the order – I would be off about it. But now I know the order and I

can tell you a little bit about each of them. I learned a trick here: My Very Excellent Mother Just Served Us Nachos....Mercury Venus Uranus Earth Mars Jupiter Saturn Uranus Neptune.

- Learning how to talk to people and approach them
- Why planets go in a circle. I really like the physics aspect of astronomy the most. Why things move the way they do. Life, spectroscopy, that's super cool. We've learned a lot about that. There are a lot of aspects of astronomy that I find really cool. Probably the coolest – that's really hard. The coolest are probably the ones about the big bang and the whole universe. That's the coolest part of astronomy, that it's the whole universe – scale, that's also really cool. Like, how something so small such as atoms could exist and how something so small such as us could exist while something so huge such as a galaxy could exist, all in the same time. It's like learning about accumulation. At some point you're going to have to employ, like, a scientific notation for your scientific notation. It's so big, it's crazy. I think that's really cool.
- New favorite things are learning about Europa being covered with ice and what's underneath that.
- The constellations and star station and connecting the dots. Stars are pretty too.
- "I had no idea what axioms were." Lizard type things. The regenerate their tail and scientist are studying them for use in humans.
- When they're tracking planets, they use light meters.
- Why planets go in a circle. A lot of aspect of astronomy...the big bang and the whole universe and scale.
- A lot of things that look like little kids stuff you can go much more into depth on them. STEM cell exhibit and real world situations. Spitting out random facts to people. Fear factor of cockroaches--thousands of types but only 2 or 3 pests.
- Learning how to talk with people.
- I really enjoy coming here. It's better than any other job I've had because I'm actually interested in science." "I think the best part about coming here is that it creates opportunities."

## 2014 Respondent Comments

- Exoplanets (3 mentions)
- Sunspots lecture - lecture was over my head but I understood more than I thought I would
- Use of telescope to see sun and teach visitors about it
- Especially the cart program
- Enormity of space and how empty it is; you can feel time - makes you feel humble

- Galaxies; how big the universe really is; how many stars there are
- I don't think I learned as much astronomy or about the TESSA program as I should have
- Only there two years, halfway into sophomore year
- Neptune rains diamonds
- Venus is the hottest planet in the solar system but it's not the closest to the sun; it has an atmosphere that keeps all the heat in
- Why Pluto is not considered a planet
- Solar flares and effects on earth magnetic field
- More planets in our solar system
- Dawn mission going to asteroid belt
- Know of 1400 other planets; life may be possible on some
- Gravity/mass/density on other planets
- Relative scales of planets/sun
- Citizen science projects
- Internships; cool to learn about craters and decide what they're like
- Black holes and meteors; learned how to re-write
- Kepler Project; search for life elsewhere

### 3d. What have you learned about NASA? [all]

#### **Summary**

Most youth (especially more recent seniors) think they have learned quite a bit about NASA and they are able to mention some things that it does. A few (more in 2014) say they have not learned much.

#### 2015 Responses

- Well honestly I haven't really learned much about it. Since my last couple years being here, I haven't done much revolving around NASA – it's like mainly what I do is I just work on the floor. I'm doing the main positions, like Tide Pool and stuff like that, but we haven't had that connection with, Like, NASA and stuff, so it's been like not as much as I would like it to be, because I mean, I signed up for that, but I mean, I signed up for a job too so.
- *(Interviewer Question-If you were to be able about NASA in some way, what would be some activities that would appeal to you?)* Well we haven't done any recent activities in a while,

but on my own I would probably say social media, I know NASA has websites, that type of thing.

- Before I started, I knew of Nasa and what they did generally, but now I know current NASA missions and working at the science center, they update you about stuff like that.
- I guarantee you that most of the kids at school don't know stuff like that but working at the science center they want you to be aware of stuff like that
- In the morning meetings they have activities where they tell you fun facts or updates/Portia went to a jet propulsion lab and came back and showed us two really cool iPhone aps related to space and NASA – spacecraft 3D and Earth Now
- Jeffry sends me articles about stuff that's going on every week, and if you have any questions Joe is more than willing to help you out, so there is always a vast number of people I could ask before having to google it
- I've learned a lot about NASA. I'm doing the planetarium internship, so as a planetarium intern for the Nasa Now show, which is really cool, I learned a lot about New Horizons, Human Space Flight, previous Nasa projects – lots of stuff like that. So it's definitely increased by a lot.
- Their Orion Space Craft Program and Mars. A packet if information and the board next to the planetarium. I asked if I could create a board and they said yes.
- Curiosity mission. The Mars mission.
- I like the fact that they grant us money. Back in the day when I was a kid...I learned more interesting things like missions than here. I feel like we could probably use more content about NASA because I can't remember what I learned. I learned more from middle school than here. Make sure you teach the kids more about NASA because I don't remember leaning much about that.
- "I thought they went to the moon and they're not doing anything and their being lazy. No, not at all. There's so much that they're doing." Amazing mind-blowing things. The planetarium people told me about NASA during lunch.
- I didn't follow NASA at all and the different missions and stuff that NASA does is quite interesting.
- I haven't learned much about NASA. I mainly work on the floor.
- I'm the planetarium assistant internship so I learned a lot--NASA NOW show, new horizons, human space flight, previous NASA projects.
- I sort of knew what they did but now I know about specific missions and what they do. I the morning meetings they have activities that tell about fun facts and what they're going to be doing.

## 2014 Responses

- A lot from base zero; citizen science research on clouds - appreciate how they collect data from citizens
- Planetarium
- Types of jobs at NASA is very diverse
- Many programs - facilitated presentation on mars rover landing
- Planetarium shows - human space flight that talks about humans in space; learned about NASA missions that have happened
- Not very much
- Not much
- Follow Instagram and learned more at work
- Messenger satellite that goes around mercury
- Orc cloud mission
- Curiosity rover on mars
- Not much; cloud observation helped them with research
- They are going to space
- They are open to helping students like me get jobs in science
- A few specific missions: word of stones, worlds unknown
- Did intermission activity and heard what planetarium is presenting
- Not that much; early in the program we talked more about NASA and the curiosity program
- Program did spark an interest in it; had an opportunity to learn
- Before, I didn't know much about NASA missions (except the major ones)
- I have learned more about them

### 3e. How likely are you to pursue future work in astronomy?

#### ***Summary***

Although students understand some of the career paths open in astronomy and many think they may continue to study it, the Program is not causing them to choose astronomy as a career path.

## 2015 Responses

- Well honestly I haven't really learned much about it. Since my last couple years being here, I haven't done much revolving around NASA – it's like mainly what I do is I just work on the floor. I'm doing the main positions, like Tide Pool and stuff like that, but we haven't had that connection with, Like, NASA and stuff, so it's been like not as much as I would like it to be, because I mean, I signed up for that, but I mean, I signed up for a job too so.
- *(Interviewer Question-If you were to be able about NASA in some way, what would be some activities that would appeal to you?)* Well we haven't done any recent activities in a while, but on my own I would probably say social media, I know NASA has websites that type of thing.
- Very likely I want to get a major in astronomy and work at NASA.
- Could be really into astronomy and astrophysicist.
- Not likely. I get bored easily. I just don't see myself doing a lot. I want to get paid for something I'm really passionate about not just a job that I decided to just pick up.
- I could see myself going into a branch of bio astronomy, searching for life forms. I find it interesting but don't want to necessarily go into it.
- Not going to go on the astrology path.
- Pretty likely for me to do something in astronomy-related maybe astrobiology or something along those lines. Everything will eventually be-related to space.
- Definitely interested in anything astronomy related like aerospace engineering.
- No
- Very likely. I really want to be an astronaut.
- Yea, you really can't tell the difference. It's exactly the same almost... (interpretation zones are space first, take space tests, encouraged to do space events and internships, astronomy day). LANCAT was launched by NASA and one year she did a LANCAT celebration where she walked around with an iPad talking to guests about it; did same with (Orion launch).
- Would like a career in astronomy working for NASA

## 2014 Responses

- Only one said likely
- Several said they may study it more

### 3f. How likely are you to pursue work in science, math or technology in any field?

#### **Summary**

The interest may not be a change, since most had interests when they joined. For most, the Program seems to reinforce the desire to work in a STEM field, although, in 2015, some participants stated that they had no interest in a STEM career.

#### 2015 Responses

- Well honestly I haven't really learned much about it. Since my last couple years being here, I haven't done much revolving around NASA – it's like mainly what I do is I just work on the floor. I'm doing the main positions, like Tide Pools and stuff like that, but we haven't had that connection with, Like, NASA and stuff, so it's been like not as much as I would like it to be, because I mean, I signed up for that, but I mean, I signed up for a job too so.
- *(Interviewer Question-If you were to be able about NASA in some way, what would be some activities that would appeal to you?)* Well we haven't done any recent activities in a while, but on my own I would probably say social media, I know NASA has websites that type of thing.
- Very likely
- Yes, definitely. I would definitely want to go to space. Anything to go to space.
- At one point I wanted to be in computer science but I procrastinate a lot and I think I would be better at dramatic acting Major in business or fine arts. Anything but being outside with insects and things. Don't want to drink water with carcasses in.
- How the human body works is more interesting to me in the sports environment.
- How the human body works is more interesting to me in the sports environment.
- Computer Science
- Physical therapy, biology, culinary or art. Work for PR Company for science.
- I want a degree in science but don't want to work in the science field because it's too constraining.
- A US diplomat
- Environmental Science
- Psychology



## 2014 Responses

- Almost all say “very likely”

## 3g. Would you like to work at NASA? Why or why not?

### **Summary**

Even though most do not see themselves in a career in astronomy, they have good feelings about NASA and can see themselves working there in other capacities.

## 2015 Responses

- I feel like my knowledge level, is like – I’m not that smart to do it, [so no.]
- Oh, very likely. I really want to be an astronaut. That would be like, job prospect numero uno.
- Very likely. I think the research they do there is pretty cool. Plus they're one of the leading astronomy places in the U.S.
- I don't see anything wrong about working at NASA. It's a pretty cool company and they do a lot of cool things.
- Nah... I won't go to the moon. I like Seattle Washington. I'd be too scared.
- I think I would. I think they even have a biology department.
- Not really my thing.
- Yes, definitely. I definitely want to go to space.
- It would be the best job ever.

## 2014 Responses

- It would be awesome - people there are very smart and doing really cool things
- I would maybe if I found a job or career that I'm interested in within NASA
- One specific area of interest is computer graphics; can see myself working for them

## 4. Why were you interested being part of the TESSA program? [all]

### **Summary**

Science teachers are big influence in telling youth about the program and encouraging them to apply.

### 2015 Responses

- I thought that we were just going to be doing a lot of science-based things with other youth and that was my knowledge of it at first.
- They came to my school and did a liquid nitrogen program. Dad encouraged her to apply.
- I got in and I was like – Oh my god! This is so cool!
- My mom told me about it – I would have probably volunteered to do it, but the fact that I could get paid to do something I would do for free is even better. The fact that you get to work at this place is really awesome. I used to come here with my dad when I was little and I really didn't know anything about science, but it was super cool to run around here and there anyway, and it's just a really fun place to be. I don't know, it's just a really awesome place to work, and I really just enjoy being here. It's not like working at Fred Meyer for your first job or something.
- The TESSA program has a better focus on astronomy and it helped me to know what I wanted to do.
- Who doesn't want a job? I applied for the Discovery Corps position but they asked me to be in TESSA and I wasn't sure what I was getting into. I thought it would be cool to work at Pacific Science Center. I'd rather work at a place where it's science related and you learn stuff.
- I heard about it through my friends. In the interview they told me it was a real job. I thought it was just something to do with science for the summer. I'm not flipping burgers. I'm not putting salt on fries. I'd do this any day. It sounds more elegant to say you're working at Pacific Science Center the Arby's or Wendy's. I like the sound of it [working for Pacific Science Center]...it has a nice ring to it.
- Honestly because I just wanted do something different and my friend told me that you get paid. I came in not knowing anything and was so much more.
- "Honestly, I didn't know anything about it. My math teacher sent my mom a link 'cause he'd seen my grades in science and I feel like this might be good for him...I was like what is it and my mom said, 'you're going to do it'."

- I just wanted to get into Discovery Corp and TESSA was the next thing on the track. A sister's friend told me.
- The hours worked to get into Discovery Corps for me. My mom saw an advertisement in the newspaper.
- I thought we were going to do a lot of science based things with other youths.
- My mom knew someone who worked here and the fact that I could be paid to do something you like to do for free was great. It's an awesome place to work.
- It came to my school and did a piece of work.

## 2014 Responses

- Since I was young, I enjoyed coming to the Science Center; it nurtured my interests in science
- More specialized version of Discovery Corps; Discovery Corps + extra
- Teacher said "you better fill this out"; poorly informed - didn't know about Discovery Corps as a separate tract; Might have been better in Discovery Corps; would have loved to do the animal care internship; Now I adore astronomy
- Being able to work at the Science Center while in high school
- Interested in science and liked the Science Center; gradually pulled me towards TESSA; Teacher suggested it and helped with applications; brought me to intern; Went to the Big Picture high school; did internships
- Teacher recommended three people including me; had not been here much; interested
- Pizza was offered on a rainy day
- My teacher was friends with Josh
- Felt like it was an opportunity for a job; still not sure
- At high school; interested in earth and space science areas from independent study; Science teacher suggested it at Overlake
- Science teacher told me a lot about it
- Saw as only chance to get exposure to earth and space science; Opportunities for a job at a young age; no better first job than at the science center
- I wanted to give back; saw both Discovery Corps and TESSA programs; TESSA more focused

## 4a. In what ways has it met your expectations? [all]

### **Summary**

Primary ways deal with the work experience with little mention of the science content.

### 2015 Responses

- Well in the beginning, we were doing a lot of science based things – like I would do cloud observing, were we would go and just observe the clouds and stuff like that, and like I said I was doing the planetarium and we were doing more group things, and we did a lot of different things.
- Thought it was just going to be working but you're not just working you're learning what it means to be a part of a team and learning how to grow as a person and go up the career ladder, so I's definitely met my expectations.
- I didn't have any expectations coming in I just wanted to get involved in some cool things at the Science Center. When I got in, the astronomy thing lived up to what I expected it to.
- All I can say is that I really like my job and learn a lot of cool things. The worst part is when you're tired but that's not their fault and some people are hard to deal with.
- I tried not to have any expectations and didn't expect much. I didn't think they liked me. I didn't want to get my hopes up. It met my expectations.
- My expectations were really low because all my friends have jobs they don't like building pizza at Pizza Hut. It totally exceeded all my expectations.
- I didn't have any expectations.
- In the beginning was doing a lot of science based things and group things and then it stopped and it was then all work work work.
- I thought I would have to know more but they taught you all of it so I was grateful. I thought it would be more harsh. It met all my expectation.
- Coming in I didn't expect anything about Discovery Corps.

### 2014 Responses

- I didn't expect it to be so supportive
- Special opportunities
- Enjoy working here; people are great; every day is something different; I give people a better experience like what I had which makes me feel fulfilled

- Gave me an opportunity for real world work experience
- Able to work with people older (staff and presenters) with lots of experience in different areas
- Able to meet new people
- People help you learn and in a way you can teach it to others
- Paid me
- Professional environment (i.e., dress code, code of conduct, have to follow rules); proud that I did
- Learned so much more about science
- I didn't know what to expect
- Happy to be working at a fun place and learn
- Have a good thing
- Exceeded expectations; gained extra skills
- Just thought it was going to be another class where I had to take notes; but I'm actually be able to explain information
- People are really nice (did not expect that)
- Learning how to learn in different ways
- Constant exposure to science; things I like doing (working with other people)
- Presentation skills; chance to learn science behind activity in depth
- Exceeded them; I didn't think it would help develop these skills and help us personally

#### 4b. In what ways has it not met your expectations? [all]

### ***Summary***

Responses are varied and each should be considered.

#### 2015 Responses

- It just sort of stopped [after a while] and now it's just like work work, work, work and I didn't have enough time – we didn't have enough time to do what we want to. Like, now we don't do enough science-based stuff. Like, if you're going to call it TESSA we need to do more. We're not doing enough, and so what sets us apart from regular Discovery Corps? Why do you put the title of TESSA on there if we're not doing anything in that field, you know? We might as well just be regular Discovery Corps.

- *(Interviewer Question- Is there anything in particular that you would like to be able to do?)*  
Like doing more science-based activities, learning what's going on, get us back in the planetariums, have more field trips and stuff like that, - just teach us. We want to learn, you know, that's what we signed up for.
- [I've been a DCSI 2 for a while and they haven't made a DCSI 3 yet so it would have been cool if I could have experienced that before I graduate ]
- I thought I would have to know more to work here, but the cool thing is that they really taught you all of it. I was like, I don't really know all of this stuff so that was one of my expectations that gratefully did not end up coming true. I've learned a lot of stuff but it's not, like "Memorize all of these things we're going to be taking tests every weekend." It was less school and more an actual job. Working here is really cool. I thought it would be a lot more harsh. I thought it would be a lot harder and a lot more "this is your boss," but it is actually a lot of fun. So I would say it definitely exceeded all of my expectations.
- It's supposed to be space-related but it's not really space-related. Like butterfly exhibit, tide pool, feature science and other things.
- I didn't have many expectations so I don't have anything.
- Working here met my expectation because I didn't have a job before.
- Don't do enough science activates. Why put the title TESSA, if we aren't doing anything in that area? More field trips and group things.
- Met expectations but it would have been cool to have a DCSI 3 because I've been here a while

## 2014 Responses

- Drop off of some things - group meetings; special programs now more like Discovery Corps
- Internship option with animal care
- Thought I would have to know everything eventually but ok that I don't
- I should have learned more astronomy or things related to it
- None
- I can't think of anything at the moment
- Limited hours
- I have to buy own clothes, phone, etc.
- Can't work more
- Taught me to conserve and save money instead of spending it on nonsense
- Sometimes not enough focus developing personal understandings; specific mentorship to see if all are on the same page

- A lot of time, I feel I could be replaced by a sign; I thought I would be interpreting science more than reading rules; cart is like that but other positions are less so

## 5. How would you suggest changing the TESSA program? [also included in focus group Question D responses]

### 2015 Responses

- Like I said before, if you're going to have it be TESSA, have it really be TESSA. Don't have it half way. Have us out there doing science –based activities besides our carts, have us learning more about science, teach us more – because there are a lot of people in there that know more about us, but just have us doing it. Have us doing more science- based stuff.
- Keep planetarium internship going now that it is established – “That was the number one thing I wanted to do coming into the science center.”
- I think being given the responsibility to do a show is the last, ultimate step that you could take on this path and I think as a graduating senior that would be pretty cool to experience
- Well I'd like to work more hours. I'd love that, but that's kind of hard to get....I'd love to work more hours because I think that would be helpful for learning stuff. I remember when I started I gained a ton of stuff really fast and I feel like that regularly working once a week actually helped me to learn all the stuff a lot faster, and it wasn't like partial knowledge either, it was actually a good knowledge of all the things...but I work a half shift every week now, which I think is probably the max you can work, and that's definitely good, but I know a lot of the new volunteers they have to work 100 hours before they can get paid, and that's really hard, because especially with 4.5 hours a week times 52, you're definitely going to get there within a year, but it's going to take about half a year, which is really difficult. And you don't always have time to learn all the positions either in one half shift – especially because most of them have a month, so that's one hour off your shift. So that's really only 3.5 hours of working.
- *(Interviewer Questions-Any other? How do you not plateau?)* I would say that a lot of that at some point is going to be personal. It's really well set up so that you have a lot of resources. I know I haven't really tried all of the pocket sciences that there are and I haven't really tried everything that you could do and there are so many books to be read. I'd say that at some point you have to take personal responsibility for that. It would be nice though to have an incentive for a DCI 3. Right now, once you're at a DCSI 2 you kind of just stop. . . I think it would be great to have a DCSI 3 because then you could do shows, you could do planetarium shows.

- I think it would be cool because it's just the incentive part of working. If you want people to work hard, there's nothing as good as an incentive. So like – no one's going to work as hard as someone who's working to eat or working to get some water. No one's going to work as hard as someone who is working to achieve something.
- *(Interviewer Question-What would the responsibilities look like for the DCI track if you could design it?)* I would say it would be show assistants. So like – you can do demos, so that one thing that I know most SIT people do is demos, and I feel like that's something that Discovery Corps people could be trusted to do and have done in the past but that was a while ago. And since then we've kind of stopped doing that – I don't really know why that is, but it would be nice to do demos. I feel like we could all probably handle a demo. And for shows, I feel like it makes sense, that SIT people do shows and Discovery Corps people don't do shows. There's something about the authority of a teenager compared to the authority of an adult, And whether or not a teenager can be authoritative, you're still going to get less respect than an adult. . . . So it would be cool to be an assistant, where you have, you know, five minutes of a show where you can do something cool, or you can set up or take down. Like, you can do that with Danger Science, and I think it would be total possible to branch out a bit and be like, I can help you blow this up. Here, let me help you hold the lighter- stuff like that. It wouldn't be necessarily the mirror of SIP, it would be its own kind of thing.
- *(Interviewer Question-How well has the Career Ladder worked for you?)* I actually like it. It worked for me pretty well, I actually got lucky, where I got it all done in a good enough time and they moved me up pretty fast. So now there's like a class of us that are juniors and DCSI 2's just because we always got our stuff done on time and so they kind of moved ups along, and I know for some people that doesn't happen very well. So maybe more opportunities to move up, but I can see that being tough to because you need enough people for a training. So I'm usually pretty happy with it.

## 6. What would make it more appealing to other youth? [all]

### **Summary**

Responses are varied and each should be considered.

### 2015 Responses

- Just let them know that its science based thing, and working with other youth, and you get paid for it – kids want to get paid.



- It's mostly appealing if you're interested in science. Maybe mark the PR thing more and the job thing more – that you will eventually get paid. Market it more too, because I didn't really hear about it until I'd heard about it from someone specific...I was talking with someone who wanted to be a child psychologist and they said they were interested in doing it because they were interested in children. And I was like, "Wow, that's cool I had never really heard of that" and I know youth who would probably be more interested in it for the PR, first job, childhood aspect of it than I was. I just thought it was cool because of the science, and the planetarium, that kind of stuff. And those things can totally go hand in hand. You don't have to like both.
- More field trips. They find the coolest places to take us to. My favorite was the foundations breakfast where I met a real astronaut.
- Now we're doing things just on the floor and before there was more of a mix which was more interesting. More activities off the floor would be good. The content-teach more about NASA, rap sessions and discussions, getting to know each other as co-workers, improving skills on the floor, interview people along the way not just at the end, ask earlier and don't wait until the end of the road.
- I would like some more opportunities after the DCSI step? I love all the opportunities like field trips.
- You guys have a good system going and honestly I think it's good because it allows the youth to start working at an early age...I feel like it's an experience that is well needed and it's like well informative like in the real world so I don't see anything negative behind it." I remember when the Science center had a new type thing and you acted like you were on the news and read a script. It would be cool if they brought that back. They change what goes on too fast. Having things for a longer period of time would be good because when you're not here all the time you don't get a chance to see everything.
- Having more activities about space. A lot of the things that are there have been there for a long time. More of the space stuff swapped out. If you see the same thing for five years you don't pay attention anymore. Exhibits like black hole, dark matter. Alien Landscape exhibit doesn't really work the fan never works and the sand doesn't blow. X-ray photos of galaxies and how they do that.
- Make TESSA more different than Discovery Corps. More workshops about space. It's the space intern and things that are a little different like Universe Expansion, astronomy, stars and planets. An internship would take away from time on the floor which is what are job is here.

- Keep field trips, group activities going. Show the kids why they are TESSA. Do TESSA activities--more science based activities and keep them going not just at the beginning. Get people more involved in the planetarium.
- I'd like to work more hours because it would be helpful to learn stuff. Regularly working helped learn faster. One day every week. A half shift is good but a lot of volunteers take a long time to actually start to get paid. And you don't have time to learn all the positions in a half shift with the lunch hour. Have an incentive for a DCSI 3 because when you get to a DCSI 2 there isn't an incentive. DCSI would include show assistant and demos. An adult would have more authority but a teenage wouldn't be respected as much as an adult. Not a mirror of SIP Moving up to different levels work for me it doesn't happen for other people. Maybe more opportunities.
- Not a lot of opportunities to learn about astronomy and stuff except on your my own and if that's what TESSA is about, they should have more. More workshops. Telling people what they can sign up for because many people don't know what things are.
- *(Interviewer Question-Tell me about the career ladder?)* If you miss something it takes forever and you have to wait for the whole class. Finally, they said let's just move ahead with you guys. Sometimes they overlook people and they get so far behind. Make the ladder more flexible. Explain better how the career ladder works.
- Have DCSI 3 and keep the planetarium internship going. Experience actually give a show would be the last thing to do in this experience.

## 2014 Responses

- It is appealing as is; Discovery Corps too (2)
- It is cool that as a freshman I got to learn while working
- Expanding horizons
- Can get redundant in some positions
- Try new things
- Money was an important motivator
- Show how many opportunities you have here; including internships
- Flexible schedule; time to study if needed
- Flexible and works well for students
- If they know it's a fun environment and good experience
- Job experience at young age
- Learn to work with the public
- Friends think it's interesting; many want to work here

- They need to do their own thing
- Focus on skills people can learn (e.g., public speaking, communication with people in general, and work with science)
- Gatherings with only TESSA folks
- Met my needs
- Science interest is what makes it appealing
- Focus on skills you learn - presentation; science and skills
- The community of the science center as a place where people help you and people are interested in science and different things
- If people understood what a cool community it is (Discovery Corps and TESSA)
- Testimonial from Discovery Corps kids (video - YouTube)
- Get a young following on the Science Center; possibly tweet about the Science Center and Discovery Corps
- Demonstrate the fact that the program changes you as a person
- Earth and space science is a draw but they don't realize how it changes your approach to everyday life

## 7. What would you like to tell others who are joining TESSA or who might be considering it? [all]

### *Summary*

Responses are varied and should be reviewed for marking similar programs. The idea of video testimonials on YouTube seems especially effective.

### 2015 Responses

- I would tell them that overall, it's a good program. You're going to make friends, you're going to make money, you're going to make memories, and you're going to have a lot of fun. There's going to be times when you work, because it is a job, and mainly it's going to be work but they do slip in fun for us. So I'd say definitely go for it. It's a good experience. It's a very good experience. Overall, I wouldn't take anything back.
- "It's probably going to be one of the best experiences of your life. You're really going to change and grow into an actual person through this."

- That they should do it, for sure. That they would have fun. There's not really a lot of advice I would have to give because it's not something that's super testing. You're going to learn a lot and you're going to have a really good experience and I think it's good that it's not super testing. It pushes you to learn, but it doesn't push you super hard to make a ton of (life) changes, and I think that's good because that's not what you need. High schools not that hard and if you just kind of play the games, but at the same time it's really boring and tedious and I really didn't like it at all. (I do running start now)...but it's like why are you giving me this worksheet to do if we all already know how to do this. Why are you making me do all of this work that you know I don't need to do . . . Here, there's a direct reason why you would want to do it, it's much more fun, and it's just a much better learning experience.
- It's not just about learning science but becoming part of science and astronomy. It's more than a classroom where you just learn things.
- Bring someone in more and show what they do in their field a couple times a month. Doesn't matter what they do like they did with the solar panels and like they did at Garfield with celebrities like Bill Gates, etc. Field trips to place like the Museum of Flight and other people's work places.
- Advertise it more because no one knows about it. Let people see that it's different that structured school. I have no instructions on how to do that.
- Come with an open mind, come with a good attitude, put a smile on your face and make the best of your time, there's no point of wasting it.
- Relate what you learn more to careers so it makes it easier to figure out what colleges would be good for a particular area.
- It's mostly appealing if you're already interested in science. Market it more so that people know it exists.
- Outreach more and letting people know about it. They should take juniors and seniors to go out and talk with students to get them interested.
- It was pretty appealing to me as a 14 y/o.

## 2014 Responses

- Do it!
- If you're thinking about joining TESSA, stop thinking and start doing it. Because you will not regret going into this program because it taught me so much that I will keep using when I'm already long past college.
- Take advantage of your opportunities and just go for it!

- You make your own experience; find your interests, take initiative, get as much out of the experience as you can
- Focus on every single day you are here
- Some friends have listened to advice
- Be passionate about it and be authentic; want to learn more about science
- Be willing to grow; care
- Won't be easy but will be fun
- Enjoy yourself
- Do it; it's fun
- Educational, learning work skills
- Will help with future work
- Make friends; social skills
- There are things you won't want to learn and things you will; but it is all good
- People here are flexible
- Stay open-minded while here; you can learn a lot more than you expect
- Take advantage of people around you here they know a lot
- Be open to trying new activities; what they are interested in
- Stick it out
- Junior year gets more difficult
- Once they get in, befriend everyone
- Coming to work is exciting
- Keep an open mind; at first I was nervous about talking to people and different kinds of people; you don't know what you can learn
- Be open to learning new things

## 8. If you were selecting future participants for TESSA, what qualities would you look for in applicants? [all]

### **Summary**

Responses are varied but say a lot about what recruiters for similar programs might consider.

### 2015 Responses

- Passion for science

- Somewhat outgoing
- Being able to work with all types of people
- Interest in astronomy
- Knowledge not required (not expert better so they have stuff to learn)
- Enthusiasm – willing and have will to do it/tenacious
- Maturity
- Self-possession
- Responsibility
- Some degree of intelligence
- They should just definitely go for it because it helps you grow and learn more stuff.
- If you're interested in space or science, you should just join.
- Make sure you are prepared to learn and to talk in front of people because if you're not you're probably going to be embarrassed. Make time for the Science Center. Don't take the job if you're not making time to come here there's other people that want to do this and if you take advantage it's not fair.
- You have to do it.
- Listen and feed off of your co-workers. They're lively and everyone wants to see you do well.
- You're going to friends, money, memories and have a lot of fun. Definitely go for it. It's a good experience. It's a very good experience. Overall, I would take anything back.
- You should do it. You'll have a lot of fun.
- It's one of the best experiences of your life. You will change and actually grow into a real person.

## 2014 Responses

- Be willing to learn - If not, how can you inspire other people to learn?
- People with a desire to learn for learning's sake
- People really open to improving themselves (try new things, willing to fail)
- Desire to help others
- Passionate about learning
- Trustworthy
- Some time management skills; punctual
- Friendly, outgoing
- Be drive - motivated to do the work
- Have a lot of potential; but has not reached it yet (show - watch them grow and open up)
- Need to present ourselves in a professional way

- Jobs and work skills
- How to communicate; make eye contact
- How to speak
- Shy but want to learn how to change
- Passionate about what they want to do
- See it as a real job
- Think about others
- Yearning to learn and better themselves
- Open-minded
- Leadership qualities
- Good speaker
- Stay focused
- A people-person; good charisma and personality
- People interested in learning - not just open
- People invested in the community
- Willing to grow; put themselves out on a limb and take risks
- Try new things outside of your comfort zone
- A general love for learning
- Difficult to find in 8th graders
- Need that potential from inside; want to learn new things
- Diverse groups
- Those that will stick with the program
- Interest in earth and space sciences
- Unique personality to take but also give back
- Outgoing nature

## 9. Has participating in TESSA encouraged you to volunteer more in other places?

### ***Summary***

Many examples of volunteer activities noted.

### 2015 Responses

- I volunteer at a lot of places now...it's made me want to volunteer at places more often (volunteered here first)
- We never volunteer here' but I had volunteered at food banks before now and then and I volunteered at the John Center – it's like the Seattle Public Schools headquarters – I volunteered there for a year and I worked in the mailroom and it was like basically they teach you job training skills and it was as I was still working here too and yea I did that for a year and I've done some things volunteering but I have a busy schedule to be honest, and it takes a while to volunteer [especially it it's long term]. I mean that year was long term but it was worth it in the end because I was helping people out and also helping myself, because those job training skills I could very much use in the future – and I still do use now. So I would say volunteering, it's a good thing, just make sure you have time for it. Because it's going to drain some time out – especially when you're not getting paid for it.
- I don't think I'd ever volunteered before I did TESSA. I didn't volunteer here either...I do volunteer a lot more now. That's definitely progressed. [Percy and Discovery Corps have to do 100 hours. TESSA can choose].
- I live in Redmond but I job shadowed and learn about engineering and putting things together, planning. Science Café to teach kids.
- I was already in volunteer programs. I'm more comfortable doing volunteer stuff because I'm more confident talking with people.
- No. I'm too stressed with school work.
- I've always been a huge volunteer so it's not made a difference.
- I don't volunteer every weekend but if someone calls me just tell me where I need to be and I'll be there.
- I volunteered at food banks.
- I never volunteered before. I didn't do much volunteering here because I started getting paid right away. But for those who volunteer, 100 hours is way too much.
- I volunteer at a lot of places. And do it more often.

## 2014 Responses

- Yes; I volunteer at my school's planetarium; run projectors in astronomy club (joined in 10th grade after was in TESSA)
- In theory yes; but with a little time it is impractical - desire has increased



## 10. Have you participated in TESSA activities outside of floor shifts? Why? What do you get out of it? Why not?

### **Summary**

Most youth say yes and give examples.

### 2015 Responses

- Museum of Flight Field Trips
- Trainings, Workshops
- The field trip to Zoo was cool.
- Tour of UW to see all the different internship possibilities for the summer; wanted to visit UW and wanted to check out the labs too “because that’s hopefully where I’ll be” and also thought it would be nice to do an internship.
- I did a focus group for teen science café.
- Often times appeal is science and financial perks together
- Doing the planetarium assistant internship – applied and had to write five-minute script, then they used that script for her to build off of
- Wants to apply for the Kepler internship this summer
- I like going to foundation breakfasts and talking to adults, Museum of Flight, camping.
- Events and during my internship they asked for our help and opinions.
- This summer I when to the Amazon family event.
- I've done so many field trips and internships. The first on I did because I got paid. The next ones I did because they were really cool and you could learn stuff, and you got paid. It's a very home school approach. For guest services, I was behind the scenes taking stock.
- Field trips and proms where I can work those things and black tie is kind of fun.
- Field trips--Museum of Flight, training and workshops.
- Participated in a tour of the UW about the kinds of internships. Focus group for 14 science café because I liked the idea and free food. Kepler internship looks good.

### 2014 Responses

- Internship with SOW; I wish I could do it again
- Most say yes and give examples

## 11. Do you feel that you are part of Discovery Corps? Do you feel connected to it as part of a team?

### **Summary**

Responses consistently show that youth feel a part of Discovery Corps and the Science Center as a whole.

### 11a. If yes, How? Why?

#### 2015 Responses

- Yes very much so, I mean we all wear this shirt (Discovery Corps shirt) so there's not much that really spreads up apart from Discovery Corps. We are Discovery Corps.
- Yes. We do some separate activities but we all come back together. So it's not segregated at all.
- Yea, you really can't tell the difference. It's exactly the same almost...(interpretation zones are space first, take space tests, encouraged to do space events and internships, astronomy day LANCAT was launched by NASA and one year she did a LANCAT celebration where she walked around with an iPad talking to guests about it; did same with (Orion launch).
- I feel like they're intertwined a lot. TESSA focuses on astronomy and Discovery Corps chooses on other things which is cool but I like astronomy the best. I don't feel like we are part of just the team group but can work with the adults on the floor and we also started a program where we can work in the planetarium. We're going to present gyroscopes in the planetarium.
- You work with all the Discovery Corps kids and to be honest, no one sees the difference when you're working out on the floor.
- It could be a little bit more unified. Get us together more and not so much on the floor positions, they're slacking off.
- I feel like they are not separated at all. We're basically the same things and we are friends and all get along.
- Yes because when you do those three days of training you do it with them and start to click more.
- Yes there isn't much difference.

- You can't tell the difference. They're exactly the same except TESSA has more stuff about space.
- All the kids in TESSA do things separately but we all come together and aren't segregated at all.

## 2014 Responses

- All one big team
- Very team oriented here
- Knowing that it's a great place to be and that you'll always be accepted is nice
- Camaraderie in break room and casual mentorship as well as conversations with peers and others with more experience
- All say yes and note training together and interacting during breaks

## 12. Do you feel that you are part of Pacific Science Center community? How is that similar to or different from how you feel about TESSA?

### **Summary**

Youth feel valued as part of the Science Center staff.

## 12a. If yes, How? Why?

### 2015 Responses

- Oh definitely yes. At first I didn't feel like that, but now that I've grown and gotten older I very much do feel like I'm part of it because I've been here for so long and right now I've been here longer than any other Discovery Corps kid so I definitely do feel like that – yea.
- Definitely yes. Everyone here is really welcoming and you meet tons of people in the break-room that you've never even seen before and they're so friendly and they just want to talk to you. I feel like at almost any other job you would have to be here a long time before people start to be that friendly. It's really great.
- Yes because we get invited to mostly the same stuff.

- I feel I'm a part of it because, you know, I'm part of the reason why this place is running. People like us, the employees, you know, we help the guests so I better feel like I'm a part of it. And I do...I feel like us employees we have a duty, and that duty is to take care of our visitors and all their needs, directing them where they need to go, and help them out, and assist them. I feel a part of it.
- If you see someone down the hall that staff you're going to smile at them and wave. I'm friends with the custodial people, security guards. Everyone knows everybody if you come here enough and it's basically a big family.
- Yes but it's not like I interact but my part contributes to the overall big picture.
- Definitely first but not at first because I've been here so long.
- Everyone is very friendly especially in the break room.

## 2014 Responses

- Very welcoming to Discovery Corps staff
- Everyone has a sense of respect and is a sign of maturity
- It's nice that they give us that motivational push...coming to work here is a step to finding other places to work
- ...seen me go from...little frail person to this outgoing person
- On the same level with someone who trained me
- Yes; promotion process and shadowing helps
- Just as much as a coworker there as anyone else

12b. If not or some, how can those who run it or who participate in it create a better sense of team spirit on that scale? [all]

### **Summary**

There are many suggestions to consider.

## 2015 Responses

Not asked in 2015.

## 2014 Responses

- The board meetings for the Science Center are boring but felt like a part of it
- Go as a group to do more; do small presentations not just observe
- Do a good job with pajama parties
- All go to a show or something off campus (e.g., bowling)
- UW lectures
- Activities to get to know other departments
- BBQ
- When weather is good, we go watch outdoor movies together here
- the Science Center Olympics; sports; staff play
- Circus; hot-dog eating contest
- Have something that everyone likes
- Painting planets
- Who can name the most planets or dinosaurs
- Continue focus on mentorship
- Keep shadowing
- Have more senior members at Discovery Corps events (training, etc.)
- Facebook group for workers
- Company picnic; more things like that to interact with more people

## 13. For female youth: Do you feel that women face extra barriers if they choose a STEM career?

### ***Summary***

Female youth are aware of ongoing discrimination and under-representation of women in STEM fields and the science and soft skills needed to succeed in STEM careers

## 2015 Responses

Not asked in 2015.

## 2014 Responses

- When I see a woman scientist...I think that's really cool

- See it is getting better but there is still an imbalance
- Can be more challenging for women to get the same amount of respect
- Believe that there are plenty of equal opportunities but women may be afraid to go into those jobs - may decide to choose something less challenging
- Hard to be a female sometimes; ideas aren't valued; learning how to carry yourself and be confident could help

## 14. If not or some, how can those who run it or who participate in it create a better sense of team spirit?

### 2015 Responses

Not asked in 2015.

### 2014 Responses

- More opportunities for fun get together for just Discovery Corps or just TESSA; fun events that don't necessarily have to be work focused and during better times that are more accessible for all people
- Should have team meetings or one big meeting at night
- Graduation ceremony for seniors

## Other Comments

### 2015 Responses

- *(Interviewer Question- What makes you want to stay?)* Honestly, it's not the pay. I just like being here. It's like my first ever job like I said, and also when we first signed up for TESSA I did not know that it was a job – I mean, I knew it was a job but I thought it was an internship, and I didn't know we were going to be here for so long... what keeps me here is I like it here. I really enjoy being here, it's not even so much the staff as just being around – I just, I like it. I do.
- *(Interviewer Question-What are some of the main things you have gained from the program?)* Job training skills definitely. I have a nice resume now. Just to be able to say that I've accomplished something that I've been here for so long. That's pretty good especially at

such a young age, I mean: 14-19 that's a long time for me – for anybody, especially at this age.

- *(Interviewer Question- Any more comments or suggestions?)* In the beginning I very much liked the science-based activities we did. The group activities and workshops and stuff like that. Just keep that going and make it stronger. That's an improvement. You need to make that stronger. And that would actually make a difference between TESSA and Discovery Corps. If you're going to name one group TESSA and one Discovery Corps, you know, show us why we're TESSA. Have TESSA activities and things like that. And for the next couple years just make sure you do lots of science-based activities, and don't just start them off doing it at the beginning and then forget about it. Keep it going, and that's how they know - they learn things from that...teach us the things we need to know.
- *(Interviewer Question- Anything you particularly enjoyed?)* I loved doing the planetarium. I loved that.
- *(Interviewer Question-How did they train you for that?)* We actually were never trained... [Summary: wrote down speech with planetarium presenter, presented it, ] And I would go and read [the speech] to them, and then I would go and help pass out surveys after, and I feel like I was actually a part of it – like I was doing something really big. And they should total bring that back, just train them on it first. Don't just throw them in there. You know, I had time to read it over and stuff, but I was never really trained on it. So just bring that back. That was really cool. It was. And then they just pulled the plug on that
- I have only done survey/test at the beginning and at the end but I would like to do it in the middle too.
- Have Discovery Corps members be part of the interview process to provide and give students a different perspective and make it less intimidating
- Last year most of graduating seniors got internships – Most kids our age don't get to actually do lab work but at the science center they are giving you a chance to actually experience this and you have kind of a leg up because most people don't get to experience that until college.
- I really enjoy the program and think that it's great to be able to work with the adult staff instead of having our own little thing in the corner. We get to be part of the Science Center. The only thing I would suggest is working in the planetarium but they already started that. I know some kids that are interested in working on the stage so that might be the next step for the program.
- I really like this program because it gives you opportunities to do things, like internships. If I wasn't in Discovery Corps, I would not have been able to do an internship. The Science On Wheels Exhibit was super fun. I could use what I learned here and could teach little kids. The

people really care about us and give recommendations and suggest things to attend. I really don't like the pre- post-test things. You learn things but not stuff that you can answer in the test. It would better to tests on things that are more specific. When the recorder was off she said after TESSA, she really liked astronomy because if it wasn't for TESSA, I don't think I would really care.

- My favorite part about TESSA is the people. I love the people because they're so energetic about science and enthusiastic and really giving and happy, well maybe not all the time, they're like drama kids. Seeing all of that and saying, 'I like it too.'
- I feel like Porsha and Josh do a good job and make things fun and help us to succeed. Have fun learning and interacting with people because you become a more people person.
- *(Interviewer Question-What do you think about the career ladder?)* I think it's really good but when I did my internship I missed out on things and others were so much farther ahead. If they could make the program more individual it would be nice. Make it more content and hours based. Sometimes you don't have the hours but you work just as hard.
- *(Interviewer Question-How to make it more content based?)* Keep track of Kudos. Have homework so you could track progress for hours without being there to get hours. Hours don't prove anything as far as what people are doing. It has to be based on what people did in the time. **Quality over Quantity.**
- The survey where you check the knowledge should be done somewhere in the middle so you can see better how the person has grown. **Have someone who's in Discovery Corps to be part of the interview to get a different perspective--someone my age that I could ask questions.**

## 2014 Respondent Comments

- Josh and Portia - I love them, they are doing a lot; hard for them to do both Discovery Corps and TESSA
- Need dedicated staff members only in charge of TESSA
- Do more NASA oriented science activities like cloud observing
- Do more field trips
- Some talk about NASA at morning meetings







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