Field Trips & Student Experience

The LIGO SEC Field Trip program began in 2004 and continues today, with approximately 100,000 students served. This brief includes data from student focus groups, a student survey about career interest, teacher interviews and teacher surveys. The data are drawn from the last 2 years of evaluation activities. Students are participants in classroom field trips, and most teachers quoted are participants in Project MISE or the Joseph Meyinsee Teacher Leadership Institute (JMTLI) at Southern University at Baton Rouge.

Inverness Research Observations:

In this region, LIGO SEC is one of few opportunities to explore science through interactive, hands-on exhibits that reflect a world-class, cutting edge scientific endeavor.

The LIGO SEC staff creates experiences for students that are enjoyable, rich in science learning, and unique.

Overall, we observe a very high level of student engagement in the field trip experiences. Students actively ask questions and engage in hands on science learning activities to increase their understanding about the cutting edge science happening in their region of LA.

LIGO has the potential to significantly influence the STEM identities of students who participate in field trips.

Teachers believe field trips are a unique, valuable, and inspiring STEM learning experience for them and their students.

STUDENT PERSPECTIVE

Physical science concepts students are learning in school are illustrated and reinforced by the LIGO experiment, exhibits and activities (i.e. waves, light and magnetism). Students make connections between their school learning or personal interests and the science of LIGO.

> *When I heard that we were going to go, I searched it up on my computer at my house and I discovered that it was like discovering gravitational waves and stuff and all that. I love that because I love physics and space and all that. (5th grade girl)*

> *I saw people in the laboratory. My mom is a civil engineer and she is on the computer all of the time because she is modeling stuff, she models dams and levees, so those people in the laboratory, they really reminded me of her. (6th grade boy)*

I am really interested in music and I am really interested in science, and when you look at the sound wave and things like the piano, I play the piano and use that kind of science a lot. (5th grade girl)

I like being observant about things and there are a whole lot of things that I learned today that I could see with my eyes. It was making me want to do it even more. (High School (HS) girl)

Students also explore ideas that are not typically found in the K-12 curriculum, particularly related to complex concepts related to the fabric of the universe, and the behind-the-scenes activities of a large, multi-disciplinary science experiment.

I like the models and the explanations, we wouldn't know that in school. People in the physics class, they never would know about the mirrors unless they come here, so you learn more about it. (HS boy)

I feel more informed. The stuff that you learn here, you are not going to learn all of that at school. We learned the basics, but not in detail like we learned here. (HS girl)

I like that I finally actually learned something, because most of the things that at school I already know. (5th grade boy)

Only a handful of people get to see it and we are one of that handful. (5th grade girl)

LIGO makes me more interested in science. I am interested in learning about astronomy, and so learning about the different sound waves and gravity in space, I wonder would I learn about that here? It is just interesting. (HS girl)

Students hear about, and are inspired by, the range of roles and careers at LIGO.

In an online survey of 150 students (58-6th graders, 37-7th graders, 14-8th graders, 24-10th graders, 10-11th graders, and 7-12th graders), 77% said they either "like" or "love" science or engineering.

72% said that they believed they could be a scientist or engineer at a place like LIGO. When asked to explain why (or why not), some wrote:

The summer internship that was talked about was very interesting in getting to go into more detail about everything they look at to determine what happens out in space. (12th)

Science and engineering is not my thing but I would like to try different things and make new discoveries. At one point I wanted to be a astronaut because I had read this awesome book about the solar system and it had Neil Armstrong in it (12th)

Because I went to LIGO and they taught me many things that I could use to teach other kids that come to LIGO. Also because I have always wanted to be a scientist. (6th)

Because when I went to LIGO I experienced cool things that I had never seen before. I love what LIGO does and I would really like to work there because I would be making a difference in the world. (6th)

I feel like if I really wanted to I could work hard towards it and be able to go there. (6th)

I have a passion for science and I am well-versed in math. I feel like I could handle research and engineering jobs and probably enjoy them a good deal as well. (11th)

I think I will be able to [work at LIGO] because if I work hard enough I will be able to be a scientist or engineer. (6th)

I really enjoy engineering and science, and from the experience of going I would DEFINITELY enjoy being an engineer or scientist at LIGO. (7th)

I like science and engineering but I want to be a welder so that would be my first priority. If I could yes, I would want to work there as a scientist or engineer, it was very fun and interactive. (10th)

Because in 5th grade I got a perfect on my science LEAP so I am basically a scientist. (7th)

In focus group interviews, they said:

I think that I would be an engineer because my parents have always helped. I have built like robots out of pieces and I build a lot of things out of my mind. Something that backed up my thinking about being an engineer was that machine where you pull down the string and it shows and then also the guitar strings where you spin the wheel and the guitar string like vibrates. That was really cool and it is easy for you to see. (5th grade girl)

In the auditorium the video that showed the black holes colliding - that got me really, really interested. (5th grade girl)

I want to be a scientist when I grow up, but I don't know what science. I like learning about gravity stuff but I am not like into space much. But, I like learning about waves, and making things and building. (5th grade girl)

The fact that you don't have to have a college degree to come here, that it helps you because sometimes people aren't good in school, but they are good at what they do. (HS girl)

LIGO field trip activities spark students' curiosity and wonder.

It made me more interested because when I find something out, I tend to want to learn more about it in science. (5th grade girl)

It made me more interested in science because it just didn't tell about one thing, it showed about lights and magnets and all of those different other stuff, especially waves. (5th grade girl)

I really like science and [the field trip] just makes me think that there are so many things that I haven't thought about in science, and that I will have to learn a lot to be able to be a scientist, a lot, a lot, a lot and I want to do it. (5th grade girl)

I thought especially after we played with the magnets and saw the iron and we were playing with that, I thought that was really cool. (5th grade girl)

We don't generally get to see, like we don't generally get to see stuff like the ultraviolet rays that we found from our bracelets or the magnetic force visually, we just don't get to see that and when we came here we do. (5th grade boy)

I want to come back again. Like every month they are open. (HS boy)

LIGO field trip activities confirm (or inspire) their interest in pursuing further study and/or careers in science or engineering.

I thought I would go into finance most likely, but this [experience] probably made me change my mind. (HS boy)

There are probably thousands and thousands of different engineers, but I would like to be like an agricultural one, and modeling would probably be one of the most important things, so seeing them working on their computers was cool. (6th grade boy)

TEACHER PERSPECTIVE

Teachers provide high ratings of the LIGO field trip experience for their students:

Answer options	Not at all	a little	Somewhat	A lot	A great deal
My students had an excellent field trip experience.	0%	0%	1%	10%	89%
The science concepts covered during the field trip aligned with what I am expected to teach in the classroom.	0%	1%	9%	22%	68%
I was able to transfer the inquiry approach into my classroom.	0%	0%	4%	31%	65%
I have incorporated my students' experience from the field trip into my regular classroom teaching.	0%	0%	5%	34%	61%
My students gained a better understanding of LIGO SEC-related science concepts on their field trip.	0%	0%	0%	24%	76%

Teachers believe students get a unique experience at LIGO

> *LIGO is the BEST science field trip experience in southeast Louisiana. I have been teaching for 35 years and have been on quite a lot of field trips, but LIGO is by far the best because it is geared towards the needs of our students. Three months later, and they are still talking about it!*

LIGO field trips are an opportunity to experience innovative science research in students' own community:

> *It was a great overall experience that took the students outside the walls of our classroom. Louisiana often gets a negative connotation when it comes to education and research. The field trip helped connecting the students with paradigm shifting community in their own "backyard."*

LIGO field trips inspire teachers to improve their own teaching:

> *The students love LIGO and want to continue to go there year after year. It has also inspired me to be a better science teacher.*

LIGO field trips can improve student learning in science:

> *I brought students to LIGO three years straight. These trips were made right before standardized testing. Each year students' test scores increased. I feel the LIGO field trip was a contributing factor to that increase and would definitely recommend and have recommended LIGO to other teachers*

Teachers report that distance and transportation are key barriers to field trips to LIGO:

Distance	44%
Transportation	31%
Cost	19%
Limited classroom materials	19%
Alignment with curriculum/standards	9%
Appropriateness for my students	2%
Limited internet access	1%

Teachers believe that LIGO SECLIGO SEC is a resource for the improvement of science teaching in the region (91% agree).