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To: Joe Giame, LIGO, William Katzman, LIGO SEC, Luria Young, SUBR

From: Jen Helms and Heather Mitchell – Inverness Research

Re: External evaluation progress report

Inverness Research, Inc., a private firm located in California, is serving as the external evaluator for the *LIGO SEC Science Education Center (LIGO SEC)*. IR has been studying the LIGO SEC since its inception in 2004. Our role as evaluators in this phase of the project is to document and provide feedback on the existing work of the Center and its partnerships, as well as new partnerships and programs.

I. Our work this year

This reporting period, IR engaged in the following tasks:

- Planning and update phone calls and emails with the LIGO SEC PI, Co-PIs, and other LIGO SEC staff
- Survey of teacher participants in PD and/or field trips
- Survey of Docents
- Interviews with cohort 1 JMTLI participants
- Debrief of data with LIGO SEC staff and PIs

The goals of LIGO SEC this year are to continue to improve their professional development and school group programs, and to bring those programs to new partners and regions of Louisiana, particularly New Orleans parish. In addition, they have expanded their Docent program to include community college students who are attending a college that is connected to the SUBR campus (SUSLA Connect). These programs are designed to expand the reach and impact of the LIGO SEC in the state of Louisiana, and to continue to be a beacon of science teaching excellence in the state.

This year we focused on collecting data from 3 key LIGO SEC audiences: teachers, Docents, and teacher leaders. These surveys (teachers and Docents) and interviews (teacher leaders) probed participants' interactions with LIGO SEC and impressions of the quality and value of their experiences. In July, we had a virtual meeting to share the data we collected and to discuss future opportunities.

II. Summary of Survey Findings – Teachers

An invitation to complete a survey about LIGO SEC was sent to 293 teachers, and 116 were completed for a response rate of 40%.

Key Accomplishments:

- LIGO SEC is reaching a range of teachers, mostly in East Baton Rouge
- Overall, teachers believe PD and field trips are of high quality and value, and many have participated multiple times
- Contributions, usefulness, and influence of LIGO SEC PD highly rated, with some exceptions
- Teachers are interested in engaging with and learning more from LIGO SEC
- Pre- and post supports highly rated (but not widely used)

General features of the teacher sample. LIGO SEC is reaching a range of teachers, with the largest group very experienced, teaching elementary and middle grades in a public school setting. The majority is from East Baton Rouge Parish.

PROFESSIONAL DEVELOPMENT

The teachers surveyed have returned to LIGO SEC for professional development – 54% of those surveyed have participated in more than one activity associated with LIGO SEC.

Overall, teachers find the professional development to be of high quality and value, with 93% surveyed rating the overall quality good or excellent, 74% rated its overall contribution to their science knowledge as substantial or great, and 80% rated its usefulness to teaching as substantial or great. Specific contributions are in the table, below:

Answer options	Not at all	a little	Some	A lot	A great deal
Your understanding of what LIGO-related science is	0%	3%	18%	33%	46%
Your interest in LIGO-related science	0%	5%	8%	28%	59%
Your overall understanding of how science is done	0%	2%	20%	30%	49%
Your enjoyment of learning science	0%	0%	11%	16%	72%
Your view of yourself as a science learner	0%	2%	10%	32%	57%
Your ability to teach science using an inquiry-based approach	2%	3%	13%	31%	51%
Your understanding of how students learn science	2%	2%	13%	38%	45%
Your perception of your role as a science teacher	2%	5%	15%	36%	43%
Your ability to teach science	2%	3%	13%	40%	42%
Your enjoyment of teaching science	0%	2%	11%	31%	56%
Your ability to help students enjoy science	0%	2%	7%	36%	56%

LIGO SEC activities were also highly influential:

Answer options	Not at all	a little	Somewhat	A lot	A great deal
Your thinking about your science curriculum	2%	3%	19%	41%	36%
Your choice of topics to teach	5%	5%	22%	39%	29%
Your instructional approaches	3%	2%	20%	36%	39%
Your thinking about the possible role of science institutions like LIGO SEC in improving your teaching	3%	0%	16%	33%	48%
Other (specify below)	13%	0%	19%	31%	38%

Finally, 88% of teachers surveyed said they would like to attend additional professional development, 91% said they would recommend LIGO SEC PD to other teachers, and 93% said that when compared to other PD experiences, LIGO SEC was at least as or more influential on their teaching. Moreover, their understanding of LIGO SEC-related science concepts were improved as a result of their experiences.

FIELD TRIPS

The majority of the teachers surveyed (76%) have taken students to LIGO SEC for a field trip. Of those who have not, they cite time (50%) and transportation issues (31%) as the main reasons.

Of those who use pre- and/or post-field trip supports or resources (about ½ of the sample), the majority believes they are good or excellent.

Overall, teachers find the field trips to be good or excellent in quality. All of the teachers said they would bring their students again, and would recommend them to a colleague. Specific ratings are below:

Answer options	Not at all	a little	Some	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%

Some teachers provided comments about their field trip experiences, below is a summary of some of the themes that emerged in the comments.

LIGO SEC 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 "back yard."

LIGO SEC field trips inspire teachers to improve their own teaching:

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

LIGO SEC field trips are unique and memorable:

[LIGO SEC 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 SEC 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 SEC field trips can improve student learning in science:

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

Distance (44%) and transportation issues (31%) are the key deterrents that prevent teachers from taking their students on a field trip to LIGO SEC.

Teachers offered some suggestions for improving their LIGO SEC experience:

LIGO SEC field trips provide unique and tailored opportunities and experiences for students to connect with the LIGO SEC experiment:

Build upon any possible opportunities for connecting students to the researchers/scientists in an authentic way. Whether it's through a meet and greet (perhaps not typically feasible) or a video clip or some other interaction, I think connection with experts in the field is powerful. Create really high quality experiences for field trips rather than standard activities that most good science teachers are already doing in their classrooms so that the field trip is something special. Be willing to personalize the field trip experience based on communication with the educator and the students' needs and studies.

Teachers also provided recommendations for expanding or continuing field trip offerings.

Continue to provide experiences that inspire students:

Continue to refresh the exhibits. Continue the friendly attitude with students that builds camaraderie and a love of science for each of them. Young gifted students need a place where their quirkiness and inquisitive nature are appreciated and "tolerated".

Provide more opportunities for LIGO SEC to visit schools:

Since it is sometimes difficult to get a field trip scheduled, I would suggest more opportunities for LIGO SEC representatives to visit schools. I know this is difficult with the limited staff; but maybe using the Southern University students could help.

Create a scavenger hunt for students to use on field trips:

I would like to develop a scavenger hunt (paper-based) so that when students do visit, they can leave with hands-on accountable documents to ensure comprehension of each activity.

Provide timely information about PD and field trips:

Please send out timely information about Professional Development opportunities and scheduling field trips. Not just to public schools, but also private and parochial schools.

Provide PD that aligns with curriculum:

Provide PDs for teachers that align with the new curriculum.

III. Summary of Survey Findings – Docents (response rate 39%)

Key Accomplishments

- LIGO SEC is recruiting Docents who have a strong interest in STEM, education and service
- Docents highly value all of the activities offered
- ~50% say their Docent experience has influenced their college, job, or career decisions
- LIGO SEC offers a unique experience in the Docent program
- LIGO SEC impacts Docents' interactions at work and in the community
- Docents have significant memories of their LIGO SEC experience

The majority of Docents are interested in STEM-oriented careers:

Answer Options	%
science research	24.1%
education research	17.2%
medical	31.0%
engineering	44.8%
technology	24.1%
business	13.8%
teaching	24.1%
sales	6.9%

When asked why they wanted to become Docents, responses largely fell into three main categories: interest in teaching or working with youth; interest in the subject matter; and interest in serving the community.

Overall, the Docents highly value the activities they participated in as Docents. In fact, for every item we asked Docents to rank, nearly all rated them “valuable” or “very valuable.” Items include: learning strategies to engage visitors, making connections between the exhibits and LIGO SEC research, working with LIGO SEC staff, and participating in science Saturday.

It is clear that their LIGO SEC experience makes an impact on Docents’ academic and/or career trajectories. We asked Docents to rank the extent to which their experience at LIGO SEC impacted the following decisions:

Answer Options	Not at all	A little	Some	A lot	A great deal
College decisions	7%	17%	21%	28%	28%
Job decisions	0%	24%	17%	38%	21%
Career decisions	0%	14%	24%	38%	24%

In particular, their experiences at LIGO SEC influence Docents’ decisions about a future career in STEM, as well as prepare them for future careers in STEM, respectively, as the following tables suggest.

Answer Options	Not at all	A little	Some	A lot	A great deal
The LIGO SEC Docent Program positively influenced my interest in pursuing a STEM field.	4%	14%	11%	32%	39%
The LIGO SEC Docent Program negatively influenced my interest in pursuing a STEM field.	75%	7%	4%	7%	7%
The LIGO SEC Docent Program helped me decide to go into a science, math, engineering, medical or technological field.	18%	7%	29%	18%	29%
The LIGO SEC Docent Program helped me decide to go into an educational field.	21%	11%	14%	36%	18%

Answer Options	Not at all	A little	Some	A lot	A great deal
The LIGO SEC Docent Program helped me know better what to expect if I go into a math, engineering, medical or technical field.	0%	11%	21%	29%	39%
The LIGO SEC Docent Program provided role models and/or mentors to me.	0%	7%	18%	39%	36%
The LIGO SEC Docent Program taught me about how to effectively communicate about STEM concepts and skills.	0%	4%	7%	32%	57%
The LIGO SEC Docent Program gave me personal contacts and information that have been useful to me.	4%	18%	21%	21%	36%

Finally, the Docents reported that their experiences at LIGO SEC impacted their interactions outside of the program, as indicated in a sample of comments below.

LIGO SEC helped improve Docents' communication skills:

Before my experience with LIGO SEC I struggled to communicate with others (especially children) to help them understand the way things worked. After LIGO SEC and seeing the way Tien worked with adults and kids to spark their interests, it helped me understand how to get a point across without confusion and loss of interest. LIGO SEC has help me in other ways such as presenting power points and talking to others, I have also worked severally math and science nights in the past that allows me to be one with children and there parents.

LIGO SEC impacts Docents' confidence interacting with youth:

My LIGO SEC experience has made me more comfortable with interacting with children and young adults on an intellectual level. I have encountered so many different individuals and made so many memories, that there is always a ways to relate new experiences back to LIGO SEC.

It has enhanced my confidence when dealing with the public.

LIGO SEC teaches Docents how to engage others to think and learn:

LIGO SEC teaches you how to properly engage individuals, ask questions, and how to push others to expand their minds and think in a positive way. LIGO SEC has truly taught me that it is more than just speaking but being a positive person that knows how to properly engage people to make them want to learn and become more knowledgeable about the topic at hand.

LIGO SEC inspires Docents to give back:

[LIGO SEC] made me more interested in volunteering and giving back to the community because the children need it.

LIGO SEC has taught me the importance of reaching out to our youth, which are the foundation to the future of this country. Having them Educate in a STEM background will grant them many educational and career options.

We also asked Docents to rate the extent to which they encountered certain challenges in their work at LIGO SEC. For the most part, Docents did not encounter many challenges. Conflicts with classes at school, other extracurricular activities, or jobs were cited as the main sources.

IV. Summary of interview findings Teacher Leaders from the JOSEPH MEYINSSE TEACHER LEADERSHIP INSTITUTE

We interviewed 7 participants from the first cohort of the JMTLI program.

Highlights:

- The JMTLI Cohort 1 participants are highly motivated to improve their facilitation, presentation, and general leadership skills
- The interviewees rated the quality (4.4 of 5) and value (5 of 5) of the institute very highly.
- The major highlights of the institute for participants include the focus on cultural relevance, opportunities to reflect on roles, and increased presentation confidence and skills
- All of those interviewed have participated in leadership activities since the institute; many of them have taken on leadership roles in schools or districts
- Most all of them would recommend JMTLI to other teachers.

Suggestions for improvement from the participants include:

- Clarity about expectations – both for participating in the activities as well as work done at home
- Endorsement or certificate that could lead to advancement
- Support for those who are interested in school/district-level leadership career track
- Formally network/connect and track graduates for ongoing collegueship and support

V. Inverness Research Reflections

It is clear that teachers, Docents, and teacher leaders highly value their relationship with LIGO SEC and see it as an important contribution to their professional development and trajectory.

For programs with teachers, we offer the following food for thought:

- Most teachers that participate in LIGO SEC activities are experienced. Can LIGO SEC create programs for early career/pre-service teachers?
- Are there other leadership opportunities within current field trip or PD programs for teachers that can be created?
- Teachers rate understanding LIGO SEC science, the nature of science, inquiry teaching identity slightly lower (though still high) than other items. Are there opportunities to address these areas in different ways?
- How can LIGO SEC help teachers make greater use of pre- and post-field trip resources?

- What are other or additional ways to reach teachers at a distance?

For programs with Docents:

- Can LIGO SEC help connect Docents to, or provide them with, mentors/models?
- Can LIGO SEC help bridge Docents' connection between LIGO SEC and the LIGO SEC lab/research?
- Can Docents be engaged in more/different kinds of outreach?
- Can LIGO SEC create a leadership cadre of Docents for advanced training/more responsibilities?
- Are there opportunities for high school teachers or students to become Docents?
- Can Docents become ambassadors of LIGO SEC to bridge the science and education communities in Louisiana and beyond?