



*“This was amazing, I loved how this year we got to see a play/performance.”*

**Expanding Your Horizons Workshop  
February 26, 2020  
Santa Fe, NM  
Final Report**

by

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# 1 What is EYH?

The Expanding Your Horizons Network is a non-profit organization of educators, scientists, mathematicians, engineers, parents, community leaders, and government and corporate representatives. Our mission is to encourage young women to pursue science, technology, engineering, and mathematics (STEM) careers. Through the Expanding Your Horizons (EYH) Network programs, we provide STEM role models and hands-on activities for elementary, middle, and high school girls. Our ultimate goal is to motivate girls to become innovative and creative thinkers who are ready to meet 21st century challenges. We aim to change the participants' opinions about people who work in STEM careers and show the fun, interesting and variety of career choices that people in STEM can have.

EYH conferences are held around the world at over 120 locations. Over 625,000 girls have participated in EYH conferences since their inception in Northern California in 1976. Now in its 45th year, the Northern New Mexico EYH (NNM-EYH) conference is organized by Los Alamos Women in Science (LAWIS) and is licensed by the New Mexico Network for Women in Science and Engineering from the Expanding Your Horizons Network (NMNWSE). The NNM-EYH conference alone has impacted over 13,000 girls! We focus in particular on the 5th-8th grades to positively affect attitudes at a critical age with the potential to impact choices on considering math and science pre-requisites in high school for the possibility of a STEM major. Additionally, the NNM-EYH also features a concurrent Teacher's Conference where teachers are supported with new opportunities to better promote STEM in the classroom. This year's NNM-EYH took place on Thursday, February 26, 2020 at the Santa Fe Convention Center.

There is a long-term vision for the EYH program to actively generate interest in STEM fields by young women through engaging workshops and STEM mentors. Cultivating this interest in youth can lead to stable, productive, and stimulating careers in the future. Participants will leave the event knowing the possibilities of what they can do in the future and that it is endless. Sometimes just one person believing in you can be the impact needed for a lifetime. The important role that STEM fields play in personal and national economy is shown in recent statistical studies. According to UC Davis 48% of all entry level jobs which require a bachelor's degree or higher are in STEM fields. There are 2.5 entry level jobs posted for each new four year graduate in STEM fields compared to 1.1 postings for each new BA graduate in non-STEM fields [1]. As of January 2019 the US had 7.6 billion unfilled jobs according to the Department of Labor and at this time only 6.5 million people were looking for work [2]. The vast majority of these positions are STEM occupations.

Beyond this these are the fields of future employment opportunities. According to the US Bureau of Labor, STEM occupations are projected to grow by 8.8% from 2018-2028 in contrast to 5% growth in non-STEM occupations. (See Figure 1) In 2019 the median annual wage difference was 48,820 dollars between STEM and non-STEM positions, showing the financial benefit of working in STEM occupations [3]. In addition STEM workers have less unemployment, greater gender pay equality, and a large impact on a nation’s competitiveness, economic growth, and overall standard of living.

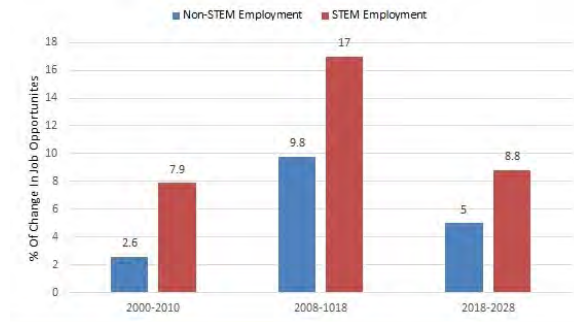


Figure 1: Recent and Projected Growth in STEM and Non-STEM Employment from the US Bureau of Labor Statistics [3]

## 2 Women in STEM

Despite these clear benefits in salary, stability, and career opportunities, women held less than 24 percent of STEM jobs in 2015. This contrasts with the fact that women constitute close to half of the general workforce. These stark statistics are shown in Figure 2. The US Department of Commerce Economics and Statistics division speculates on possible explanatory factors such as the lack of female role models, gender stereotyping, and less flexibility for working mothers in STEM fields. Regardless of the causes, the 2011 US Commerce Issue Brief on Women in STEM calls for the need to encourage and support women in STEM. While these numbers have slightly improved since the 2009 census we still find that only 14% of engineers are women and the number of women in computing has fallen from 35% in 1990 to 24% in 2015.

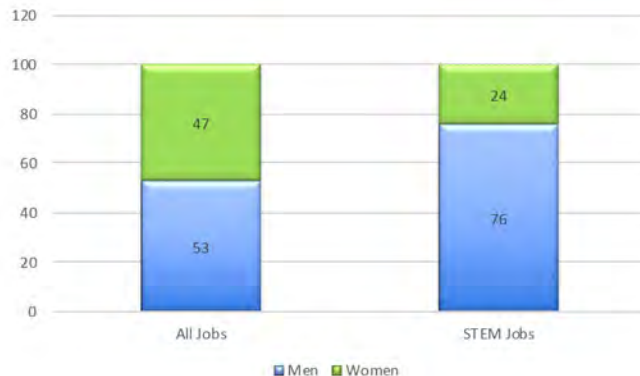


Figure 2: Relative percentages of employment by gender as discussed by the Department of Commerce [4]

## 2.1 Minority Women in STEM

These numbers become even more discouraging for the representation of Hispanic, African-American, and Native American Women in STEM fields. A 2013 report from the American Association of University Women found that African American women constitute 1% of engineers and 3% of the computing workforce. Hispanic women hold only 1% of jobs in each discipline. Native American women represent only a fraction of 1% [5]. This is the problem that EYH strives to address presenting young students positive female role models who are passionate about their scientific work in STEM fields. The students who have diverse backgrounds and differing educational opportunities are engaged through fun hands-on STEM activities.

## 3 STEM Interests

To open up young minds to the world of STEM, we take special care to present a wide range of STEM topics in youth-oriented workshops such as physics, chemistry, computer science, robotics, environmental science, minerals, math, accounting, etc. We truly want the participants to walk away feeling that STEM is fun and interesting and to feel more empowered to follow their interests. Key to this empowerment is the relaxed, interesting hands-on experiments the students participate in and the personal connection they develop with their STEM role models. Some of this comes across in the word cloud based on our student participants' feedback in Figure 3.



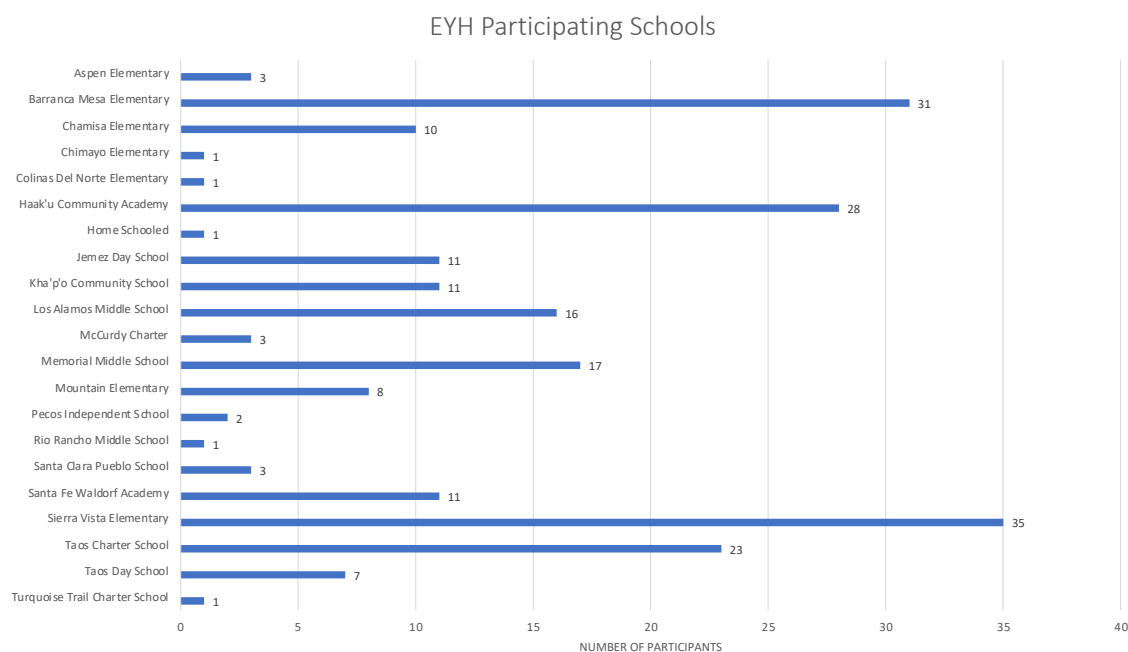


Figure 4: EYH Participating Schools

A few years ago we found out that transportation was one of the main reasons why some schools could not attend the event. EYH leadership responded with the investment of 20% of the budget for transportation costs as well as the enormous help of EYH volunteer Karen Kelley to bring students from all over northern New Mexico. Just look how far they've come to attend our EYH conference in Figure 5. The school that traveled the longest distance of 123 miles was Haaku Community Academy from the Acoma Pueblo!



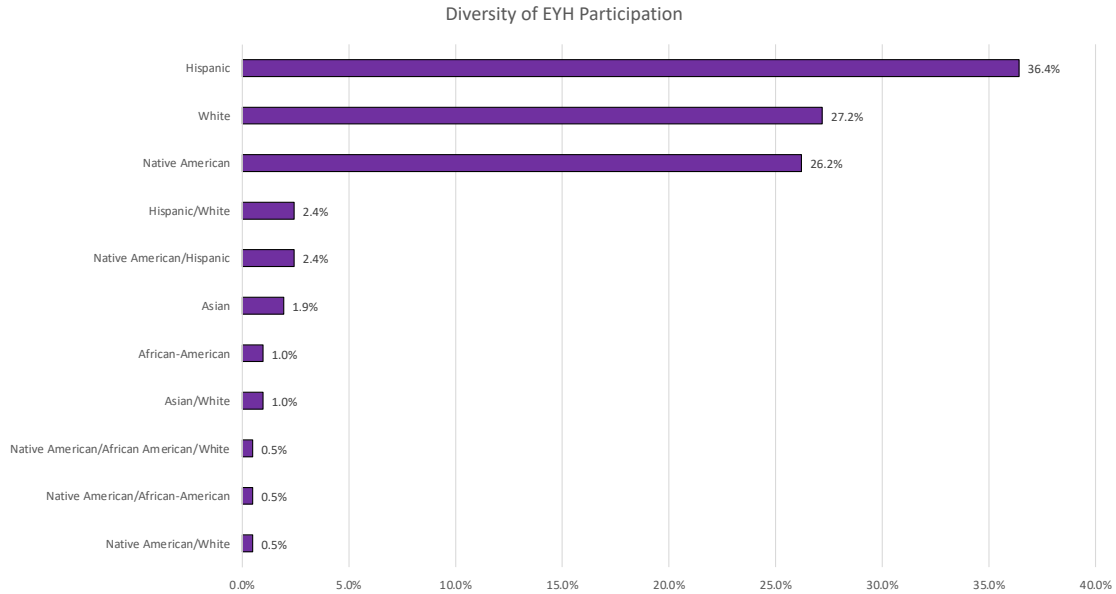


Figure 6: The Diversity of EYH Participants

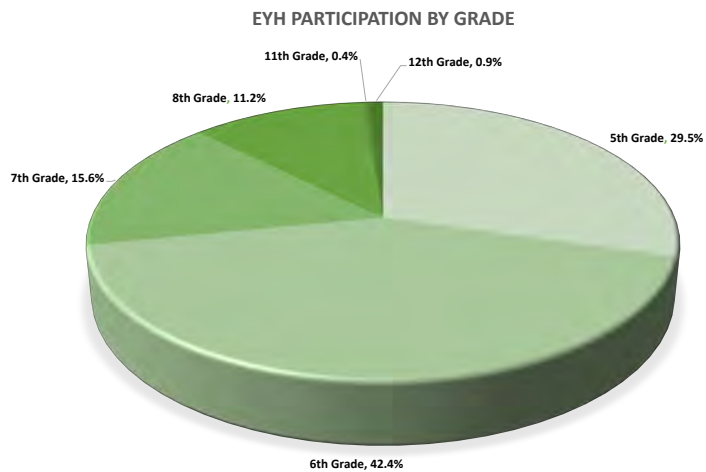


Figure 7: EYH Participation by Grade

Another focus of this year's EYH conference was to focus on critical early years for encouragement towards the pursuit of STEM fields. Here in Figure 7, it shows

the predominant participation from 5th, 6th, 7th, 8th, 11th, and 12th graders with 29.5%, 42.4%, 15.6%, 11.2%, 0.4% and 0.9% respectively.

## 5 The Impact of EYH

### 5.1 Student Impact

A total of 242 participants from all over northern New Mexico made it to the event. Registration is no small feat with logistical complications stemming from registration caps, long waitlists, cancellations, and walk-ins. None of this could have been handled without the kindness, grace, and acumen by our EYH registrar Josefina Salazar.

One of the wonderful validations of the success of the EYH conference is evidenced in our registration statistics. Not only have we increased participation almost fourfold in recent years, but over the last few years we see the return of previous years participants at a rate of 30%!

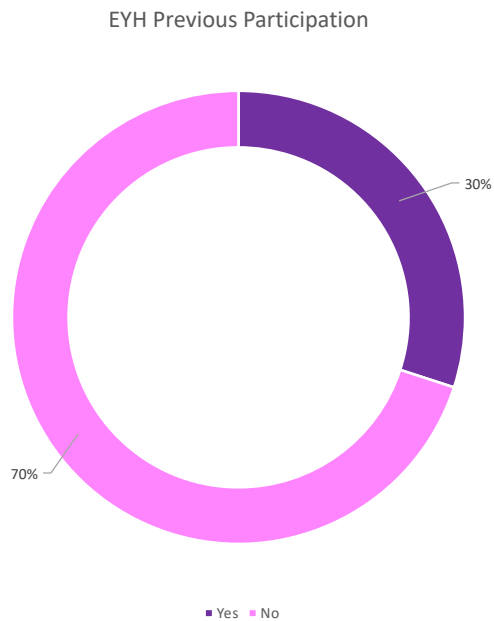


Figure 8: EYH 2020 Returning Participants

We are very encouraged by the indications of the impact the EYH conference has

Did EYH positively change your attitude about STEM?	Yes!	No
	90%	10%
More STEM classes in the future?	79%	21%

Table 1: Changing Attitudes Towards STEM

	Yes!	No
Before today did you have a positive attitude about STEM?	<b>76%</b>	24%
Given a <b>positive attitude</b> , did EYH positively influence your attitude about STEM?	<b>81%</b>	19%
Given a <b>positive attitude</b> , do you plan to take more STEM classes in the future?	<b>81%</b>	19%
Given a <b>negative attitude</b> , did EYH positively influence your attitude about STEM?	<b>29%</b>	71%
Given a <b>negative attitude</b> , do you plan to take more STEM classes in the future?	<b>53%</b>	47%

Table 2: Influencing Attitudes Towards STEM given Previous Attitude

on youth participants. Over 90% of those polled say their attitude toward STEM fields was positively affected by their experience at the EYH conference. Over 79% of the students attending our conference expressed that they feel more motivated to take STEM classes. EYH attract students with an already positive attitude towards STEM with 81% reported as having their attitude towards STEM positively affected by EYH and 81% report having an increase in their positive attitude towards taking STEM classes in the future. These striking statistics of changing attitudes based on student feedback are summarized in Tables 1 and 2, in addition to Figures 9 and 10.

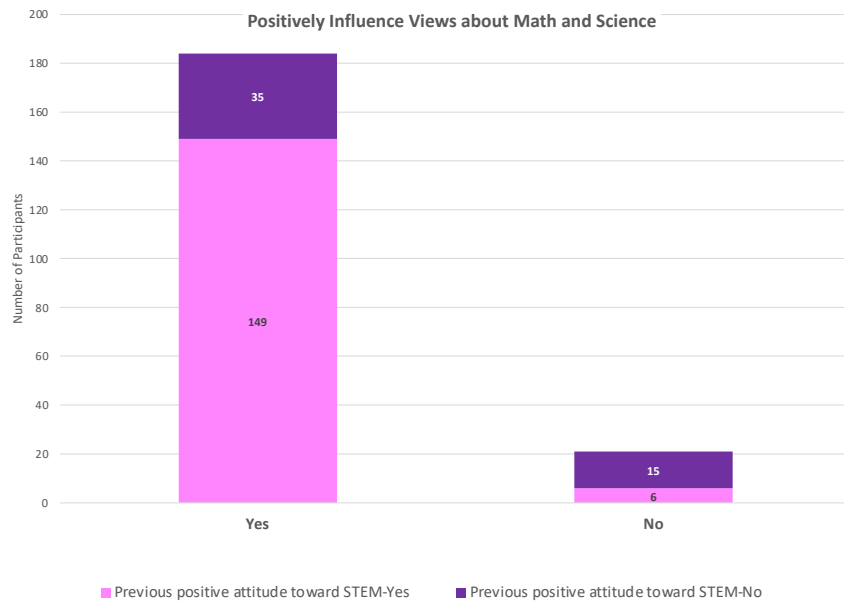


Figure 9: Changing Attitudes Towards STEM Fields

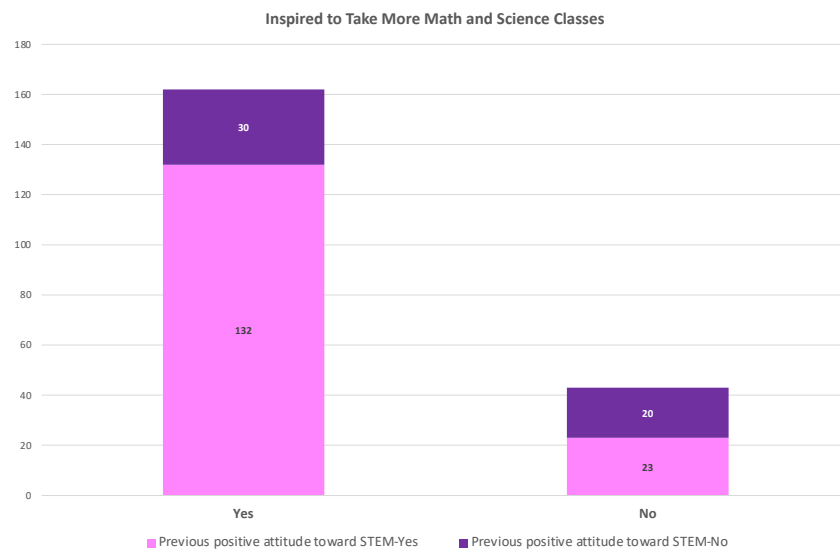


Figure 10: Inspiring the Pursuit of STEM Classes

## 5.2 Student Scholarships

Of the 242 students in attendance there were 94 students or 39% that received a scholarship to attend and registration fees were waived. Enabling students through scholarships prevents socioeconomic background from preventing attendance and is one of the most direct student benefits from EYH sponsorship.

# 6 The Day of the EYH Workshop-February 26, 2020

## 6.1 Matheatre production “Curie Me Away!” performed by Sadie Bowman and Ricky Coates

For this year rather than the normal Keynote Speaker we had Matheatre come and perform Curie Me Away. This is a radioactive musical based on the science, life and discoveries of Marie Curie. Core chemistry concepts (compounds and reactions, groupings on the periodic table, transmutation, radioactive half-life) are reinforced through lyrical metaphor in a biography of discovery. With emotional range, a powerful message for women in STEM and their collaborators, and lots of science—it’s the radical story of a persistent woman who changed our understanding of the universe. This was also a fun opportunity to provide a musical performance experience to the girls in addition to the STEM and historical topics mixed in.

At the 2006 Minnesota Fringe Festival, Sadie Bowman and Marc Gutman premiered a highly unlikely smash hit: Calculus: The Musical! It was the product of a funny math teacher and a smart comedian, and it struck a resounding chord in the education world. Bowman and Gutman toured an early version of the show to schools throughout the US and Canada, then Know Theatre of Cincinnati produced an eight-year tour with their own actors. In 2016, Bowman and Gutman were joined by actor/writer/one-time-astrophysics major Ricky Coates to reboot the now classic Calculus musical and in this configuration, Matheatre continues to grow.

Now a 501(c)(3) entity with international reach, Bowman and Coates tour full time with four full scale productions that promote scientific literacy and intellectual curiosity. Marc Gutman and Rosalie Norris Gutman provide administrative support and music production from our home base of Minneapolis, MN. We now work with museums and science centers, libraries, and planetaria in addition to high schools

and colleges. We now travel beyond North America, building relationships with students and science fans worldwide. We offer workshops to educators and science communicators and are producing a dramatized nonfiction podcast about math and science history, coming in 2020. Matheatre is a member of ASTC (Association of Science and Technology Centers).

As of 2019 statistics, Matheatre reaches over 18,000 individuals every year and growing. Based in the United States, we travel worldwide to museums, colleges, high schools, libraries, theatres and any place science and arts can collide. Our professional theatre artists perform for and work with educators, students and laypeople to enrich science communication with the power of story. We believe that scientific literacy, curiosity, and imagination are necessary components of a healthy society, and these are values we seek to promote through our work.

Sadie Bowman is co-founder, co-artistic director, managing director, and touring performer for Matheatre and has years of educational theatre experience with Matheatre. She has previously served as education manager at Know Theatre of Cincinnati and a coordinator and performer for Thinking People's Theatre of Portland, Oregon. She has been part of sketch and musical comedy groups in various cities and served as a creative contributor for educational software company ScienceVR. She holds a BA degree in Theatre Arts from the University of Minnesota, Twin Cities.



Figure 11: Sadie Bowman in character, portraying Marie Curie for Matheatre



Figure 12: Marie and Pierre Curie discovered Radium [6]

## 6.2 Science Fair

The lunch time activities included a Science Fair where students and teachers could engage with local businesses, government agencies, and utilities about their opportunities related to STEM. This year participants included NM State Forestry Division NM Wildfire Prevention, Ski Patrol/UNM Health Center, "How computers work" and "Drive a Droid", Girl Scouts of New Mexico, Flow3d, Understanding Fission, TA-55 WSST, and New Mexico Tech!



Figure 13: Learning about Girl Scouts



Figure 14: Exploring medical aspects with UNM Health Center



Figure 15: Practicing to work in a glovebox



Figure 16: Participating in the science fair

### 6.3 Student Workshops

Paramount to the EYH experience is our hands-on workshops where students get the opportunity to interact with professional women in STEM fields on interesting and engaging topics ranging from physics, light, hydrogels, chemistry, fluid dynamics,

cryptography, minerals, computer science, genetics, plants, climate, lightning, circuits, industrial hygiene and so on. The following were the workshops that students participated in at the event:

- **Ancient Therapeutic Tea Bath Soak**

**Presenter: Dr. Jessyca Franco-Chavez, NMD**

DIY Ancient Therapeutic Herbal Tea Bath to help calm nervous tension from daily activity and help combat emotional stressors. Warm Ancient Tea Bathing has been known as a traditional remedy to aid in promoting restful, relaxing sleep for relaxation and concentration. This Herbal Tea Bath will be made in a hands-on workshop aimed toward exploring the science behind nature and how botanical medicine along with other naturopathic medicine nutrients (Himalayan sea salt, magnesium sulfite) combined in a soothing combination may have a positive healing effect on body, mind soul.

Dr. Franco-Chavez completed her Community Health Education undergraduate degree at The University of New Mexico in Albuquerque in 2004. She then completed a Post-Baccalaureate program focusing on Biochemistry at New Mexico State University in Las Cruces, New Mexico in 2011. Dr. Franco-Chavez earned her Doctorate in Naturopathic Medicine from the Southwest College of Naturopathic Medicine in Tempe, Arizona in 2017.

- **Introduction to Arduinos**

**Presenter: Alia Long**

Students learn to do basic coding and circuit design in a fun environment with user friendly and affordable Arduinos. These can be used in everyday home and school projects to sense and control. The number of projects they are capable of is limited only by the imagination, making a great platform to learn how computer programming is accessible to all of us.

Alia Long is the lead for developing research in cyber-physical systems in the Advanced Research in Cyber Systems group at Los Alamos National Laboratory. Alia is a skilled Electrical Engineer with over 15 years of computing system design, hardware architecture, and cybersecurity research experience. She completed her Master of Science degree in Electrical Engineering at the University of Oklahoma, while serving as Institute of Electrical and Electronics Engineers branch chair.

- **All About Birds**

**Presenter: Audrey Sanchez**

This ornithology workshop will teach students all about birds, their conservation need, and avian research for management recommendations. The students will be given a 15 min PowerPoint presentation that covers bird identification by sight and sound, data collection on species, age, etc., and some components of data analysis. There will be at least 4 activities after the lesson where students get to practice what they learned in the lesson.

Audrey and Jenna are both Environmental Professionals in the Biological Resources Program in the EPC-ES. As wildlife biologists, they implement compliance requirements and perform environmental monitoring to ensure LANL operations do not impact biological resources.

- **The Chemistry of Red Cabbage: A Homemade pH Indicator**  
**Presenter: Chelsea Neil**

In this workshop we will talk about what pH is, why it is important, and participate in a hands-on activity using cabbage juice as a color indicator of whether different household substances are acidic or basic.

Chelsea Neil is currently a postdoc in the Earth and Environmental Sciences Division at Los Alamos National Lab, where she studies fission product geochemistry and transport in the subsurface. She received a Ph.D. in Energy, Environmental, and Chemical Engineering in 2015 from Washington University in St. Louis.

- **Let's make slime!**

**Presenter: Jenna Lente**

Fun activity making slime-focusing on the fact that chemistry is useful in all aspects of life, but it can be used to just make cool and fun textures!

Jenna Lente and Chelsea Ottenfeld-Two geologists turned chemists. Both have Masters degrees in Geology from NMSU (go aggies!) and now work in C-AAC. Jenna works on the X-Ray Fluorescence Team and Chelsea works on the Thermal Ionization Mass Spectrometry Team.

- **What's that Smell? What's that Noise? The Great Industrial Hygiene Mystery!**

**Presenter: Dina M. Siegel**

Students will learn how Industrial Hygienists protect the health and safety of people where they work. These "invisible heroes" make sure our friends, ac-

quaintances, and loved ones come home safe every day. Students will be able to use instruments that measure hazards associated with many jobs, and will solve an industrial hygiene mystery.

Dina has been in industrial hygiene for over 30 years. She currently provides program management, technical expertise and continuous improvement in chemical safety, biosafety, and glovebox safety as an IH Professional IV at Los Alamos National Laboratory. Her current expertise includes exposure assessment, nanotechnology, chemical management, and she has general expertise in the broad spectrum of IH programs for DOE, DOD, and private industry. She is a Certified Industrial Hygienist, a Certified Safety Professional, and a Certified Biosafety Professional.

- **STEM in Archaeology**

**Presenter: Cyler Conrad**

This workshop examines archaeology and STEM, and the ways in which you can apply science and mathematics in archaeology to understand questions about our human past!

Dr. Cyler Conrad is the archaeology technical lead at Los Alamos National Laboratory. He completed his dissertation from the University of New Mexico in 2018 and has conducted archaeological fieldwork in New Mexico, California, Thailand and Laos.

- **Light, Color, and Sparkles**

**Presenter: Laurie Waters**

The girls will explore the wave nature of light by learning about the electromagnetic spectrum from infrared to visible to ultraviolet. We will use prisms and diffraction gratings to separate sunlight into colors and light sticks to bring colors back together. We will examine scattering, reflection and refraction of light beams made visible through cloudy water and smoked acrylic prisms. We will briefly look at fluorescent objects and write with light on phosphorescent paper. The girls will learn a simple way to make different types of rainbows with flashlights and a glass of water. The step into a rainbow demo has girls looking directly at the rainbow colors in an immersive experience. I will also set up a laser microscope, and a demonstration on why the sky is blue. Girls will also get training in the safe use of laser pointers and UV light. This year I'll have some new demonstrations on waves to introduce.

Dr. Laurie Waters got her PhD in Physics at the State University of New York at Stony Brook and worked as a nuclear physicist at Los Alamos National Laboratory for 21 years. She retired from the lab in 2012, and now does consulting work for a firm called TechSource, Inc., for places like the Department of Homeland Security. She dreamt of becoming a scientist from a very early age, back when there weren't any computers. She read as much as I could about science and had friends with similar interests. Her biggest influence was Mr. Johnson, her 10th grade algebra teacher, who encouraged her to take harder math courses. Few people back then thought that women could be scientists, but he was an exception. She loves what she does, especially the challenge of research and making discoveries. She made her personal dream come true.

- **Plants, water and climate: How trees' plumbing determine where they can grow**

**Presenter: Rutuja Chitra-Tarak**

Learning about how trees use water, how that affects the climate and how water use of trees determines where they can grow. Hands-on task is to measure hydraulic conductivity of samples from different trees and then compare and discuss the results together in the end. Each group will be divided to pairs or small subgroups that measure one tree.

Rutuja is a post-doctoral research associate at the Los Alamos National Lab, where she models tropical forests. She grew up in central India on the wilder outskirts of a small-town, Wardha, which was, incidentally, a political base for Mahatma Gandhi that influenced much of her bringing up. While her favorite subjects in school were Maths and Physics, a fascinating introduction in college to evolutionary biology drew her to biology. She followed that interest through a Masters in Biodiversity which took her to some of the most beautiful landscapes and biomes in the Western Ghats Biodiversity hotspot in India. She did a PhD in Ecology and spent several memorable years doing field work in southern Indian forests amidst elephants, tigers and ticks and was fortunate to be protected and assisted by native forest dwellers. Before joining LANL Rutuja was a post-doc at the Smithsonian Environmental Research Center in Maryland. Rutuja loves New Mexico: being in the wild, its sunshine, dancing tango and more.

- **Having Fun with Circuits!**

**Presenter: Michelle Sherman**

In this workshop, students will learn the basics of circuit theory in order to

make a Music Rhythm Operated Dancing Light using LEDs and transistors. The lights follow the high pitch beats in music, such as drum beats or electric guitar strums, and turn on and off according to the music pattern.

Michelle Sherman is a student at New Mexico Institute of Mining Technology. She is also the Student Government Association President for NM Tech for the 2019-2020 academic year. She will be graduating in May 2020 with two Bachelor of Science degrees with a double major in Mathematics and Electrical Engineering. Michelle earned two Associate of Science degrees in Engineering and in Physical Science from the Santa Fe Community College while simultaneously graduating from high school in May 2017. Her future career plan is to work in a problem-solving environment such as a research lab using her analytical and electrical engineering skills. She enjoys working with robots and UAVs and hopes to use these skills to enhance research on other planets. She encourages more women to seek advanced degrees in the STEM fields by being a spokesperson at every opportunity she can find.

- **Bounce, Splat and Stretch**

**Presenter: Rachel Huber**

Polymers are everywhere! Both natural and synthetic, polymers are a major part of our lives, from the food we eat to the clothes we wear, and from hair-spray to space shuttles. We will explore some of the properties of these bendy and stretchy molecules by making bouncy balls that you can take home!

Rachel is a scientist at Los Alamos National Laboratory, specializing in polymer compression via gas gun driven shock. In general, Rachel throws one material into another really hard and then observes the effect on the material. This helps determine how sturdy the material is and what applications the materials could be useful in.

- **Electro-Magnetic Train**

**Presenter: Loren Espada Castillo**

Build a train made out of coiled copper wire and a train car comprised of a battery with magnets on both ends.

Loren Espada Castillo has a Bachelor and a Master Degree in Physics from the University of Puerto Rico-Mayaguez Campus. A PhD in Materials Science from the University of Texas at El Paso. She did her Postdoctoral Appointment at LANL from 2000-2003 and went to work at Sandia National Laboratory Al-

buquerque from 2003-2016. Since then she has been back in LANL working in the Material Science and Technology Division (MST-7). Her area of expertise is in solid state physics and semiconductor where she studies how the large-scale properties of solid materials result from their atomic-scale properties.

- **Introduction to polymers and pH chemistry**

**Presenter: Julie Jung**

Part (1) Synthesis of polymer from milk Part (2) Experiment with pH (testing several samples with red cabbage juice).

Julie is a postdoc at Los Alamos National Laboratory.

- **Principles of Radiation Protection**

**Presenter: Jenelle Mann**

In this session, we will go over the basics of what radiation is and how we protect workers and the public from the associated hazards. We will focus on using the three radiation protection principles of minimizing time, and maximizing distance and shielding in ionizing radiation environments. Additionally, we will show different consumer products that produce minimal amounts of radiation, and we will discover how different types of materials make better shields from radiation. The workshop will also include a dress out activity where students can dress out as radiological workers.

Jenelle Mann is a Criticality Safety Analyst at Los Alamos National Laboratory. She received a PhD in Radiological Health Sciences specializing in Health Physics at Colorado State University in 2016. She also has a Master of Science degree in Radiological Health Sciences from Colorado State University and an Honor Bachelor of Science degree in Nuclear Engineering from Oregon State. Ms. Mann has experience in modeling occupational situations using Monte Carlo N-Particle Transport (MCNP), radiological emergency response equipment, deterministic dosimetry codes, plant uptake, and biological remediation.

## **6.4 Teacher Workshops**

The EYH conference also aims to inspire the student's teachers in STEM by providing a teacher workshop that provides resources for hands-on STEM involvement in their classroom and in community science competitions. EYH has

enjoyed a lot of positive feedback from teachers for providing stimulating and innovative teacher workshops to introduce fun STEM educational activities to bring back to the classroom. This year over 20 teachers participated in the teacher workshops.

– **Teacher Workshop I: Art with a Spark-Explora**

**Presenters: Explora!’s Anthony Salvagno and Hali Willis**

Can a painting light up an LED? Can a sculpture power up a motor? Create a painting, build a sculpture, weave a pattern or sew a design that functions as simple circuitry in this hands-on art + science workshop facilitated by Explora educators.

– **Teacher Workshop II: Easy Household Chemistry Experiments**  
**Presenter: Genna Waldvogel**

This workshop will provide lesson plans, strategies, laboratory procedures and material list to get you started with easy chemistry experiments and demonstrations for all levels. Topics include chemical reactions, hydrogen-bonding, molarity, measurement and the scientific method.

Genna Waldvogel is a civil engineer at Los Alamos National Laboratory. She works for the utilities and institutional facilities division and works for the Smart Lab Team, creating more energy efficient laboratories. Genna has a BS in Environmental Science from University of Vermont and a MS in Civil and Environmental Engineering from Carnegie Mellon University. After finishing her bachelor’s degree, Genna joined Teach for America and was a high school Chemistry and Environmental Science teacher for four years at Hartford Public High School in Hartford, CT. She loves science and creating an environment in the classroom that will draw students in!

– **Teacher Workshop III: Circuit Playground Express**  
**Presenter: Veronica Camarillo-Morris**

The workshop is an introduction to electronics and embedded programming. Students learn about how to write programs in python and execute the programs on the Circuit Playground Express hardware board to enable sensors, such as the following:

- 10 x mini NeoPixels, each one can display any color
- 1 x Motion sensor (LIS3DH triple-axis accelerometer with tap detection, free-fall detection)
- 1 x Temperature sensor (thermistor)
- 1 x Light sensor (phototransistor). Can also act as a color sensor and

pulse sensor.

- 1 x Sound sensor (MEMS microphone)
- 1 x Mini speaker with class D amplifier (7.5mm magnetic speaker/buzzer)
- 2 x Push buttons, labeled A and B
- 1 x Slide switch
- Infrared receiver and transmitter

This hardware is intended for use on robots, clothing, etc.

Veronica Camarillo-Morris is a proponent of technology for the betterment of humanity. Her professional background is in the integration and implementation of technology for operational efficiency and innovation. Veronica's master's is in Network Communication engineering with an emphasis in Software Defined Networking. She is most passionate about Amateur Radio, and organizations that promote STEM as well as our young women in pursuit of technical careers.



Figure 17: Teachers' collaboration provides opportunities to share experiences and knowledge

## 7 The EYH Evaluations

### 7.1 Student Workshop Ratings

Figures 18 and 19 below shows the ratings for workshop content and workshop difficulty-level based on the student evaluations. The average for workshops content was 4.02 out of 5.0 for mostly good and for difficulty-level 2.78 between just right (3) and easy (2). It is a great challenge to appeal to the broad student base that spans the 5th-12th grade as well as diverse educational backgrounds with students across Northern New Mexico. We are thrilled by these results as they show that our presenters are creating fun and engaging workshops that are right on track with the level of difficulty.

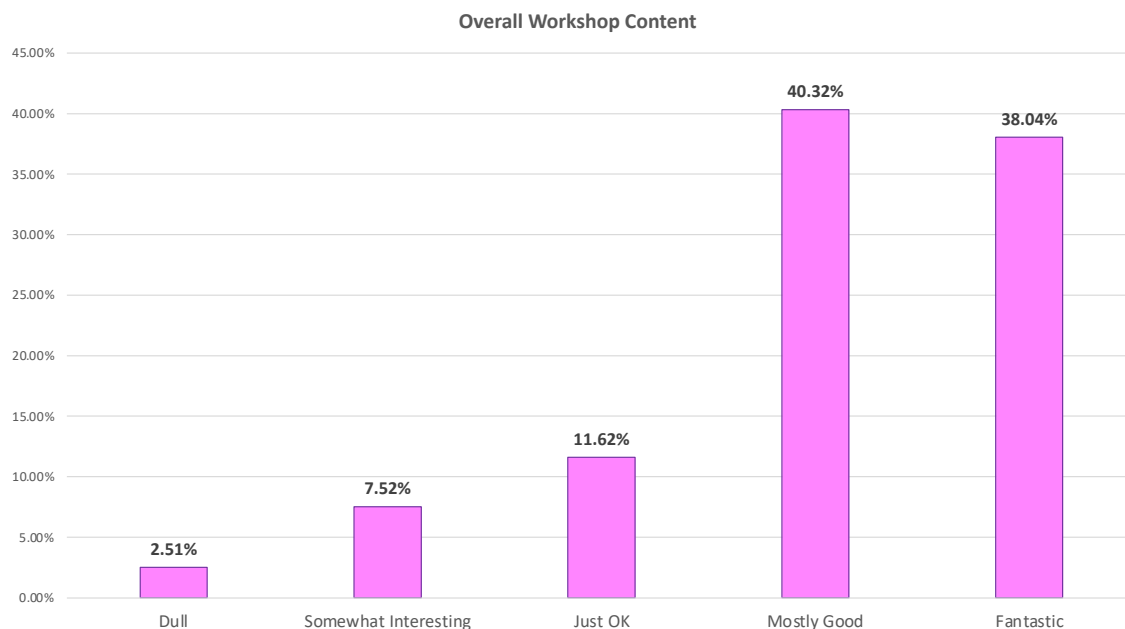


Figure 18: Student Evaluations of Workshop Content

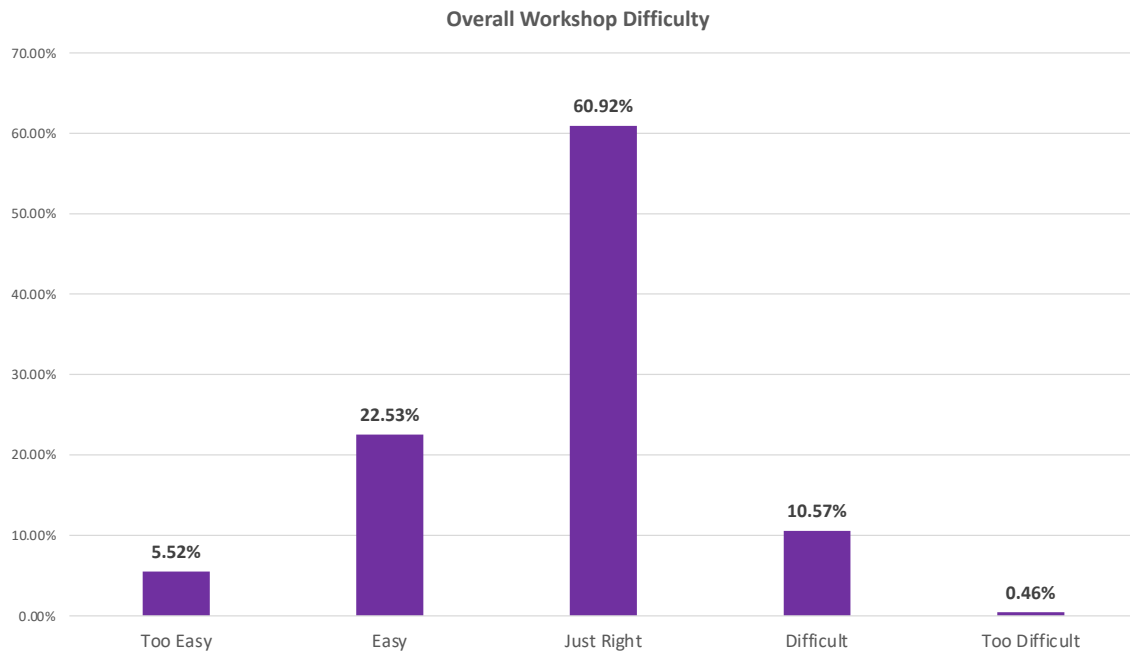


Figure 19: Student Evaluations of Workshop Difficulty

## 8 The Best Part of the Report

### 8.1 The Students' Feedback

Here are the student's answers to open-ended questions at the end of the day captured in their own words...complete with emoticons and misspellings:

#### What I expected was...

"A nervous but good time"

"The workshops to be boring"

"That there was more technology"

"I expected it to not be fun but it actually was fun"

"Not very fun?"

"To have a good time. Lirn cool things. Make new friends"

"I expected to have lots of fun!! and I did :-)!!!"

"A good slime"

“Speeches of empowerment”  
“I didn’t expect to enjoy everything as much as I did.”  
“A boring confrence”  
“To watch a video and watch what they were doing”  
“To have fun, meet friends, and learn!”  
“a fun experience.”  
“to be learning about boring birds”  
“just a speech”  
“To have more fun”  
“fun expiraments and to learn”  
“something very boring”  
“To have a amazing time meet new friends, and learn new/interesting things.”  
“I expected that it was going to be boring and I wasn’t going to learn anything”  
“It to be boring but when I got to expirince it, it was fun”  
“It was so cool and was fun. I like all the science stuff”  
“Very Complex Science”

### **What I got was...**

“A great day that encouraged me”  
“FUN!”  
“Awsomeness”  
“Fun”  
“Very educational and amazing!”  
“All of that”  
“I got to learn about radio activity”  
“A very fun a educational expesence”  
“failed slime!”  
“Amazing! I didn’t even think that I was going to get anything other than a T-shirt.”  
“Exitment! So cool to see the light bend! It was amazing!! :)”  
“How the transisters worked.”  
“That we got to be hands on and have an experience for ouselves.”  
“Everything!”  
“Learning about birds but in a much funner way”  
“I learned a lot more about natural medicine”  
“cool and amazing”  
“to learn”  
“a good experience and it was fun and very interesting”  
“How archiologists work. How to program a Ardoino/make a Led light go on. And

about archology.”

“The exact opposite this class was really fun and very educational”

“learning about science and archeology”

“what I got was we got was bags and we got to mix colors to purple.”

“Very useful Science.”

### **I wish I learned more about...**

“Space”

“How to be clean”

“How the programing works”

“If there is moer different colored vegistables”

“doctors/surgeons”

“slime because I failed!”

“Computer Programming”

“The credit card hidden writing (how it works).”

“explore more of was I learned.”

“The song project”

“More electronics and how fast they work”

“Math”

“blowing stuff up”

“The bird’s wing.”

“all of the other work shops but it’s ok!”

“Science and computers”

“radiation”

“atoms and how to find them”

“How what we are typing in Ardoino programs it Medical Sciences. Chemistry.”

“coding”

“expirimating”

“a scientist space.”

“engineering”

### **Next, I will...**

“Go home and tell my family all about it and try the experiments out”

“Make a better mess”

“Now start taking math and science classes”

“Hopefully, I can come again soon!”

“Lirn more about dating artifacts by their radio activity”

“make slime”  
 “Tell people how much I loved this camp.”  
 “Explore the effects of the invisible ink pen and different ways it shines. :)”  
 “Having fun with circuits!”  
 “See if it works and see how it works”  
 “investigate polymers more”  
 “love to come again”  
 “took what I learned and use it”  
 “ask more questions in science and participate more”  
 “Keep learning and seeing all the fun/interesting things I learned here.”  
 “Try to do it with little to no help”  
 “Learn more about science”  
 “go home and teach my family what I did”  
 “Do better”  
 “try to expand my knowledge on science and math”

### And the best part was...

“Everything”  
 “The cabbage”  
 “The chemistry”  
 “The best part was when we tested the red cabbage and changed the colors of the liquids”  
 “THE PLAY”  
 “The acology”  
 “slime because I love slime and was happy!”  
 “The light, color, and sparkles workshop.”  
 “Seeing the prisms bend the lasers from the laser ray box.”  
 “I had so much fun, this program was an amazing experience and I thank everyone who helped this become possible. Pst thanks.”  
 “When we saw how it was put together”  
 “I got to participate in cool things and meet friends!”  
 “going outside and looking at random stuff”  
 “the bath bomb.”  
 “making slime”  
 “the experiments”  
 “getting to eat our M&Ms from the principles of radiation workshop”  
 “The Marie Curie play was the best. It was all great! Meeting new friends and learning about anatomy. And all the great activities I did in the workshops”

“learning more about computers and the process that goes into them. expirimating”  
“The computer was the best part ever because you can touch the stuff engineering and learning about hearing.”

### **Anything else?**

”I wish that they were more classes in a day”  
“have more time to go to more stations”  
“Fun day!”  
“I enjoyed it”  
“was a great product”  
“This was amazing, I loved how this year we got to see a play/performance.”  
“next time I will participate more”  
”I really enjoy doing hands on stuff and peoples inspirational stories”  
”I hope this we go on, this is a great program.”  
”I really enjoyed this conference thing”  
    “I love how we are broken up it to group and have to work together to complete a challenge”  
“It was FUN!”  
“love the positivity!”  
“I enjoyed everything today, I like how we bonded with new people”  
“it was perfect and tasty!”  
“I liked the radiation protection”  
”I would love to come back every Monday.”  
”Nope nothing else to share besides I want to take more math and science classes in the future”  
”It was really good for the first time ”  
”not really, but thank you so much fun! I had an awesome time”  
”I like Lazars”  
“I would love to come back every Monday.”  
“Nope nothing else to share besides ha I want to take more math and science classes in the future”

## **8.2 The Pictures**

The student workshop experience is beautifully told in pictures:



Figure 20: Creating bouncy balls in Bounce, Splat, and Stretch



Figure 21: Dressed out in Personal Protective Equipment for radiation protection



Figure 22: Learning about Ornithology in the All About Birds Workshop



Figure 23: Industrial Hygienist's using their instruments to measure hazards



Figure 24: Setting up red cabbage pH indicator



Figure 25: Having fun getting messy making bouncy balls through the application of polymers



Figure 26: Making new friends while learning about magnetic concepts

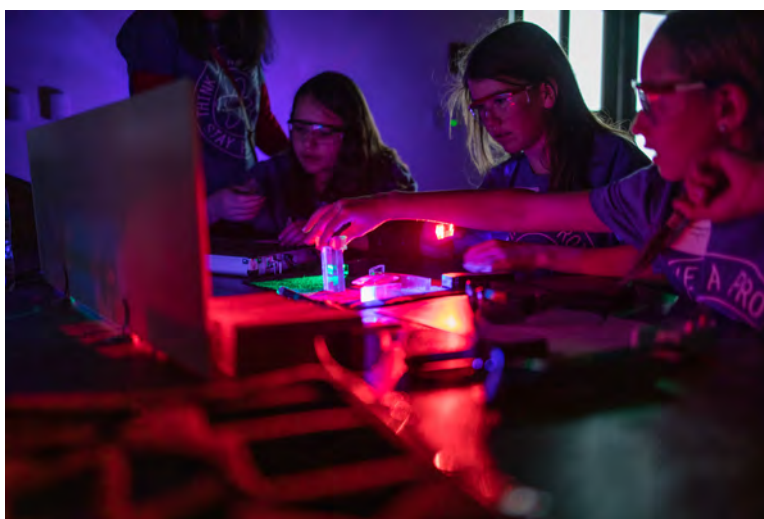


Figure 27: Working as a group while observing optics



Figure 28: As an ice breaker the girls made thank you posters for everyone who supports EYH and makes it possible

## 9 Making EYH 2020 Happen

*“Tah-ah (means thank you in Taos Pueblo language).”*

Our EYH workshop would not be the enormous success that it is without the generosity of our volunteers and sponsors. We had the perfect venue of the Santa Fe Community Convention Center and worked with Melissa Glick the operations manager of Santa Fe Community Convention Center. She and the staff of the Santa Fe Conference Center were so wonderful and gracious in following up to make sure all our needs were met. Jesse Bartlett who is the assistant operations manager of the Santa Fe Community Convention Center, helped support the additional needs associated with having the Matheatre performance.

### 9.1 Volunteers for EYH 2020

The formidable task of organizing, setting up, and executing leverages many thousands of hours of volunteer time. This year we had over 90 volunteers, presenters, speakers and committee members working anywhere from 8 to 100s of hours each to make this event happen.



Figure 29: Volunteers make this large event possible

### **Planning Committee for EYH 2020**

- *Chair/Registrar:* Josefina Salazar
- *Director:* Jan Frigo
- *Co-chair/Site Coordinator:* Zoe Ledbetter
- *Co-chair:* Hannah Ekblad
- *IT-Computer/Network Coordinator:* Phil Rivera
- *Caterer/Printing Coordinator:* Jennie Harvey
- *Science Fair Coordinator:* Mary Ann Stroud
- *Teacher Workshop Coordinators:* Sandy Frost, Veronica Camarillo-Morris, and Genna Waldvogel
- *Student Workshop Coordinators:* Kate McIntosh and Laverne Gallegos-Graves
- *Fundraising Coordinators:* Jan Frigo, Hannah Ekblad, Karen Kelley, and Laurie Waters
- *Volunteer/Advertising Coordinator:* Tamra Heberling

- *Registrar/Transportation Coordinator*: Karen Kelley
- *Master of Ceremonies*: Margaret Sudderth
- *Assistance to Matheatre and Master of Ceremonies*: Tess Lavezzi Light
- *T-shirts/Prizes*: Hannah Ekblad and Jan Frigo
- *Photographer/Video*: Carlos Trujillo and David Tietmeyer
- *Treasurer/Fundraiser*: Laurie Waters
- *Swag/Bag Stuffing Coordinators*: Jessica Manzanares and Tamera Heberling
- *Gifts for Volunteers Coordinator*: Jan Frigo
- *Data Collection Lead/Data Analysis/Reporting*: Kari Sentz
- *Website/Database*: Xiaoguang Yang
- *Procurement/DPR*: Sylvia Montoya-Wiuff and Theresa Aguilera
- *Data Analyst Team Lead*: Steve Whittemore
- *Reporting*: Kari Sentz, Hannah Ekblad, and Jan Frigo



Figure 30: Thank you everyone, the smiles are endless!

## 9.2 Sponsorship for EYH 2020

We want to thank our sponsors: Triad LLC, TechSource, LANL Foundation, National High Magnetic Field Laboratory, City of Santa Fe Councilor Renee Villarreal, New Mexico Network for Women in Science and Engineering, Los Alamos Women in Science, and the Expanding Your Horizons volunteers for their time, resources, dedication, and commitment to this EYH event.



Figure 31: Showing off some of the thank you posters created by the girls to show appreciation of the EYH event sponsors

### **Many Thanks to our Sponsors:**

**City of Santa Fe, Councilor Renee Villarreal for donation of the Santa Fe Community Convention Center**

**New Mexico Network for Women in Science and Engineering (NMNWSE)**

**Los Alamos Women in Science (LAWIS)**

**TRIAD National Security LLC**

**TechSource Inc.**

**National High Magnetic Field Laboratory (NHMFL)**

**Los Alamos National Laboratory (LANL) - DDSTE**

**Los Alamos National Laboratory (LANL) - SRO**

**Los Alamos National Laboratory (LANL)- ALDPS**

**Los Alamos National Laboratory (LANL)- ALDGS**

**Los Alamos National Laboratory (LANL)- ALDCLES**

**Los Alamos National Laboratory (LANL)- DDW**

Los Alamos National Laboratory (LANL)- ISR  
Los Alamos National Laboratory (LANL)- CNLS  
Los Alamos National Laboratory Foundation  
Los Alamos National Laboratory (LANL)- Community Partnerships Office  
Institute of Electrical and Electronics Engineers (IEEE)  
Department of Energy-the National Nuclear Science Administration  
Sandia Office Supplies  
Holmans  
Flow Science Inc.  
PlanB Network of Española  
Association for Computing Machinery (ACM)  
Del Norte Credit Union  
University of New Mexico Los Alamos (UNM-LA)  
The Healing House of NM  
General Mills  
Santa Fe County Community Services

### **9.3 EYH Report Acknowledgments**

Thanks Jan Frigo for thorough reviews and thoughtful comments of this report.

**Thank you to our volunteers and sponsors for helping to make a difference!**

## References

- [1] UC Davis. “STEM and US Job Market.” UC Davis, 2017, <https://stem.ucdavis.edu/stem-and-us-job-market/>.
- [2] Chamberlain, Sarah. “Addressing the Skilled Labor Shortage in America.” *Forbes*, 21 Aug. 2019, <https://www.forbes.com/sites/sarahchamberlain/2019/08/21/addressing-the-skilled-labor-shortage-in-america/#196f1e181d>.
- [3] U.S. Bureau of Labor Statistics. “Employment Projections.” 12 Apr. 2020, <https://www.bls.gov/emp/tables/stem-employment.htm>.
- [4] R. Noonan (2017b) “Women in STEM: 2017 Update” *U.S. Department of Commerce: Economics and Statistics Administration. ESA Issue Brief 06-17*, November, 2017.
- [5] American Association of University Women (2013) ”Solving the Equation: The Variables for Women’s Success in Engineering and Computer” <https://eric.ed.gov/?id=ED580805>.
- [6] Matheatre. ”Live Shows and Workshops.” <https://matheatre.com/live-shows/>.