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FORMATIVE EVALUATION  
PALO ALTO JUNIOR MUSEUM & ZOO  
OUTREACH PROGRAM

FINAL REPORT

MARCH 2016 -APRIL 2017

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**Palo Alto Junior Museum and Zoo Outreach Program  
Formative Evaluation Final Report**

**Submitted by Elsa Bailey - April, 2017**

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*Well I think this program is a really good way to get our kids excited about Science. A lot of the things you bring in are not what we see on a daily basis (cow's eye, shake table, etc...) They are lucky to have the opportunity to see Science modeled in different ways.*

-Vargas Teacher

*The best part about the lessons provided by this program is that it provides more equity of voice as students who usually may feel shy to speak is more empowered to speak. Students who may not feel as though they can learn science start to pay more attention to details and focus for the duration of the lesson. They are given tools to engage with the material more deeply. Students feel as though they can succeed and feel more confident academically.*

-Vargas Teacher

*Yes, I did notice a lot of focus, participation, and most importantly, CURIOSITY. Students were really making strong connections with some of the materials to the real-life topic.*

-Vargas Teacher

*Students come alive during the classes and it really helps to solidify their learning.*

-Vargas Teacher

## Introduction

The City of Palo Alto, CA has funded the Palo Alto Junior Museum and Zoo (JMZ) to conduct a formative evaluation of their outreach program to schools. They are interested in learning more about the impact of this program on participating students and teachers.

## Evaluation

### Evaluation Overview

Vargas Elementary, in Sunnyvale California, has been selected as a case study school to examine the Palo Alto Junior Museum and Zoo (JMZ) outreach and partnership program with schools. We have investigated this partnership through examining the experiences of Vargas Elementary students and their teachers participating in the JMZ outreach program to Vargas Elementary.

This evaluation's formal data collection has focused on two primary audiences: students and teachers. However, the evaluation design, evaluation questions, and the evaluator's general knowledge-base have been informed through continued conversations with the JMZ program director, outreach teachers, and the liaison teacher at Vargas Elementary.

### Evaluator

Palo Alto Junior Museum and Zoo (JMZ) has requested Elsa Bailey Consulting to conduct a formative evaluation of their outreach program. Dr. Elsa Bailey, Principal, Elsa Bailey Consulting, comes to this evaluation with a substantial knowledge-base appropriate to this project. Dr. Bailey has over 25 years of experience as an educator working in both formal and informal education settings, and over twenty years of experience researching and evaluating education programs for K-12 and post-secondary institutions, education partnerships, and informal education projects. Her areas of expertise, experience, and research provide a substantial knowledge-base relevant to this evaluation project. They include evaluation of science, technology, engineering and mathematics (STEM) education projects; professional growth of formal and informal educators; pre-service and in-service teacher education in STEM; education partnerships among schools, universities, and other community groups; socio-cultural considerations of STEM education; situated learning; and organizational development.

## Evaluation Questions:

The evaluation questions to focus this investigation have been established through early conversations with JMZ. They include two Overriding Evaluation Questions, within which are a series of Evaluation Sub-questions.

### ***Overriding Evaluation Questions***

- A.** What is the impact of the JMZ outreach program on participating students at Vargas Elementary?
- B.** What is the impact of the JMZ outreach program on participating teachers at Vargas Elementary?

### **Evaluation Sub-questions**

- 1.** How are the students experiencing the JMZ outreach program, and what can be observed in terms of both its immediate and identifiable longer-term impact on these students?
- 2.** What aspects of the JMZ program have transferred into and/or influenced other classroom practices and activities?
- 3.** Has the JMZ-Vargas Elementary partnership provided models, resources, and experiences, which teachers have found useful towards their professional development and classroom practice? If so, what have they found useful?
- 4.** What are the participating teachers' attitudes and perspectives about teaching science?
- 5.** What are participating teachers' reflections and suggestions toward the JMZ outreach program?

## Evaluation Methodology

### **General considerations**

Qualitative and quantitative evaluation methods were utilized as appropriate to the evaluation questions, and sensitivity to the context and culture of project work was considered throughout. The study design and evaluation activities have followed the established guidelines and policies for Protection of Human Research Participants. All data has and will be kept confidential, and all appropriate procedures for recruiting research participants have been followed.

Findings from this formative evaluation have been informed through multiple data sources, including observation of selected program activities in context, on-line surveys, informal communications, and review of project documents and products.

All data were coded, analyzed, and synthesized. As consistent in qualitative research traditions, quotes have been provided to support findings. To protect confidentiality, respondent quotes are not attributed to specific individual case study teachers (except only in the general “snap shot,” of respondents below), but are sorted by category of findings.

Findings have been presented to the project team both informally on an on-going basis, and formally via this Final Report.

### **Data Collection**

Data has been gathered for these evaluation studies through multiple data collection activities. These included two site visits and three on-line surveys.

One one-day site visit took place in April of 2016, and another two-day site visit took place in November of 2016. Lessons observed focused on a range of science content delivered to classes including Kindergarten and two primary level grades. The evaluator was able to observe eight outreach lessons across three days of site visits. The evaluator was also able to use these opportunities to conduct informal conversations with teachers.

The first Survey was a survey conducted in the spring of 2016. All teachers at Vargas were surveyed and about 50% of the teachers responded. The responses to this 2016 spring survey, were used to provide base-line data for their case studies in the fall study. (Five of those responses were from the teachers who subsequently volunteered to be case study respondents in the Fall Study.)

The second survey was conducted in the Fall with the ten case study teachers. This survey, was called a “Check-in Survey.” As each teacher received the outreach on a different day across the fall term, teachers were asked to respond to this Check-in Survey shortly after their individual outreach program date. All case study teachers responded to these surveys. The third survey was called a “Teacher Survey February 2017.” This survey was distributed after all fall outreach programs had been completed. (This was a “Summative Survey” for this evaluation, and thus is so labeled in this Report). All case study teachers responded to this final survey. Data relating to the two primary audiences of students and teachers were collected through these various data collection activities. Further details about these collections follow.



Focus on Students:

Data examining student engagement and impact has been collected for this evaluation. These data were collected in two ways (1) through surveying teacher's perspectives, and (2) through site visit observations.

(1) Data through surveying teacher's perspectives. Because teachers are in the best position to observe their students' day-to-day interactions they are in a good position to determine their students' engagement with science before, during, and after the JMZ outreach program. This evaluation has drawn on teachers' perspectives and knowledge of their students to gather data on their students' attitudes and interest in their participation in the JMZ outreach program and any follow-up observations on their students that may have connections to the outreach experience. These data have been collected through surveys and informal conversations. Teachers were asked to observe their students during the outreach experience and asked to report on what they observed during and after via a Check-in Survey. Questions included gathering perspectives on students' attitudes and responses to the outreach program, as well as any student behaviors/activities post outreach, which teachers perceived to be connected in some way to their students' outreach experience.

(2) Data through site visit observations. Data examining students' engagement with the JMZ outreach experience was also collected through a sample of observations of the program in context. Evaluator notes were taken during these observations, and random student comments and actions were documented as the evaluator observed the outreach experiences.

Focus on Teachers:

Data examining the JMZ program in relation to teachers' professional impact and development has also been investigated through this evaluation. These data have been collected in two ways:

(1) Data through surveying teacher's perspectives. Teachers were surveyed about their perspectives on the value and impact of the outreach experience toward their own professional development. They were asked questions that included their comfort level teaching science and changes to this comfort level; if and how the program has provided value for them; their suggestions for the program and JMZ; and their perceived needs toward supporting for their professional growth.

(2) Data through site visit observations. Evaluator site visit observations provided opportunities to have informal conversations with teachers and observe their interactions during the outreach lessons.

**The sample of the case study teacher respondents**

The case study teacher respondents are representative of a range of grade levels taught, and a range of experience teaching, encompassing from three years to twenty plus years of teaching. Half of the case study teachers have experience of 11 or more years. Some reported having taught different grade levels in other years. Table 1 below, presents a snapshot of the case study teachers, indicating the grade they taught in the 2016-2017 year, their years of experience with the JMZ outreach program, and their years of teaching experience:

The science supervisor who was present across all the outreach lessons taking place in the science laboratory was also invited to respond to the Summative Survey questions, and those responses were included in the analysis.

The JMZ-Vargas outreach program has been delivered now for two years. All of the case study teachers have had a least one year experience with the program and some (40%) reported having had two years of experience with the program.

Table 1: A “snap shot” of the case study teacher respondents in the sample

Case Study Teachers	Grade teaching this year	Number of years of outreach experiences (including fall-winter 2016)	Years of teaching experience
Case Study #1	1st	1	5
Case Study #2	5th	2	4
Case Study #3	Kgn.	1	11
Case Study #4	3rd	1	19
Case Study #5	T Kgn.	1	11
Case Study #6	3rd	2	20+
Case Study #7	5th	1	3
Case Study #8	1st	2	4
Case Study #9	2nd	2	18
Case Study #10	4th	1	4

## Evaluation Activities, Goals, and Timeframes

### **April 2016**

*Mid spring site visit and meeting at Vargas Elementary School to observe outreach program, meet the teachers, and introduce them to the evaluation*

This teacher meeting was held on April 20, 2016 and was conducted by JMZ staff, the Vargas teacher liaison to JMZ, and the evaluator. Its purpose was to introduce the evaluation, and recruit ten volunteer teacher-observers for a fall study of ten classrooms. Volunteering teachers agreed to respond to two surveys during the fall term, a fall check-in survey and a summative survey.

The day after the meeting with the teachers, the evaluator made a site visit to the school to observe three of the outreach lessons conducted that day. These lessons took place in the outdoor yard, and all sessions that day were for Kindergarten classes. The lesson was on floating and sinking. General notes were made regarding the lesson format, methods used, and student engagement.

*Baseline study with approximately 20 currently participating teachers to investigate their experience with the outreach program*

Following the meeting described above, we conducted an initial study with up to 20 teachers participating in the 2016 spring program to investigate their experience with the program, their perceptions about their students' experience with the program, teachers' attitudes about teaching science, and inquire into what support they would find useful toward teaching science in their classrooms. Data from teachers was gathered via an on-line survey. Questions included information about their current STEM work with students, their areas of comfort with this, their challenges with this, and things they identify as areas in which they would like more support. Five of these teachers volunteered to be case study respondents for the fall studies; and their data from the spring 2016 survey was used in conjunction with their data from the fall 2016 surveys.

### **September 2016 - April 2017**

*Evaluation planning and confirmation and identification of the 10 case study teachers who agreed to participate in the evaluation during the fall and early winter.*

In September and October, the evaluator communicated and collaborated with JMZ and Vargas Elementary about the fall outreach schedule, organized for site visits, and contacted case study volunteers to confirm their participation.

*Conduct meeting with case study teachers.*

In early November 2016, the evaluator met during a face-to-face meeting with those teachers who volunteered to be case studies. During this meeting the evaluator reviewed the upcoming evaluation process. She explained that they will be asked to carefully observe their students during the outreach experience and report on this via an on-line “Check-in Survey.” She also explained that in addition, they will be asked to respond to an on-line “Summative Survey.”

*Observations of the program in action.*

In November 2016, the evaluator conducted a two-day site visit to Vargas Elementary where she observed five sessions of the outreach program scheduled for those days. She observed two different topics of lessons, one on specific gravity (5<sup>th</sup> grade), and the other on erosion (3<sup>rd</sup> grade). All teachers were present during these lessons, and four of the five classes were among the selected case study classes/teachers. Lessons all took place in the science room, and the science teacher was also present during these sessions. Data collection focused on observing the content delivered, methodologies used, student engagement, and exchanges/interactions with students and the activities by both the JMZ educator and the Vargas teachers present.

*Conduct Check-in Survey study of case study teachers*

This on-line “Check-in” survey asked teachers to respond to questions about what they observed/noticed during the outreach lesson, and if they have noted in their subsequent work with students any connections to the outreach experience.

Due to scheduling matters, some teachers had outreach sessions conducted early in the fall and some into the first part of January. All teachers responded to the Check-in survey, although there was some variation in the length of time between the outreach experience and their survey responses.

*Conduct February 2017 Summative Survey of case study teachers.*

The on-line Summative Survey queried teachers again about their students outreach experience, and any influences from the outreach experience they’d observed during their regular classroom activities. They were also asked about their own perspectives on the program and any influences from this, which they associated with their own professional development and needs.

*Analyze and Synthesize all data, and write and Submit Final Report*

Table 2: Table of Evaluation Activities and Timeline: Palo Alto Jr. Museum and Zoo Outreach Program, March 2016 – April 2017

<b>Evaluation Activity</b>	<b>Date</b>
• Meet and work in collaboration with the project team to design and develop the evaluation plan and coordinate the meeting with the Vargas Teachers.	March 2016
• Site Visit to Vargas Elementary to observe 3 outreach presentations	April 2016
• Meet with participating teachers to explain evaluation process and recruit volunteers to serve as case study classes for the fall term.	
• Spring 2016 Data Collection	April 2016
Observe one day of outreach program presentations, to gain first-hand knowledge of the program, note student engagement, and clarify teacher activities	April 2016
Selection of up to 10 teachers who have volunteered their classes for the fall case studies	April 2016
Survey all Vargas participating teachers in outreach program, with the goal of establishing an understanding of their experience with the program; their perceptions about their students' experience with the program; teachers' own attitudes about teaching science; and what support teachers would find useful toward teaching science in their classrooms.	April 2016
• Fall 2016 Data Collection	
Survey the 10 teachers who have volunteered to be case studies during the spring meeting, to confirm their participation and interest in being respondents for the fall study.	September 2016
Observations of the program in action in a selection of those 10 teachers' classrooms, on 2 days of the program's implementation at Vargas, with an eye toward student engagement and teacher engagement	November 2016
Teacher check-in surveys reporting on their observations and reflections on student engagement before, during, and after the outreach presentations.	October 2016-January 2017
Conduct a summative survey study of 10 teacher's perspectives on engagement of their students as a result of the outreach program, and their reflections on its possible influence on their own professional development.	January – February 2017
• Develop and submit Evaluation Report: <i>Formative Evaluation Palo Alto Junior Museum &amp; Zoo Outreach Program</i>	April 2017

## Report Organization

This Report is organized into the following sections:

- (1) Introduction;
- (2) Evaluation;
- (3) Report Organization;
- (4) Findings;
- (5) Discussion; and
- (6) In Brief: What have we learned from this evaluation?

## Findings

### Spring 2016 Study

The Spring 2016 study was conducted to provide a general understanding and baseline for teachers' perspectives and reflections of the program to date.

The evaluator made a one-day site visit to observe the program in action to better inform design of the Fall Study. Findings from evaluator observation notes of the three outreach program sessions in the Spring of 2016 (Kindergarten), indicated a high degree of engagement for students during the course of these sessions.

In addition, data was requested from all of the Vargas teachers during the Spring Study. There were 11 responses, and five were from teachers who also ultimately participated in the Fall Study. Findings were utilized to inform the design and development of the Fall Study.

Data from the Spring Study from the teachers who were among the ten case study volunteers, were considered during the analysis of the Fall Study, but was not incorporated into the fall synthesis.

Findings from data collected in the Spring 2016 from these five teachers indicated positive experiences with the program they'd experienced thus far. These data drew on their long-term memory of past program experiences. Among the questions they were asked, was to identify things that stood out in their memories as they reflected on the program and things they'd recalled in terms of student reactions to the program. Findings show they reported high interest from their students, positive impressions of the JMZ educators, and strong science content. Findings also indicate that the experience was sustained for students beyond the JMZ outreach session, and that teachers noted their students applying what they'd learned in subsequent inquiries. Representative quotes from teachers responding to the Spring Study follow.

*Standouts:*

*#1 Enriching to students*

*#2 High student engagement*

*Standouts:*

*#1 The staff was wonderful and great with the students.*

*#2 I appreciated to lessons in my class.*

*Standouts:*

*#1 Awesome hands-on, kinesthetic learning.*

*#2 Really strong science content.*

*I do remember one of the students felt inspired to become a zoologist when they grow up right after one of the programs was done. She wanted to take care of birds since she learned so much about them.*

*Weeks after tasting the rainforest foods, a female student came up to me and said how much she loved the dried mango and wished she could get more of it.*

*One student asked about [the JMZ educator] constantly, she was the one who had a really nice electric-ball-making-the-hair-stand-up demonstration that everyone loved. Another student really picked up on what the water molecule demonstration was all about.*

*They really look forwards to the next visit. They want to ask so many questions and take part in the activities.*

*They get excited when they know it is another Palo alto zoo visit. They use the language they learn in future inquiries.*

*They love it, very enthusiastic about the science, loved touching the animals, talk about [the JMZ educator] all the time.*

## **Findings: Fall Study**

This evaluation has been designed to investigate the JMZ-Vargas outreach program via gathering data from ten teachers who volunteered to be case study respondents. In addition to the case study respondents, the science teacher agreed to respond to the Summative Survey, thus providing 11 respondents in total for that final data collection. This study design provided an in-depth look at a sample of individual classes' and teachers' experience with the JMZ outreach program during the 2016 fall and early winter 2017 implementation. An analysis of these data provides insight toward a better understanding this program. Findings are organized in relation to the evaluation questions.

## **Fall Study: What is the impact of the JMZ outreach program on participating students at Vargas Elementary?**

**Evaluation Sub-question 1: How are the students experiencing the JMZ outreach program, and what can be observed in terms of both its immediate and identifiable longer-term impact on these students?**

**Evaluation Sub-question 2: What aspects of the JMZ program have transferred into and/or influenced other classroom practices and activities?**

**What was observed during the outreach experience?**

Teachers were asked to observe their students during the fall outreach, and be ready to report on this via the Check-in Survey. Hence, these teachers were “cued” to observe and then report. A few of the teachers completed the Check-in Survey after some time had passed post outreach. In these cases, data show, that their reports offer longer term recollections/descriptions of that experience.

One of the most frequently reported observations was that most of the students were engaged and interested in the lesson and activities. This observation from teachers aligns with the evaluator’s experience during the five classes she observed (four of which were case study respondent classes). Some of the teachers reported students’ reactions, behaviors and attitudes. These included excitement, enthusiasm, awe, impatience, timidity/shyness around new experience, distraction when intriguing materials were visible, and challenges following directions. Challenges listening to and following directions were traced to multiple sources including excited anticipation, language issues, and incompatibility of some students grouped together. Teachers noted the modifications made for these situations, such as providing further explanation, demonstrations, modified directions, and special management for particular students.

The following are excerpts from Evaluator Observation Notes:

*Kids appear engaged and on task. Students are observed to touch and smell the minerals. They are working as a group, discussing things, and measuring and observing what they’ve worked on.*

*Kids appear very animated as they look at the materials spread out on the rug.*

*Kids in group are engaged and talking about how they will build on the sand hill and what they will build.*



Representative quotes follow from Case Study Teachers:

*Students were engaged and on task.*

*Students were most excited about seeing the animals. They wanted to touch each animal and talk about what they were seeing. It was challenging for students to listen to the adaptations and other discussion once the animal came out. Focus among the boys in particular was bad once they could see the animal. All students were very engaged and most were even willing to touch the animal.*

*The students were very excited to get started on the activity. Listening to directions was challenging because they could see the materials. One student was unengaged and hiding during directions.*

*Students were eager to participate, liked the supplies offered and enjoyed building the structures. Students struggled to follow directions. [the JMZ educator] made modifications for 2 boys who were challenged with group work.*

*During the outreach experience, I saw students actively engaged in listen[ing] and in the activity. Students were interested in the activity and wanted to be successful. Students had some difficulty understanding directions but with further explanation were successful.*

*Students were raising their hands, leaning forward and showed a great deal of enthusiasm. They were eager to do the hands-on activities with the sand and building a mountain, then using their squirt bottle to simulate rain.*

*Students were engaged with the models that [the JMZ educator] brought to this experience! The shake table, the Earth with the plate tectonics, and the interactive spaghetti machine had my class in awe! They were really into the pictures as well (showcasing how the disasters affected California).*

In their response to this question, some of the teachers also offered a description of the lesson, and the activities and tools/materials they included in that lesson. Representative quotes from teachers follow:

*I observed students working using tools to help decipher different minerals based on several traits. They had to be able rub the mineral to see what color streak was left behind. They also had to find out the density of the rock by placing in a graduated cylinder with water already in it. They had to see how much the water had rose in the graduated cylinder to note the density of the mineral. They also had to include the weight of the mineral. With all this information, they had to use a key where it listed all of the type of minerals, and see which mineral matched the information on the sheet.*

*This was a long time ago, so I don't remember much. We sat in a circle and [the JMZ educator] brought animals for us to touch. If kids didn't want to touch, they shook their heads or didn't put out their hands.*

*The activity consisted of students trying out different methods of illuminating the inside of a box to see what color was inside. The key was that students needed to be able to reflect light of a succession of mirrors to get the correct trajectory for illumination. Students were asked to figure out pretty much everything on their own, in a logical sequence of increasing variables, with [the JMZ educator] also demonstrating strategies appropriately.*

At the end of the term, on the final survey, teachers were asked to reflect back on the outreach program experience with the perspective of the intervening time. They were asked again to comment on what they'd observed during the program. All but one of the case study teachers responded to this question.

The majority of teacher comments emphasized their students' excitement, attention, and high engagement, and motivation to participate during the outreach experiences. A number of teachers emphasized that the use of hands-on, and innovative methods/materials contributed to these reactions. Two teachers used the term "curiosity" as something they'd observed in their students. One teacher discussed concern about the animal outreach topic for very young children. This teacher recalled students having different reactions to the animals brought to them in the session. Another teacher reflected on the value of the program for students who don't often do well in normal classroom work. This teacher described this as an opportunity for those students to develop confidence, and feel empowered as they succeed in this kind of experience. Representative quotes from teachers follow.

*Students were very excited.*

*Yes students are very excited. They want to touch everything. They want more talk time with their friends to discuss what they are seeing and learning.*

*Student's attention during the program is always high. They are excited about the animals and interested in learning about them.*

*Students are focused and engaged, especially when the activity is hands on.*

*During the programs students are highly engaged. They are motivated to pay attention and participate. They are always excited when they hear you are coming to visit.*

*Students are exceedingly engaged, very excited, learn a lot, totally curious.*

*Yes, I did notice a lot of focus, participation, and most importantly, CURIOSITY. Students were really making strong connections with some of the materials to the real-life topic. For example, during the wave/earthquake demo, [the JMZ educator] brought in spaghetti crushing machine that shows how earthquakes work and we also did this fun activity where students saw the difference between earthquakes that occur often versus not often (earthquake's strength).*

*Well, that is the pro and con of having animal visits. It's a lot of sitting and waiting during the 30 min class, which is very difficult for 4 & 5 year olds. So attention can be lacking if the kids aren't interested in the animals that are there. Also, there are many kids that don't want to touch the animals, and get scared. So the visits can also be stressful for a few.*

*The best part about the lessons provided by this program is that it provides more equity of voice as students who usually may feel shy to speak is more empowered to speak. Students who may not feel as though they can learn science start to pay more attention to details and focus for the duration of the lesson. They are given tools to engage with the material more deeply. Students feel as though they can succeed and feel more confident academically.*

*Yes- students are on task and there are minimal behavioral issues. Students are highly excited for the PA JMZ programs.*

**What specific observations of student engagement were noted during and after the outreach experience?**

Teachers were also asked on the Check-in Survey to specifically comment on student engagement both during and post the outreach experience. There is extensive data relating to engagement primarily during the outreach experience. All but one teacher indicated observing student engagement. Teachers noted behaviors that they associated with engagement such as eyes tracking and discussion. They also reported observing particular tasks that appear to have helped sustain and/or renew student focus and investment in the activity. These activities included entering data on a collection sheet and engaging young students in full body movements relating to the lesson.

Working in teams and becoming involved in “hands-on” learning was also reported as motivating and engaging for students. Representative quotes from teachers follow:

*Students were engaged by having to note down all of their data on a sheet. That helped them keep themselves on task and organize their information. As a result,*

*most students had a clear objective to meet. Since most students chose their own rock, they were more invested in the process of finding data.*

*When the class made the millipede chain and moved around the classroom, it was a great way to act like the animal but to also get them moving. In kindergarten by the end of the hour lesson, the students were very unfocused and needed to move.*

*Eyes tracking the teacher, productive student discussion*

*Students were really excited to engage with the activity. Students asked questions of each other and [the JMZ educator] throughout the lesson. Students were really excited to try out strategies with the flashlight and the mirrors.*

*Another related student engagement during the program was that it was interactive when [the JMZ educator] had them figure out which will have a stronger earthquake magnitude with the string and the foundation house they built. Also, students had to work in teams to construct a building that would survive on the shake table! They were really into that.*

*Yes, many of the students were eager to participate in discussions. We had discussed some types of rocks several weeks ago and this built on what we have been learning, providing students with more hands-on activities.*

One teacher explained that young students found it difficult to focus on the less exciting mode of just listening and viewing posters after seeing animals. Another teacher reflected on how students were challenged to go deeper. This teacher reported that students were a bit frustrated, but expressed finding this a “good challenge.”

*[The JMZ educator] brought posters and spoke about certain animals and how they use their five senses. This was a low student engagement time because the kids were still excited over seeing the animals.*

*They were challenged to go deeper in their knowledge of light. A little bit of frustration but a good challenge.*

One teacher with a student who had been timid at first and hiding was noted to be drawn out and become quite engaged by the active learning of the erosion lesson. This same teacher reported observing excitement on the part of students, and an eagerness to share their discoveries.

*The one student that had been hiding during the directions came out and totally engaged. She chose to work alone but was very involved in the task. One group*

*constructed a wall that held their house so they were extremely excited to share their findings.*

On the Summative Survey, the teachers were also asked to reflect again upon post program observations. They were asked to respond to the question: *After the program(s), did students continue to discuss it, have questions, etc? If so, please describe this.*

One teacher didn't respond to this question and another responded "no." The other teachers all responded. Their observations included that students were eager to discuss their experience, and that students demonstrated an interest in further investigation of the topic through their own research both during and after school hours. Data show the differences among classes follow-up experiences. Although the majority of the case study teachers reported a great deal of follow-up high interest, curiosity, and discussion, two teachers did report different reactions such as being surprised by students' not wanting to discuss or ask questions post program, or observing confusion on the part of young children in relation to the names of the animals in the outreach experience.

Findings show that making connections between the outreach experience and follow-up classroom activities may be supported by teachers consciously scaffolding that through specific techniques and prompts. A couple of teachers indicated success with finding ways to bridge the outreach experience with follow-up classroom instruction, including combining it with a lesson and prompting students to make connections from the outreach inquiry experience to the ongoing classroom lesson. Another teacher also encouraged connections from the outreach experience to the topics they were focusing on in the science laboratory. Representative quotes from teachers follow.

*Yes. Students want to have their questions answered since they were very curious know more of the material. The new experience helped them come up with questions they did not know existed before. They were curious to look online for facts and videos on their own. Some students wanted to do a follow-up discussion about the lesson and so we might discuss them at recess or beyond school hours.*

*They would discuss the animals they saw or ask questions about the animals and their adaptations. They mentioned they wanted more time to touch artifacts and to interact with the animals.*

*I am describing visits from last year...some of the kids were confused over which animals came and were incorrectly . . . [citing] what they learned. For example, kids called the ferret a squirrel or weasel when talking with their parents after school.*

*We usually had activities that lasted longer than the teacher's time. And, students were able to use the information from the session to add on to later discussions. The experience gave them more to contribute.*

*Students were not as curious as I expected. A few students had questions but overall they did not independently discuss the experience in class.*

*Sometimes, students were more likely to discuss it if I also combined it with a lesson*

*Yes! They referred to them in later science lessons. They cheered when they heard [the JMZ educator] would be coming back.*

*After the program, the students did not always continue to discuss about the topics unless I prompted them back to those activities. I think the hardest thing is bridging what they learn and get from these presentations/inquiry and applying it into other science topics we are discussing in the class.*

*In the science lab, I would often connect lessons to experiences students had with the programs. Some students would bring up activities- like with the plate tectonics lessons or erosion lessons.*

Teachers were asked on the Summative Survey: *Are there any other examples of related student engagement, which you've observed during or after the program?* Six of the ten case study teachers, offered examples of other student engagement. These included hearing from parents that their child shared about the outreach lesson experience with family and friends, and that students were looking forward to the next JMZ program visit. One teacher highlighted the fact that students' team focus was on science during the activities as opposed to focusing on other teammates. Another teacher reported students referencing their outreach activities in other post visit experiences, including using the outreach experiences on written tests as evidence of the point they were writing about. Among the benefits that students experience from the outreach, was that the group problem solving activities done in some outreach activities, were beneficial toward helping students learn to collaborate. This benefit was mentioned by at least two of the case study teachers. Another teacher noted that some students, who were known to be less participatory in class, appeared to be motivated to participate with outreach activities. Representative quotes from teachers follow.

*Students were very engaged.*

*Parents are more excited to hear their child talk about some of the lessons the programs does. Students want to tell their friends from other classrooms what they did. Students look forward to the next visit from this program.*

*Students are working together-focused on science and not on who they are working with*

*Students have referenced the experiences after the program. On tests and in their science writing, they used their experience as evidence!*

*Lots of great group work and problem solving by the students.*

*For the Earthquake presentation, I liked how students had to work in teams to create a structure that could withstand the shake table. This really got them thinking about how you need to collaborate and work as a team to reach a certain goal (especially in the Science field).*

*I have observed students that are hesitant to participate in class raise their hands to participate.*

**Have teachers observed any influence from the JMZ outreach program on students beyond the actual program experience?**

This evaluation sought to examine what, if any, other influences or benefits the teachers perceived their students had received from the outreach experience. They were asked to respond to the following question:

*Have you seen any influence from the Outreach program on students beyond the actual program experience? (e.g. making connections from that experience to other learning activities, using/applying critical thinking skills to other activities etc.) If so, please explain. If possible, please indicate how you associate this with their Outreach experience.*

When teachers were asked to consider if any other aspects of the JMZ program have had influences on classrooms and their activities, all but two teachers responded to this question. Everyone responding identified influences already observed, or an expectation to see influences in the future. Influences identified included learning skills that transferred back to the classroom, and an introduction to topics coming up in classroom curriculum. Several teachers highlighted that when a topic aligns with what is going on in the classroom, they note higher student engagement and a reinforcement of concepts being addressed. Teachers also highlighted the value of students having new materials with which to explore concepts, and several reported instances of students making connections between the outreach experience and other classroom instruction. One teacher indicated finding the outreach experience not only useful for students, but also useful for teacher professional development. Representative quotes from teachers follow.

*Not, yet. I think once the year goes on and we have more experiences with them, we will.*

*Yes. Students remember the experience of having to engage with the topic more hands-on. They enjoy having to figure out a new topic and finding out some answers to their questions. Students come away with skills that are adaptable to the classroom (i.e. making observations, writing down data, etc.) Also, much of the content matches with what we are teaching in our curriculum, so it can be a good introduction to a new topic or a nice review of content learned.*

*I have not noticed it on this most recent visit, but last year when we had the polar lesson and it aligned with our polar unit in the classroom, the students were more engaged. It is very helpful when the classes align with the current content being taught.*

*Because the outreach program brings the supplies, like magnetic tiles, that I do not otherwise have access to, the students are able to do more which led to better connections.*

*As stated above, students were able to recall the experience of looking at properties when doing activity in class about the topic. This gave students another activity to help them understand the concept. Students were also able to practice using scales, which was valuable in later classroom experiments.*

*Yes! During other light lessons, students have referred to this lesson regarding light reflecting off things.*

*As mentioned above there was some connections the day after the lab.*

*It is also PD for the teacher. I learn too!*

Teachers were asked on the Summative Survey: *Have you seen any influence from the OUTREACH program on students beyond the actual program experience? (e.g. making connections from that experience to other learning activities, using/applying critical thinking skills to other activities etc.) If so, please explain. If possible, please indicate how you associate this with their OUTREACH experience.*

Six out of the ten case study teachers did report influences. One discussed how the JMZ program activities such as animals' adaptations to different habitats aligns with other field experiences this class has made to places such as Save the Bay. These field trips connect well with the JMZ content, as they help students to "contextualize big concepts." Another teacher noted that students bring up what they'd learned through the JMZ outreach experience when talking in class about related ideas. Another teacher echoed this, explaining that students frequently



make connections from the JMZ experience to science lessons in class. One teacher also noted students making connections to the JMZ programs. This finding appears to relate to previous findings about the benefits of connecting the outreach sessions to regular study units in classrooms. Representative quotes from teachers follow.

*Since all our field trips are science-based, there is always a few students that make connections from this program. In particular, with the topic of animals as they make the connections about the adaptations animals have in different habitats. My classes have gone to the Palo Alto Baylands as well as Save the Bay. These types of field trips connect nicely with the content presented by this program as they provide models and examples to help students contextualize big concepts.*

*Last year, [the JMZ educator] brought birds and fish. In our class, we talked a lot about animal adaptations, so students were always bringing up what they had learned.*

*We learned about plankton on our field trip. Then, in class we skyped with a scientist and discussed plankton. In addition, we looked it up on Khan Academy to learn more.*

*Students have referenced the experiences after the program. On tests and in their science writing, they used their experience as evidence!*

*Lots of connections during later science lessons.*

*Students have made connections in the lab to the programs. We have tried to pick programs that connect with what we are currently learning in the lab so that both experiences build upon each other.*

**Have teachers observed any benefits from the JMZ outreach program on students beyond the actual program experience?**

When asked about perceiving other benefits for students, two teachers skipped this question, one indicated “no,” and seven identified other benefits. Benefits reported included enjoying experiments, and reinforcing related classroom activities, opportunities for meaningful student interaction, communication, and collaboration, and chances to build oral language and new vocabulary. Teachers also highlighted the benefits of exposure to new things such as animals, materials and equipment they wouldn’t have access to otherwise, the opportunity to draw on the expertise of JMZ educators with deep knowledge about the outreach topics, and exposure to models and methodologies that meet diverse learners’ needs and styles, and align with Next Generation Science Standards (NGSS). Representative quotes from teachers follow.

*They enjoyed the experiment and it reinforced what we taught them in class.*

*One more thing: the program gives students the opportunity to interact with each other more meaningfully since most of the time they are working together. This helps bring our communication and oral language practice (especially with new vocabulary).*

*I think the biggest benefit is exposure. It is obvious that many students have never been to a zoo, and that they have little experience interacting with animals in real life. Student facial expression came alive, and you could tell they were really fascinated by all the animals.*

*The biggest benefit of this program is the access to the materials and educated staff that without them I would not have. Like I mentioned the tiles, last year, the instructor, [the JMZ educator] brought actual fish to observe. And, she is so knowledgeable about the topics, her level of instruction is better than I could provide.*

*Students get exposure to new animals in an up close and small setting. I just wish there were other programs for them to have besides animal visits. There weren't very many options for Transitional Kindergarten classes.*

*What I liked about the lab, was that it had a variety of components (discussion, hand on) that touched on a variety of students' modalities.*

*There is definitely a benefit for my students from this program. A lot of these students are not exposed to these models that you bring in and it really helps them make connections on what they are learning in the classroom. Also, I am sensing a lot more group work and collaboration (which is very NGSS).*

#### **What other benefits do teachers see for students in this program?**

Teachers were asked: *Are there any benefits to students from this program, which have not been mentioned above? If so, please let us know about them.* Seven case study teachers responded to this question. They identified benefits that included connections to NGSS, a supplement to the science notebook initiative that supports the scientific inquiry process, and getting students excited about science through innovative materials and methods. Beyond science content development, three teachers noted things such as building students' confidence levels, providing opportunities for low income students who don't often have experiences with animals, science experiments, etc., and offering "real world" experiences. Representative quotes from teachers follow.

*Connections to the NGSS standards*

*Well I think this program is a really good way to get our kids excited about Science. A lot of the things you bring in are not what we see on a daily basis (cow's eye, shake table, etc...) They are lucky to have the opportunity to see Science modeled in different ways.*

*This program is a great supplement to our science notebook initiative. Students are asked to write down inquiry questions, observations, data, and conclusions in their science notebook. It is great to see students notice the benefit of taking notes as they can always refer back to their observations. Scientific inquiry process is constantly at work.*

*I think this program provides opportunities to low income students that don't get to visit zoos or take family vacations. The interactions with animals, science experiments, and artifacts is real and lasting. Students come alive during the classes and it really helps to solidify their learning.*

*It is great to have a real-world experience.*

*Gets kids even more excited about science, builds self-esteem.*

**How do teachers rate selected aspects of the JMZ program in terms of value for their students?**

Teachers were asked to rate aspects of the JMZ program in terms of their perspectives on value for students. All case study teachers and the science teacher responded to this question. All aspects of the program were rated by these teachers as having some value ranging from *very valuable* to *slightly valuable*. The aspects rated **very valuable** by nine out of the 11 teachers, or 82% of the teachers responding, included *novelty of this learning experience*, *working with an educator from outside our school*, *active learning*, and *working with and exploring new kinds of materials and phenomena*. *Opportunities to explore concepts in science*, was rated **very valuable** by eight out of the 11 teachers, or 73% of teachers responding.

Table 3 below, offers a full presentation of teacher ratings for each aspect, and how those ratings are distributed:

Table 3: Teachers’ ratings of various aspects of the JMZ-Vargas program

Aspect of JMZ-Vargas Outreach Program	Not at all valuable	Slightly valuable	Valuable	Very valuable	Not applicable	Totals N=11
The novelty of this learning experience	0	0	2	9	0	n=11
Working with an educator from outside our school	0	0	2	9	0	n=11
The program supports content that we have addressed in class	0	0	4	7	0	n=11
The program supports content that we will address in class	0	0	4	7	0	n=11
The program addresses ideas not currently in our regular curriculum	0	2	5	2	2	n=11
Active learning (such as hands on activities and interactive games)	0	0	1	9	1	n=11
Opportunities to explore concepts in science	0	0	3	8	0	n=11
Opportunities to develop language skills	0	0	5	6	0	n=11
Opportunities to learn and use science vocabulary	0	1	3	6	1	n=11
Opportunities and motivation to communicate through discussion and questions	0	1	3	7	0	n=11
Working with and exploring new kinds of materials and phenomena	0	0	1	9	1	n=11

**What do teachers suggest for the JMZ-Vargas program in relation to more value for their students?**

Teachers were asked: *Do you have suggestions and/or ways the program could be more effective or more valuable for students?*

All but one teacher responded to this question. Two teachers had no suggestions, and one of these indicated that it was “such a strong program” that no suggestions were necessary. Seven teachers did offer suggestions, and these can be sorted into two categories: (1) suggestions for content inclusion and curriculum integration, and (2) suggestions for alternate methodologies.

Those focusing on content appeared to look for more alignment with their trimester units of study, more physical science for young students, and

integrating language arts into the experiences such as writing reflections on their experience, and vocabulary related to content. Those focusing on methodologies would like to see more activities to create things such as create your own fish (after being introduced to real fish), and more developmentally appropriate approaches and activities for the very young students (such as more movement). Another teacher noted that activities, which particularly engaged students, have had “a story attached to them.” Representative quotes from teachers follow.

*Not that I can think of, it's such a strong program!*

*I have seen my students make connections from these experiences, but it takes a bit of scaffolding and reminders of what we did and how it relates to what we are learning. For example, after our cow eye dissection, we didn't get to talk about the eye till about 3 months later in Science. The students had to try to remember the certain parts of the eye and how they work. So, I think planning the program experience with what we are learning in the class is the utmost important. \*I know this may be difficult due to conflict of time, etc...*

*I think working with the teachers to make sure that each activity can align to our unit of study for the trimester would be beneficial.*

*The only thing I would suggest is to add a component of conclusion writing, in which students have to look back and reflect on the lesson they participated in. Specifically, making claims and using the data they investigated to write down sentences for their explanations. It would go well with our school-wide initiative to improve writing in science.*

*Provide a little science notebook or something to write on to detail their experiment and experience.*

*Provide Vocabulary/Content aspect*

*More opportunities for scientific exploration in TK would be wonderful. Maybe something with magnets, sink and float or even weather?!*

*For kinder, more visuals, more movement or conversation time, and more hands on is always the key to keeping the kids engaged in the activity.*

*Last year, after students examined fish, [the JMZ educator] brought an activity for them to create their own. The students enjoyed doing that and learned a lot. Maybe more activities like that.*

*The balance presentation (from last year) was very successful. [The JMZ educator] brought a whole bunch of kitchen tools and the kids tried balancing them on their fingers. Then she gave each kid a cutout of a person and we added a weighted penny taped to the head. We were instructed to decorate, but coloring on the carpet was not ideal. I would have suggested having the kids color at the tables*

*after giving instructions on the carpet. . . . We appreciate these visits so much. I just wonder how we could make them more engaging and get the kids moving more.*

*The best activities I have observed are lessons that have a story attached to them. The story line seems to hook the students.*

### **Fall Study: What is the impact of the JMZ outreach program on participating teachers at Vargas Elementary?**

**Evaluation Sub-question 3. Has the JMZ-Vargas Elementary partnership provided models, resources, and experiences, which teachers have found useful towards their professional development and classroom practice? If so, what have they found useful?**

**How do participating teachers rate the JMZ-Vargas program in relation to their professional development?**

This evaluation also examined the impact of the JMZ outreach program on the Vargas case study teachers. On the Summative Survey, teachers were asked to rate aspects of the JMZ program in terms of their perspectives on their own professional development. All case study teachers and the science teacher responded to this question (N=11).

Analysis showed two categories of response for which all respondents (100%) indicated either *strongly agree* or *agree*.

These are:

- *would recommend this program to other teachers (100%)*  
**strongly agree** (91%) **agree** (9%).
- *value observing the program when it comes to my class (100%),*  
**strongly agree** (64%) and **agree** (36%).

Other categories of response had a wider distribution of ratings. The most frequently selected high ratings, where the majority of respondents indicated either *strongly agree* or *agree*, were for the following categories of response (presented in order of category with highest percentage of respondents):

- *I have developed content knowledge through experiencing this program*  
**(82%)**
- *I value the opportunity to participate during the program experience*  
**(82%);**

- *I have (or plan to apply) aspects of this program in other ways with students (64%)*
- *I learned teaching methods by watching the educator/presenter (64%)*
- *I have learned more about my students through watching them experience this program (55%)*

Table 4 below, offers a full presentation of teacher ratings for each category of response, and how those ratings are distributed. The table presents the categories as ordered in the Summative Survey:

Table 4: Teachers’ ratings of the JMZ-Vargas program as it relates to teacher professional development

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Applicable	N=11
I value observing the program when it comes to my class	0	0	0	4	7	0	n= 11
I learned teaching methods by watching the educator/presenter	0	2	2	5	2	0	n= 11
I have developed content knowledge through experience this program	0	1	1	7	2	0	n= 11
I value the opportunity to participate during the program experience	0	0	2	2	7	0	n= 11
I have (or plan to) apply aspects of this program in other ways with students	0	0	3	4	3	1	n= 11
I have learned more about my students through watching them experience this program.	0	0	4	2	4	1	n= 11
I would recommend this program to other teachers.	0	0	0	1	10	0	n= 11

**Do teachers report professional learning as a result of the JMZ outreach program?**

Teachers were asked on the Summative Survey: *Have you picked up any specific tips or activities that you have used or expect to use? Please explain.*

Many reported having picked up professional ideas and approaches through experiencing the JMZ-Vargas outreach program. Eight of the 11 teachers offered a response to this question. Most of these responses focused on kinds of materials to use in their instruction, but some also discussed picking up on approaches to use with their students. Their comments included often adopting methods such as (1) use of real life experiences; (2) use of labeled scientific posters; (3) hands-on activities in general and some specific ones they'd seen modeled; (4) ideas for launching discussions; and (5) ways of capturing students' attention. One teacher indicated that "connecting with a story line" was a methodology learned. Another teacher expressed an interest in materials such as earthquake models, but was unsure how to access these to use as a follow-up. Representative quotes from teachers follow.

*Providing students with real life experience!*

*When I was in third grade last year, we had two lessons about adaptations (birds and fish). I loved the posters the instructor provided that labeled the different parts of the animals and how it helps them survive. They were easy to read, yet detailed. I have used those posters as models for how I represent scientific concepts on paper.*

*When we did the Artic lesson, I really liked some of the hands-on activities and I would like to get those lessons and replicate them for future classes.*

*We studied erosion this year and I was able to use an activity I had observed last year.*

*Yes, attention getters!*

*More ideas for leading group discussions effectively.*

*Connecting with a story line.*

*Well, I enjoyed the earthquake presentation a lot, but I don't have any of the materials [the JMZ educator] brought in. It would be nice to be able to have an extension activity for that.*



## **Evaluation Sub-question 4: What are the participating teachers' attitudes and perspectives about teaching science?**

### **What are the respondent teachers' current comfort level for teaching science?**

When teachers were asked to identify their current level of comfort with teaching science, most of the teachers responding to the survey (N=11) indicated being either *very comfortable* or *somewhat comfortable* with teaching science. Hence, at least for this group of case study respondents at Vargas Elementary, there is a high level of comfort with teaching science.

46% of teacher respondents (n=5), indicated:

*I am very comfortable and experienced with teaching most areas of elementary science.*

46% of teacher respondents (n=5) indicated:

*I am somewhat comfortable with teaching science, but some areas of science are more of a challenge.*

One teacher indicated:

*I am somewhat uncomfortable with teaching science, but find some areas of science are OK.*

### **Changes in comfort level for teaching science over time**

Teachers were also asked: *Has your comfort level for teaching science has changed over time, and if so in what ways?*

All teachers responded to this question. Ten out of 11 teachers indicated “*yes, their comfort level had changed.*” A few added comments about this change. Reasons given for this change included improvements for science teaching through the influence of teaching in a science-focused school; and becoming more involved in inquiry-based learning, experiments, group work, and discussion. One teacher has been developing curriculum for the TK program. The one teacher who indicated “*no change,*” explained that comfort level with science teaching has been affected by the Next Generation Science Standards (NGSS) transition, which requires adjustment to the new methods, but without an existing curriculum. Another teacher reported developing an increased science knowledge for various grade levels. Representative quotes from teachers follow.

*Yes. Being a science focused school and loving science as well, has helped me teach science even better!*

*Yes. The open-ended approach to inquiry.*

*Yes. TK creates our own curriculum, so we have been researching and adding more content in our second year of have a standalone TK program.*

*Yes. Learned more about experiments, inquiry, discussion, group work, standards.*

*No. Well, with the transition to the NGSS, it's been harder to plan a lesson without a curriculum to use. However, our science coach has been really helpful in terms of supplementing support and resources for us to use in the classroom.*

*Yes, I have increased my science knowledge for various grade levels.*

#### **Has the JMZ program influenced comfort level for teaching science?**

Teachers were asked if the JMZ-Vargas Outreach experience in particular had influenced their comfort toward teaching science. They responded to the question: *Has this program influenced your attitude and/or comfort level about teaching science? If so, please describe in what ways.*

Nine teachers responded to this question. The majority said *yes* to some degree, and many of these offered explanations. Those who indicated *no*, explained that they were already very comfortable and excited with science. Gaining new strategies, activity ideas, and methodologies were indicated as particular influences. Hands-on, use of “realia,” and group work were included in these influences. Stimulating curiosity, and deepening an understanding of science teaching were also highlighted. One teacher voiced a concern that such high interest sessions with specialized materials, can make the traditional classroom activities “seem a bit tame.” This teacher explained finding it “a little bit intimidating in a sense that we have to live up to that expectation.” This teacher would like to have access to materials to extend these lessons in the classroom post outreach. For another teacher, this program has confirmed the effectiveness of hands-on learning.

*No but my comfort level with science was already high.*

*No, I love science and I find a way to teach science every day.*

*I enjoy science already, but the students like it more with the hands-on activity the program brings.*

*To some degree. My school has done a fantastic job over the last 4 years providing PD, curriculum, and outside/online programs to help teachers have a smooth*

*transition in teaching science effectively. That being said, this program always provides me with one or two new strategies to help enhance my teaching pedagogy. In particular, how to best use realia during the lesson so that students get the most out of observing real life scientific objects.*

*I am more curious and then...I google it! I also like to try new things and keep a growth mindset.*

*It definitely has given me new ideas about using hands-on activities and science experiments, and also group work!*

*Yes, it has deepened my understanding of teaching science.*

*Well, I think it goes both ways. I think it has made my kids more comfortable in terms of understanding the concept better because they are given some many different tools to help them understand the science topics. However, as a teacher, I think it can be a little bit intimidating in a sense that we have to live up to that expectation when we plan our Science lessons. Such as getting the materials necessary to model how a certain inquiry works, etc... Once the students have a taste of the good stuff, the activities we do in class may seem a bit tame for them. Also, it would be nice if we had activities to take away after the program so we as teachers can extend what we learn from that day in our classrooms!*

*It has confirmed my belief that students best learn science through hands-on experiences.*

## **Evaluation Sub-question 5: What are participating teachers' reflections and suggestions toward the JMZ outreach program?**

### **Has the JMZ program and partnership had other influences on teachers?**

The evaluation investigated if teachers had experienced other influences from participation in the JMZ program and partnership. They were asked to respond to the following question: *Are there other ways in which this program and/or your relationship with JMZ has informed and/or influenced your work?*

Seven teachers indicated and described some influences. These included (1) having a common experience among their colleagues, which has facilitated profession discussions during prep periods; (2) support to "bring alive" the science they are teaching in classrooms; (3) providing context and reference for concepts being taught in classrooms; (4) increasing comfort and knowledge in how to engage their students with science; (5) improving know-how around NGSS; (6) learning how and implementing labs around a story line; and (7) being

inspired by the enthusiasm the JMZ educators bring to the outreach.  
Representative quotes from teachers follow.

*This helps with the collaboration with colleagues as we discuss how the lesson went during our prep period. We talk about what we enjoyed and how we can relay that back to the classroom.*

*It is a great partnership that helps bring alive the science we are teaching in the classroom.*

*Because of these programs, we have been able to go more in depth with these concepts. By allowing the students to be hands-on, they can have more meaningful discussions and are able to reference their experiences. This allows me to stretch their thinking and challenge them in the classroom.*

*To me, the program and experience seemed very educational and easily to understand. I think overall, it has made me feel more comfortable how to engage my student's. I think the challenging part is getting the resource to our classroom to support that.*

*Improved my content knowledge of NGSS science standards.*

*I have tried to follow the JMZ's lead on developing a story line to set up activities in the lab.*

*Really like the instructors and their enthusiasm for science, nature and living green*

#### **Teacher suggestions to JMZ for professional support**

Teachers were invited to make suggestions to the JMZ program in relation to their own professional development. They were asked: *Do you have suggestions for the program and/or PA JMZ toward supporting or informing your professional work?*

The majority of the teachers offered suggestions. These included (1) considering how to organize/manage students when visible, high interest materials are present and their attention needs to be on the presenter; (2) sharing lesson content prior as to how it relates to NGSS so that teachers can better prepare students prior, support the JMZ educator during, and follow up the session with related activities in the classroom; (3) having JMZ develop assessment tools that align with the sessions' learning objectives; (4) block out a longer time-frame for the outreach sessions; (5) provide professional development workshops and institutes; (6) and provide more options for preschool age children.  
Representative quotes from teachers follow.

*Yes, when teaching content, ask students to sit on the carpet. When the presenter taught, the materials were on the table. It was a distraction. Also, I realized how much team work they needed for this. In the class, they do great at team work, but not that day. I wasn't sure if they were frustrated or the materials were too exciting to share. Something, I want to reflect on more.*

*The only suggestion is having teachers know beforehand exactly how the session correlates with NGSS so that we are best prepared to assist the students during the session (especially teaching 30 students in a science lab can be demanding) and alleviate some responsibility to the session leader.*

*Maybe having a place where teachers can find activities that are aligned to the NGSS to use. Like extension activities after the program.*

*I'd like some type of quiz developed by PAJMZ that could assess the effectiveness and knowledge gained by students.*

*One suggestion I would suggest was that we ran out of time because of the awesome models and activities that we did. I think it would be nice for us to collaborate and to block out a longer chunk of time to get all the activities and for my kids to reflect by writing a CER after just to keep the consistency.*

*Offer summer institutes or after school workshops.*

*Professional Development opportunities?*

*More class options for TK, what kind of classes do you use with preschool age? Everyone is four and just turned five. . . Again, structure the classes a little different so we get the kids moving. I never have them sitting for longer than 10 mins without a wiggle break of some sort.*

#### **Additional feedback for JMZ**

Teachers were also invited to give any other feedback to JMZ and teachers did give additional feedback, Teachers were asked the question: *Do you have any other feedback or ideas about the Outreach program to share with PA JMZ?*

Some of this feedback took the form of additional suggestions and in many cases these suggestions were specific to a particular outreach session. Feedback included asking for more up-front information about language to be used in the lesson so teachers could better prepare their students, especially the English Language Learners (ELL). Along with this request, was a suggestion for presenting directions first, prior to experimentation. Another teacher would also

like to have more language integrated into the program and more inquiry-based activities. Another teacher suggests using more visual technologies such as iPads and related videos. One teacher suggested that directions written on a chart or the blackboard should be written large enough for students to read at a distance. One teacher expressed an interest in finding out more about the program planning to inspire/inform similar planning for the classroom. Another teacher would like more experiments for younger students.

Another group of comments were more general in nature including complementing the program and JMZ educators, anticipation of future JMZ visits/activities, and expressing appreciation of student driven inquiry related activities.

*Give teachers a heads-up on the lesson specifics and any language needed. I would like to front load the vocabulary, especially for our ELLs. Directions for experiment were given while students explored and then the directions were needed again. It would be helpful to be more explicit with directions and then gradual release into the experiment. Put the steps of experiment on the board for visual learners and overall learning.*

*Adding language/lesson objectives that are called out at the beginning of the lesson. Include more inquiry into the activities.*

*The incorporation of technology can help enhance some of the lessons. Students are now tech-savvy than ever and could use tools like iPads to record their actions or type out their responses. Also, having students watch a complementary video to the content being taught can give students an even clearer understanding of a difficult concept.*

*When presenters come to present, please consider writing information larger. Last time students were asked to copy from a chart paper but it was very small and students had trouble seeing.*

*It might have been helpful to have a clearer thing to look for in the boxes, I think some kids couldn't quite tell that the inside walls even had a color. Awesome, awesome lesson though!*

*It would nice if there was a way to see how/where this program gets its ideas from. Just so that I can creatively think of hands-on inquiries for my classroom.*

*We look forward to our upcoming field trip to the museum on March 21st. . . I look forward to having more visits, even if they are only animals, but would prefer more classes with experiments.*

*[The JMZ educator] kept the lesson going very well. Students were engaged and there was never a down time-great time management.*

*I teach 3rd grade and we are completely using NextGen science standards now. I appreciate any inquiry type of lessons provided because our new standards do not necessarily allow for much student driven questions to easily test.*

*love it!*

*Keep up the great work!*

*Thank you for working with us these past two years- this has given our students and teachers invaluable experiences.*

## Discussion and Recommendations

It is clear from Findings that the JMZ-Vargas outreach program and partnership has been well received by Vargas teachers, and has provided considerable value to that schools' science program. As one teacher put it, "It is a great partnership that helps bring alive the science we are teaching in the classroom."

In its efforts to examine the programs' impact on students, this evaluation has drawn on teachers' perspectives and knowledge of their students' before, during, and after their outreach experience. Teachers were queried about their students' actions, attitudes, and interest in the JMZ outreach experience; and if, and how, their participation in the JMZ-Vargas outreach program has affected students' science interests and engagement.

Findings show that this outreach experience has excited and engaged students about science, has provided opportunities for explorations they might not otherwise have, has exposed students to ideas and activities not easily presented in traditional classrooms, and has offered students new ways to learn and develop confidence in themselves as students and as STEM learners.

Findings do show that the JMZ outreach experience extends past the JMZ session. Many teachers reported seeing evidence of students' interest in science and scientific thinking after the JMZ sessions, that they attribute were stimulated by the JMZ experience. Such evidence was seen during science lessons in their classroom, on teacher administered written tests when students referenced things they'd learned and experienced during outreach sessions, and on field experiences where related ideas supported students' building conceptual understanding. They reported observing students' curiosity piqued by an inquiry they'd initiated during the outreach, which motivated their independent research and follow-up investigative activities.

This connection-making appears to happen sometimes on its own, but at other times, needs to be encouraged by teachers' pro-active work towards this end.

Findings show that many teachers reported with enthusiasm that the program has sustained impact on their students beyond the outreach lesson. But many of these teachers also explained that for this to happen they often utilized strategies that helped students make these connections. This suggests that JMZ would do well to consider helping teachers make that transfer to the classroom post outreach, by providing some follow up questions or perhaps simple activities related to their outreach lessons that teachers could draw upon in order to “keep the conversation going.”

Findings definitely show transfer and influences from the JMZ outreach, some of which goes beyond the classroom. Further connections were identified as teachers spoke about children sharing their outreach experience with family and friends, and noting that families were very excited to hear about these experiences. Another strongly voiced benefit, was that the outreach sessions provided students opportunities to work in teams and groups during these outreach activities. It is beyond the scope of this study to compare the degree of student group work that normally takes place in Vargas classrooms, but findings show that teachers were pleased to see their students working well in groups and to see students’ motivation to do this through science-related problem solving. At least for those students and teachers in this data collection sample, this finding provides evidence that many of the JMZ approaches and methods are both engaging and useful for students and teachers both during school time, and beyond school time.

Teachers were given opportunities to make suggestions toward improving the program’s value for students. The overall reception of the program has been positive, but there were instances where teachers had suggestions and recommendations for some modification. These suggestions indicate teachers’ informed knowledge of their students’ needs and learning styles. Therefore, it is logical that teachers’ pedagogical strengths could be utilized to inform the JMZ program. It is recommended that JMZ continue to seek feedback from teachers, so that they can refine and adapt their offerings to even better align with Vargas needs. Doing so, could also strengthen the partnership between the schools and JMZ, where their respective areas of expertise can “cross-pollinate” across the participating professional organizations.

Findings show that when there was alignment between the outreach topics and classroom study units, teachers reported this enhanced both the students’ outreach experience and subsequent classroom experience. This finding suggests that whenever possible, JMZ and Vargas collaborate on planning the program’s topics, scheduling, and staffing. The more JMZ can augment the existing curriculum requirements, the more likely the program will be perceived as “value added” to the normal Vargas curriculum.

However, the innovative elements of the JMZ outreach program appears to be one of the most positively received aspects of the program, as findings show they have stimulated students’ high engagement and motivation to participate, and to



be useful, inspirational, and transferable into teachers' classroom practice. So, even when the value of alignment with outreach topic and classroom study units is taken into account during planning, JMZ should continue to present new ideas, science excitement, and emerging methodologies for students and teachers.

In these early days of Next Generation Science Standards (NGSS) implementation in California and other states, findings show that it is very useful for JMZ to align and explore ways to utilize this same approach in their outreach work to schools. Modeling inquiry and problem-solving in authentic real world activities, aligns with NGSS, and offers teachers a chance to see how this can be done with their students.

The analysis for the JMZ-Vargas program not only focused on students, but also on, if, and how, the JMZ-Vargas partnership benefits teachers' professional development.

Teachers were asked to rate various opportunities presented by the JMZ outreach, as they relate to their professional growth. They each had a unique set of responses, but findings show that all participating teachers would recommend this program, with 91% indicating that they'd strongly recommend it. The most highly rated aspects of the program for professional development were (a) valuing observing the program; (b) developing content knowledge; (c) participating in the program; (d) learning teaching methods through watching presenter; and (e) applying aspects of program with their students.

These findings from teachers indicate that the JMZ-Vargas outreach program is valued for modeling effective science teaching, and that teachers report learning science content through these sessions. Findings also show that teachers have gleaned many ideas from these sessions, are participating during the outreach program, and are later applying these ideas in their classrooms. A number of teachers reported using activities they'd observed during a JMZ outreach, in subsequent years with students. The materials that JMZ uses have provided models for instructional materials the teachers have developed for their own classrooms. Teachers also report that JMZ has helped them to become more familiar and comfortable with the Next Generation Science Standards (NGSS).

One teacher's concern is that the materials used in JMZ sessions are not always easy to replicate, such as an "earthquake" simulator. In some cases, these lessons are so exciting for students, teachers feel they can't match them in terms of engagement level for their own classrooms. Other teachers have requested that JMZ make their lessons available to them, so that they could use them in their classrooms. These comments suggest that JMZ think about developing some simple associated classroom-friendly ideas/lessons, ones that don't require specialized equipment, which teachers could use to follow-up the JMZ outreach lessons.

Findings also indicate that teachers, have great respect for the JMZ educators, and have been inspired by their enthusiasm and love of science. They have also picked up delivery skills from the JMZ educators. They report learning through watching these presenters. This idea of modeling techniques appears to be a strength held by JMZ educators, which could be utilized in a more formal way through professional development workshop offerings. A number of teachers requested this, and is something that JMZ could consider doing in the future, if not doing so currently.

One of the influences on teachers from their JMZ experience reported, was that the JMZ outreach has provided a common experience that triggers informal professional discussions. This is an indicator of JMZ as a catalyst for collegial collaboration at the school. One teacher's comment about using the JMZ session as a focus for informal discussions with colleagues, suggests that perhaps JMZ could convene a post-outreach discussion with teachers, so that they might also participate in this conversation.

Teachers were surveyed as to their comfort level with science. It was not surprising to find that most of the teachers were "somewhat comfortable" or "very comfortable" with teaching science, as Vargas is a science-focused elementary school. Collaborating more directly with these teachers to develop lesson foci, pedagogical approaches, and keeping current with school/district culture and mandates, would seem a logical step for JMZ to take. For example, this might take the form of a "teacher advisory group," or some similar kind of professional arrangement. Such direct teacher input could enhance JMZ's offerings to meet the needs of other schools where there are teachers who may be less comfortable with science. Findings show that even though these Vargas Elementary teachers report being quite comfortable with teaching science, they do learn a great deal from watching and working with the JMZ educators. So, further collaboration with these teachers is likely to provide learning for both groups of professionals.

Teachers also had suggestions for JMZ, in relation to their professional development. As mentioned above, some would like professional development workshops or summer institutes. Some of these other ideas related to thinking through activity and materials management, time frames, and selection and arrangement of activities. Others discussed development of extension activities. Some would like to know more about how outreach sessions correlate with NGSS. Another suggestion related to JMZ developing assessment tools for the outreach experiences. All of these ideas might be good topics for JMZ to discuss with the teachers. The idea suggested above of coming together for structured conversations with the Vargas teachers could be opportunities to explore these topics and perhaps help inform future programing.

Teachers also offered additional feedback for JMZ. Some were very specific ideas and requests, which included providing more up-front information, and specific refinements for an activity or presentation. These items should be considered for future lesson development, and could be incorporated in joint conversations

which may take place in the future. In general, though, the teachers were very positive in their feedback, expressed gratitude for the relationship and outreach program with JMZ, and look forward to its continuation!

In conclusion, findings from this evaluation indicate that the JMZ-Vargas partnership program is a strong one, with significant evidence of a beneficial program that supports and sparks the science learning for both students and teachers at Vargas Elementary School.

A summary of the recommendations discussed above, follows:

**Recommendations:**

It is recommended that JMZ provide teachers with some follow up discussion questions related to their outreach lessons to help create a bridge for students from their outreach lesson back to the classroom.

It is recommended that JMZ continue to seek feedback from teachers.

It is recommended that JMZ and Vargas collaborate on planning the program's topics, scheduling, and staffing.

It is recommended that JMZ think about developing some simple classroom-friendly lessons, utilizing easy to access materials, which teachers could use to follow-up the JMZ outreach lessons.

It is recommended that JMZ consider offering professional development workshops, if not doing so currently.

It is recommended that JMZ convene post-outreach discussions with teachers, so that they might also participate in conversations already informally taking place at the school.

It is recommended that JMZ continue to collaborate directly with these teachers and keep current with school/district culture and mandates, perhaps through formation of a "teacher advisory group."

## In Brief: What have we learned from this evaluation?

The following offers a quick look at the key findings from the Evaluation of the JMZ-Vargas Outreach Program.

1. The overall reception of the outreach program has been quite positive, and this is evident across the two audiences of students and teachers.
2. The outreach sessions engage the students to a high degree, and in many cases this engagement can be observed sustaining over time.
3. There is evidence that the content and experience from the outreach sessions transfers into other classroom and afterschool contexts, as students were observed to reconnect with aspects of the outreach lessons during classroom activities and conversations with family and friends.
4. Many teachers have found the outreach to be useful for their own professional learning, as they have picked up teaching ideas and methods through observation and participation in the outreach sessions.
5. All participating teachers would recommend this program, with 91% indicating *strongly recommend*. The most valued aspects for teacher professional growth were (a) observing the program; (b) developing content knowledge; (c) participating in the program; (d) learning teaching methods through watching presenter; and (e) applying aspects of program with their students.
6. The outreach sessions have provided a common experience for teachers through which professional dialogue has been generated after those sessions.
7. The teachers are reflective about the outreach sessions, and have thoughts and suggestions for JMZ that relate to (1) management of the experience; (2) developmentally appropriate presentations; (3) having more orientation to the activities before the session; and (4) requests for extensions to implement in their classroom after the outreach session.
8. Many teachers report finding the program useful toward their transition to Next Generation Science Standards (NGSS) and use of inquiry-based learning.
9. Findings show the relationship among JMZ educators and the teachers participating in this evaluation is a very positive one.
10. Findings suggest that JMZ consider augmenting the program to include: (1) teacher discussions during planning and after outreach; (2) development of ancillary materials and activities such as professional development workshops; (3) formation of a teacher advisory group; (4), developing follow-up lessons incorporating accessible materials that teachers can use post outreach sessions; and (5) development of assessment tools.

## Appendix

Word versions of the protocols used for this evaluation are included in this section.

### Protocols

#### **Protocol A**

Palo Alto Junior Museum & Zoo (PA JMZ) Outreach Evaluation  
Spring 2016 Survey

#### **Protocol B**

Palo Alto Junior Museum & Zoo (PA JMZ) Outreach Evaluation  
Check-in Survey

#### **Protocol C**

Palo Alto Junior Museum & Zoo (PA JMZ) Outreach Evaluation  
February 2017 Survey

**Protocol A  
Palo Alto Junior Museum & Zoo (PA JMZ) Outreach Evaluation  
Spring 2016 Survey**

Thank you for taking the time to respond to this survey. Your insights are most appreciated!

We are eager to learn more about your experience with the outreach program from Palo Alto Junior Museum and Zoo (JMZ). Additionally, to better inform our work with you, we'd like to learn a little more about your attitudes and needs around teaching science.

Name

School

Grade Level taught Sept 2015-June 2016 school year

Grade Level anticipated teaching 2016-2017 school year

When you reflect on the JMZ outreach program you have observed thus far, please tell us two things that stand out in your mind about this program.

What have you noticed about the general reaction your students have displayed toward the program?

Do you have any specific recollections or stories to relate about one or two particular students' reactions?

Which of the statements below best describes your own comfort level about teaching science?

I am very comfortable teaching science and excited and confident about teaching all areas of science.

I am comfortable teaching science and am somewhat comfortable teaching all areas of science.

I am comfortable teaching science, but am more comfortable with certain areas of science than other areas.

I am sometimes OK with teaching science, but I don't really get excited about it.

I am a little uncomfortable with teaching science.

I am generally very uncomfortable with teaching science.

Can you identify any special support, needs, professional development, and/or materials you could use toward teaching science?

**Thanks so much for your time and responses!**

**Protocol B**  
**Palo Alto Junior Museum & Zoo (PA JMZ) Outreach Evaluation**  
**Check-in Survey**

Now that your class has had at least one session this fall with the PA JMZ Outreach program, we will appreciate your perspectives on that experience. First, we will ask you to think about your students' experience. Next, we will ask you to think about the experience from the perspective of your own professional development. Thanks for sharing your insights!

Please tell us your name and grade you teach \_\_\_\_\_.

The topic for the most recent OUTREACH program experience for my class was \_\_\_\_\_.

The date of most recent OUTREACH program experience for my class was \_\_\_\_\_.

**THINKING ABOUT THE STUDENTS**

We are interested in looking at the effect of the Outreach program on student engagement - both during and beyond the program's implementation. Please think about student engagement during and/or after the program. If you recall specific examples, please describe these as you respond to these questions.

*During* the outreach experience please describe what you observed with your students. Please note specific examples, as appropriate:

\_\_\_\_\_.

*After* the program, and after the class left the session, did students continue to discuss it, have questions, etc? If so, please describe this.

\_\_\_\_\_.

Are there any other examples of related student engagement, which you observed during or after the program? \_\_\_\_\_.

Have you seen any influence from the OUTREACH program on students beyond the actual program experience? (e.g. making connections from that experience to other learning activities, using/applying critical thinking skills to other activities etc.) If so, please explain. If possible, please indicate how you associate this with their OUTREACH experience.

\_\_\_\_\_.

**THINKING ABOUT TEACHERS**

We are also interested in learning if, and how, the Outreach program is useful for teachers. This year, (and during previous years if applicable), has this program had an influence on your teaching practice in any ways?

Have you picked up any specific tips, activities, and/or benefits from this OUTREACH experience and relationship with PA JMZ that you have used or expect to use? If so, please explain.

\_\_\_\_\_.

Do you have suggestions for the program and/or PA JMZ toward supporting or informing your professional work? \_\_\_\_\_.

Do you have any other feedback or ideas about the OUTREACH program to share with PA JMZ?

\_\_\_\_\_.

Thanks for sharing with us!

## **Protocol C Palo Alto Junior Museum & Zoo (PA JMZ) Outreach Evaluation February 2017 Survey**

Thank you for taking some of your valuable time to complete this survey. Your perspective is extremely important toward our understanding the Palo Alto JMZ Vargas OUTREACH PROGRAM and its impacts on those experiencing it!

We appreciate your participating as a JMZ Outreach case study teacher. All of you completed a check-in survey soon after a specific Outreach session this school year, and we thank-you for this! This current survey is a Summative Survey for the JMZ program evaluation, and is designed to collect your general experience with the program to date. It offers a chance for you to tell us additional impacts, activities, reflections, and ideas you and your students may have had as a result of your Outreach session(s) and relationship with JMZ.

Your candid feedback is appreciated. Although we need your name, grade, and email for this survey, all respondents will remain anonymous in the report.

Thanks!  
Elsa

-Elsa Bailey, Ph.D.  
Elsa Bailey Consulting  
ebbailey@earthlink.net

### **Name, Grade, & Email Contact**

Your Name  
Grade You Teach  
Email Address

In this current school year, how many times has the JMZ OUTREACH PROGRAM come to your class?

- 0**
- 1**
- 2**
- 3**

In previous school years, how many years have you had the JMZ OUTREACH program come to your class?

- 1**
- 2-3**
- 4-5**
- 6-7**

### **Please tell us a bit about your teaching experience**

How many years have you been teaching (including this year)?

If you experienced the program in previous years, which grades were you teaching in those years?

### **Value to Students**

Please rate the value of these program aspects for *your students*. Your comments are especially helpful toward our understanding these things from your perspective.

Not at all valuable  
Slightly valuable  
Valuable



Very Valuable

Not Applicable

The novelty of this learning experience

Working with an educator from outside our school

The program supports content that we *have* addressed in class.

The program supports content that we *will* address in class.

The program addresses ideas *not* currently in our regular curriculum.

Active learning (such as hands on activities and interactive games)

Opportunities to explore concepts in science

Opportunities to develop language skills

Opportunities to learn and use science vocabulary

Opportunities and motivation to communicate through discussion and questions

Working with and exploring new kinds of materials and phenomena

Are there other aspects of the program that you feel are valuable for students? If so, please list them here and briefly describe why they are valuable.

We are interested in looking at the effect of the OUTREACH program on student engagement - both during and beyond the program's implementation. Please think about student engagement during and/or after the program. If you recall specific examples, please describe these as you respond to questions 7, 8, 9, and 10.

During the program(s) did you observe students' attention, focus, participation, excitement, curiosity, etc.? If so, please tell us what you observed.

After the program(s), did students continue to discuss it, have questions, etc? If so, please describe this.

Are there any other examples of related student engagement, which you've observed during or after the program?

Have you seen any influence from the OUTREACH program on students beyond the actual program experience? (e.g. making connections from that experience to other learning activities, using/applying critical thinking skills to other activities etc.) If so, please explain. If possible, please indicate how you associate this with their OUTREACH experience.

Are there any benefits to students from this program, which have not been mentioned above? If so, please let us know about them.

Do you have suggestions and/or ways the program could be more effective or more valuable for students?

#### Value to Teachers

We are interested in learning *if* and *how*, the OUTREACH program is useful for *teachers*. This year, (and during previous years if applicable), has this program had an influence on your teaching practice in any ways?

Please indicate your level of dis/agreement with the following statements. Your comments are especially helpful toward giving us a deeper understanding of your perspectives.

Strongly disagree

Disagree

Neutral

Agree

Strongly agree

- I value observing the program when it comes to my class.
- I learned teaching methods by watching the educator/presenter.
- I have developed content knowledge through experiencing this program.
- I value the opportunity to participate during the program experience.
- I have (or plan to) apply aspects of this program in other ways with students.
- I have learned more about my students through watching them experience this program.
- I would recommend this program to other teachers.

Has this program influenced your attitude and/or comfort level about teaching science? If so, please describe in what ways.

Have you picked up any specific tips or activities that you have used or expect to use? Please explain.

Are there other ways in which this program and/or your relationship with JMZ has informed and/or influenced your work?

How would you describe your *current* orientation to teaching science? Please indicate which choice best matches your degree of comfort with teaching science.

- I am very comfortable and experienced with teaching most areas of elementary science.
- I am somewhat comfortable with teaching science, but some areas of science are more of a challenge.
- I am somewhat *un*comfortable with teaching science, but find some areas of science are OK.
- I am most uncomfortable with teaching all areas of science.

Has your comfort level with teaching science has changed over time?

- Yes
- No
- I'm not sure

Please comment on your response.

Do you have suggestions for the program toward supporting or informing your professional work?

Do you have any other feedback or ideas about the program to share?

**Thank you very much for your time and thoughtful sharing!**

