

**ELISA 2008-2010—ENGAGING LATINOS IN  
SPACE AND ATMOSPHERIC SCIENCES**  
**Integrated Teacher Professional Development and Community Outreach**

**FINAL EVALUATION REPORT**

**SUBMITTED—April 2011**

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## EXECUTIVE SUMMARY

*“This is the way it should be—train teachers, give us materials and provide ample time to implement and try them and learn in a low-pressure community event.”—Salinas teacher*

### Background

**Engaging Latinos In Space and Atmospheric Sciences (ELISA)** is a NASA-funded Education and Public Outreach (E/PO) project intended to integrate formal education and public outreach. The ELISA project envisioned the implementation of a unique model in which teacher professional development workshops are combined with family-oriented events for Latino communities. This model is designed to achieve two primary goals...

- Through sustained standards-based professional development activities, engage and educate teacher leaders and teachers of Latino students in space and atmospheric sciences
- Through community outreach events, inspire and engage Latino families by sharing modern science discoveries while at the same time connecting to their cultural heritages in science and their understanding of the world

The venues of this project that were designated in order to bring this vision to fruition were...

- 2009—GEMS Site launch held in San Antonio, TX
- 2008-09—Teacher PD workshops followed by a community event in San Rafael, CA
- 2010—Teacher PD workshops integrated with a community event in Salinas, CA

Evident in the following selected statistics is the extent of ELISA’s reach not only to educators and E/PO professionals; but also to the public, predominantly the underserved, underrepresented Latino community. These statistics are captured from all individuals participating in the various venues of the ELISA project. Data analyses are run on subsets of this larger group.

- Approximately 1,700 adults and children participated in community events
- 116 teachers and E/PO professionals participated in ELISA workshops
- Workshop participants implemented ELISA lessons with about 470 students and shared them with 70 fellow educators
- Teacher participants either shared or anticipated sharing ELISA-related workshop materials/ideas with approximately 800 colleagues and 3,200 students

The ELISA E/PO team engaged Cornerstone Evaluation Associates LLC (CEA) to conduct the evaluation of ELISA’s professional development (PD) initiatives, while Contemporánea was identified to assist in planning community events and developing instruments to collect data from attendees of these public outreach endeavors. Moreover, Cornerstone was selected to write the comprehensive story of the project’s formal education and outreach initiatives. Cornerstone, a Pittsburgh-based client-centered research firm, specializes in the evaluation of NASA E/PO projects with a special focus on teacher education. Contemporánea is a Hispanic-owned company in San Francisco that is uniquely positioned to provide expertise in research, evaluation, communication and marketing within the Latino community.

The major portion of this evaluation report, ‘Part 2—ELISA Project Venues’, describes each venues ‘story’—giving descriptive data on teacher workshop participants and event participants at the GEMS Site launch, San Rafael and Salinas. These stories will not be summarized in the executive summary. It is important, however, for the reader to review these descriptions in order to understand the three attempts to implement the ELISA model. Text boxes with ‘fast facts’ are provided throughout these descriptions for readers with less time.

What we provide in this executive summary are excerpts from the final section, 'Part 3—Realizing the Model', that explores how the venues 'stack up' against the model and how NASA's goals were achieved. Additionally, we offer a number of 'lessons learned'.

## **Realizing the Model**

The ELISA team initially envisioned the 'ideal' model to embody the following elements...

- Implementing two days of professional development workshops for teachers of Latino students; workshops are separated by a couple of months
- Holding the second workshop on the day of a Latino family-oriented community event
- Assigning teachers to create and implement a lesson plan between workshop sessions
- Having trained teachers 'man' the activity tables at the community event; a bi-lingual environment
- Offering incentives to teachers for their full participation and commitment to all aspects of the ELISA project

Here we provide a brief discussion of each of ELISA's three venues as it appears when we hold it up to the 'ideal model' and reflect back what it looks like—that is, what elements of the model the venue addresses well, where it falls short and what impact each venue seems to have made. Again, we are holding each venue up to the 'model', measuring each one against the model's elements. These three venues are not meant to be replications of each other. We will not go into comparative discussions, pitting what happened in one venue against the outcomes of the other two. These venues represent attempts to implement multiple elements of a complex model in three varied and complicated circumstances.

**GEMS Site Launch**—The GEMS Site Launch proved to be extremely successful in training teacher leaders for the role of GEMS leaders. The training in both science and mathematics is intensive inasmuch as the teacher leaders are being prepared, using a train-the-trainer strategy, to conduct their own workshops for fellow educators.

The site launch's mission was clearly accomplished. At the conclusion of the workshop, teachers reported understanding their roles as GEMS leaders and how the GEMS Site could assist them as trainers. They estimated that in their roles as teacher leaders/trainers they would be reaching approximately 700 colleagues and 2,500 students, 82% of whom were Hispanic.

The GEMS Site launch falls short of the 'ideal' model in two key respects—by not having a lesson plan assignment and by not having a community event associated with it. The two-day workshop was held on consecutive days, allowing no opportunity for designing and implementing a lesson plan. Moreover, since the thrust of GEMS Site launches in general is to train teacher leaders who then train their fellow educators, the focus is on these educators as end-users, not on designing lesson plans and instructing students.

Unfortunately, the envisioned community event for the San Antonio, TX site failed to materialize. The original plan had been to take advantage of the Center for Science and Math Education's connections within the Hispanic community and hold the event subsequent to, not necessarily immediately after, the final workshop session. Interviews with the ELISA team revealed that to them, it appeared that the GEMS Site coordinators had their hands full with the extensive amount of preparation and attention required to get a GEMS Site up and running. The prospect of additionally orchestrating a community event seemed to exceed their capacity. The ELISA team felt that for their part they had failed in communicating the critical elements of the formal education/public outreach model that they were envisioning. Realizing the community event would never materialize in San Antonio, the ELISA team turned its attention to seeking and developing other partnerships that would eventually produce opportunities exhibiting characteristics closer to their 'ideal model'.

**San Rafael Workshop/Community Event**—The San Rafael experience followed the ‘ideal’ model by incorporating both workshops and an event. While twenty teachers were reached by at least one aspect of the San Rafael experience, only eight teachers participated in both workshops and seven took part in the event—this attrition is partially due to the separation of workshops and event by over a year. These educators anticipated reaching student populations in which 44% were Hispanic.

For the adults and children who attended the community event, it was an enjoyable and novel learning experience. Most had never attended an event that combined science and culture. Latino families with a special interest in the Mayan culture were drawn to the event and found themselves engaging in the activities and learning new things in science.

From the perspective of the teachers, the timing of the workshops and community event was a mixed blessing. The two workshop days were separated by three months which allowed ample time for teachers to design and implement their assigned lesson plans. They rated the process as being fairly easy, although they did find that gathering resources was time consuming. Teachers were put to the test, however, due to unplanned circumstances which resulted in the community event occurring more than one year after the second workshop. Because of this protracted time period between learning the activities and presenting them to the public, teachers’ experiences were adversely impacted in the following ways...

- Retaining teachers in the project for the full nineteen months was difficult
- Teachers who stayed the course by participating in all aspects of the San Rafael experience were challenged by the long period of time between learning the activities and presenting them to the public reporting that they had lost confidence in being able to do their presentations

On the other hand, teachers were quick to point out that the community event’s relaxed setting provided an atmosphere conducive to learning and engagement for both themselves and event participants. They felt that they benefited from listening to the ‘public’ and learning about misconceptions in scientific knowledge. Teachers felt that understanding these misconceptions positioned them to better prepare their own students for doing the ELISA activities. Furthermore, their initial lack of confidence in dealing with the public dissipated as they repeated activities and fielded the public’s questions.

The four teachers who stayed committed to the project throughout the entire fourteen-month experience were rewarded with the opportunity to earn college credits. Despite their protracted period of involvement, they found the integrated experience to be worthwhile. And they received college credits for their perseverance!

**Salinas Workshop/Community Event**—The Salinas experience represents a faithful adherence to the ‘ideal’ model not only by incorporating both workshops and an event, but also by implementing all three within a one-month period. Moreover, its implementation benefited from the lessons that were learned from the GEMS Site launch and the San Rafael workshop/event experience. In Salinas, while 25 teachers were reached by at least one aspect of the experience, only 11 teachers participated in both workshops and 12 took part in the event. These educators received training in standards-based science activities that they anticipated sharing with their students of whom 77% were Hispanic.

The Salinas venue also featured a newly forged and productive relationship with Hartnell College, a community college in a Latino community. The ELISA team had several face-to-face meetings with the staff at Hartnell College in order to ensure that the concept of an integrated formal education and public outreach model was well understood. Once on board, the Hartnell staff was forthcoming with its knowledge and experience, particularly with the Latino community. The ELISA team views this partnership as critical to actualizing the model. It is fair to say that ‘partnering with a two-year community college with unique resources and experience within the Latino community’ needs to be added to the list of essential elements for an ‘ideal’ model.

For the 1,000 enthusiastic adults and children drawn from a community that was 64% Hispanic, attending the community event was a delightful experience. The activity tables were well attended by children and adults alike. Children indicated that they not only liked the activities, but also learned new things. Adults gave high praises to the event for combining culture and science. The overwhelming majority mentioned that the event piqued their interest in science.

The Salinas teachers' overall experience benefited from the workshops and event being timed in accordance with the model. Benefits included...

- More teachers were able to complete their commitment to the project—there was less attrition
- One month between the first and second days of the workshop proved adequate for developing and trying out a lesson plan
- Putting workshop knowledge to immediate use at the event increased teacher confidence
- Teachers appreciated being able to perfect their activity presentations in the relaxed atmosphere of the community event
- Teachers affirmed that the combined workshops and event was an 'ideal' model for professional development
- Teachers appreciated having experts available at the community event to offer immediate support
- Teachers learned flexibility at the community event—learning to adapt their lessons to the audience

The teachers' incentive for full participation and commitment to the project was also restructured for the Salinas experience. Rather than the 'all or nothing' college credit approach that was offered to San Rafael teachers only if they completed both workshops and event, Salinas teachers were given a monetary stipend payable in two stages. Completing only the first workshop earned them a nominal amount. Additionally, seeing the project through to the end, by participating in both the second workshop and the event, earned them a far larger stipend amount. With many other opportunities for earning PD credits available to teachers, it is likely that the prospect of getting an immediate and tangible cash award was quite appealing.

**Lessons Learned**—Together, the community events at both San Rafael and Salinas were successful in drawing nearly 1,700 adults and children predominantly from Latino/Hispanic communities. Both audiences proved to be engaged in the events that combined NASA-related science and culture.

Both groups of teachers involved with San Rafael and Salinas saw the benefits of a professional development experience that combined teacher workshops with a community event. These benefits emerged despite the fact that the two venues offered different experiences in timing, location and community demographics. Those teachers who were most dedicated to the project saw great value in the integrated PD 'model'. They have emerged from this project and gone forward with confidence that they can teach in a bi-lingual environment and better reach the Latino students that they currently have in their classes. Despite missing out on the complete model, teachers attending the GEMS Site launch were successfully trained as teacher leaders who will also reach a high percentage of Hispanic students.

Amidst this success, lessons were learned along the way that helped the ELISA project team improve the overall experience that the project offers. These lessons suggest that the 'ideal' model is best realized when the ELISA team...

- Partners with a predominantly Latino community college that has resources and experience with the Hispanic community and can thus offer a superior venue for Latino family-oriented community events

- Invests time to establish a solid working relationship with a partnering institution to ensure 'buy-in' on the concept of the integrated PD model and receive the best advice on creating a culturally-sensitive and appealing family event for the Latino community
- Keeps time between the first workshop and final event short enough to minimize teacher attrition
- Considers holding second workshop and community event 6-8 weeks after the first workshop to provide sufficient time for gathering resources for lesson design
- Structures incentives for full participation and commitment to the event that offer instant gratification, possibly a stage-wise monetary stipend to maximize continued involvement
- Maximizes evaluative feedback from children by ensuring that their questionnaires are engaging and visually appealing
- Maximizes evaluative feedback from adults by ensuring that their questionnaires are brief and non-intimidating, devoid of demographic probes

## PART 1—INTRODUCTION

### Background

**Engaging Latinos In Space and Atmospheric Sciences (ELISA)** is a NASA-funded Education and Public Outreach (E/PO) project intended to integrate teacher professional development and community outreach. ELISA is designed to achieve two primary goals...

- Through sustained standards-based professional development activities, engage and educate teacher leaders and teachers of Latino students in space and atmospheric sciences
- Through community outreach events, inspire and engage Latino families by sharing modern science discoveries while at the same time connecting to their cultural heritages in science and their understanding of the world

The ELISA project envisioned the implementation of a unique model in which formal education initiatives in the form of teacher professional development workshops are combined with public outreach initiatives in the form of community events in Latino communities. The venues of this project that were designated in order to bring this vision to fruition were...

- 2009—GEMS Site launch held in San Antonio, TX
- 2008-09—Teacher PD workshops followed by a community event in San Rafael, CA
- 2010—Teacher PD workshops integrated with a community event in Salinas, CA

*The 'ideal' model called for implementing two day-long PD workshops for teachers of Latino students. These sessions were to be separated by a couple of months. A Latino family-oriented community event would be held on the same day as the second teacher workshop. Teachers trained at the workshop who had already implemented ELISA-based lessons in their classrooms would 'man' the activity tables at the community event. Moreover, these teachers would receive incentives for their participation and commitment to the project.*

Moreover, the ELISA project partnered with the THEMIS E/PO effort to deliver professional development opportunities to teachers of Latino students. Under the aegis of the ELISA project, E/PO professionals also participated in a workshop designed to offer them effective strategies for engaging Latino/Hispanic audiences in astronomy during the IYA 2008. These two events captured an audience of 29 participants. All workshops and events conducted during the ELISA project are presented in Table 1.

<b>ELISA PROJECT—Timeline</b>	
Date	Professional Development Workshop/Event
June 1, 2008	<b>Additional venues</b> —Partnered with THEMIS to present workshop for E/PO colleagues at ASP entitled <i>Effective Strategies For Engaging Latino/Hispanic Audiences in Astronomy during IYA</i>
August 16, 2008	<b>San Rafael</b> —First teacher PD workshop entitled <i>From Space Discoveries to Mayan Culture</i>
October 15, 2008	<b>San Rafael</b> —Second teacher PD workshop entitled <i>From Space Discoveries to Mayan Culture</i>
November 18, 2008	<b>Additional venues</b> —Partnered with THEMIS to present ASP workshop entitled <i>From Space Discoveries to Mayan Culture</i>
June 8, 2009	<b>GEMS Site Launch</b> —San Antonio, TX
October 10, 2009	<b>San Rafael</b> — <i>Maya Culture and Science</i> community event held at Pickleweed Community Center
September 11, 2010	<b>Salinas</b> —First teacher PD workshop entitled <i>From Space Discoveries to Mayan Culture</i>
October 16, 2010	<b>Salinas</b> —Conduct second PD workshop entitled <i>From Space Discoveries to Mayan Culture</i>
October 16, 2010	<b>Salinas</b> —Community event at Hartnell College Planetarium entitled <i>Family Celebration of Maya Culture and Astronomy</i>

**TABLE 1.** Workshops and events conducted for ELISA Project.

Evident in the following selected statistics is the extent of ELISA's reach not only to educators and E/PO professionals; but also to the public, predominantly the underserved, underrepresented Latino community. These statistics are captured from all individuals participating in the various venues of the ELISA project. As is made clear in later sections of this report, data analyses are run on subsets of this larger group.

- Approximately **1,700 adults and children** participated in community events
- **116 teachers and E/PO professionals** participated in ELISA workshops
- Workshop participants implemented ELISA lessons with about **470 students** and shared them with **70 fellow educators**
- Teacher participants either shared or anticipated sharing ELISA-related workshop materials/ideas with approximately **800 colleagues** and **3,200 students**

### Evaluation Plan

The ELISA E/PO team engaged Cornerstone Evaluation Associates LLC (CEA) to conduct a comprehensive evaluation of ELISA's professional development (PD) initiatives, while Contemporánea was identified to assist in planning community events and developing instruments to collect data from attendees of these public outreach endeavors. Cornerstone, a Pittsburgh-based client-centered research firm, specializes in the evaluation of NASA E/PO projects with a special focus on teacher education. Contemporánea is a Hispanic-owned company in San Francisco that is uniquely positioned to provide expertise in research, evaluation, communication and marketing within the Latino community.

Cornerstone assumed the 'lion's share' of ELISA's evaluative activities. These included 1) developing instruments for teacher feedback, 2) managing, analyzing and interpreting all professional development and community event data and 3) writing up the ELISA story. Both quantitative and qualitative data were gathered through self-report instruments completed at teacher workshops and community events. Quantitative data were summarized using descriptive statistics, while qualitative information was content analyzed to reveal emerging themes. Telephone interviews conducted with ELISA team members clarified and supplemented data gathered from project participants as well as provided critical documentation of the implementation of the ELISA 'model' at each venue.

Contemporánea focused on two aspects of the ELISA project—1) planning and marketing the San Rafael community event and 2) developing instruments to tap the perceptions of both adults and children attending the event. As part of the formative evaluation process, these instruments were revised by Cornerstone and the ELISA team, resulting in modified instruments that were administered at the Salinas community festival.

The ELISA project was designed to be attentive to NASA goals in formal education and public outreach, especially in reaching the Latino community that is underserved, underrepresented in the sciences. The project attempts to address these goals by demonstrating the implementation of a unique model that combines teacher professional development with community events. The focus of this evaluation is to provide evidence of the extent to which the project achieved its goals and to show how the model fared in its implementation. While none of the three project venues—San Antonio, San Rafael and Salinas—is a perfect representation of the ‘ideal’ model, each one is true to the model in a variety of ways. These ways are described next in each venue’s story.

To that end, this report will present findings in two parts: ‘Part 2—ELISA Project Venues’ summarizes the evaluative data collected at each of the project’s three venues and ‘Part 3—Realizing the Model’ explores how the venues ‘stack up’ against the model and how NASA’s goals were achieved. Additionally, we offer a number of ‘lessons learned’.

## **PART 2—ELISA PROJECT VENUES**

This part of the report summarizes evaluative data collected at ELISA’s three venues—the GEMS Site launch in Texas and the two California locales in San Rafael and Salinas that have become labels for identifying not only the community events that took place there, but also the teacher workshops that led up to these events. Each of these summaries is accompanied by ‘fast facts’ text boxes, providing highlights of each section. For the reader seeking more detail, technical reports for each venue are available from the ELISA E/PO team or from Cornerstone. These reports contain tabulated data without attempting to present highlights or draw interpretations.

### **GEMS Site Launch—San Antonio, TX**

A two-day GEMS leaders’ workshop for mathematics and science teachers was held in June 2009 in San Antonio, TX. This workshop integrated ELISA-based science with the launch of a new GEMS Site, becoming part of an international network of more than 65 sites and centers offering professional development and providing resources for teachers of mathematics and science.

#### **GEMS LAUNCH FAST FACTS**

- *For the GEMS Site launch in San Antonio in June 2009, the ELISA team partnered with Lawrence Hall of Science and the Center for Science and Mathematics Education at Our Lady of the Lake University*
- *42 teachers attending the two-day workshop were predominantly (83%) teaching in elementary schools*
- *89% of teachers were from urban/suburban settings with 74% in Title I schools*
- *89% of their students are minorities in science—either girls or non-Asian, non-White boys*
- *82% of their students are Hispanic*
- *88% of teachers used inquiry-based or problem-solving materials an average of 57% of their instructional time*
- *Teachers rated their understanding of workshop topics highly and were quite likely to use the materials presented*
- *Teachers clearly understood their roles as GEMS leaders and how the GEMS Site could assist them*
- *Teachers expected to reach 2,500 students and more than 700 of their colleagues with GEMS materials*

GEMS (**G**reat **E**xplorations in **M**ath and **S**cience) is a proven resource for excellence in inquiry-based mathematics and science with guides used nationwide from preschool through eighth grade. The center makes GEMS guides available to be loaned to area teachers. After the conclusion of the workshop, GEMS leaders are expected to conduct PD in their own schools centered on GEMS materials.

For the GEMS Site launch in San Antonio, the ELISA E/PO team partnered with the Berkeley-based Lawrence Hall of Science (LHS). Together they conducted the workshop to launch a GEMS Network Site at the Center for Science and Mathematics Education (CSME) at Our Lady of the Lake University (OLLU), a university with expertise in Mexican-American culture.

The university itself is located in the predominantly Hispanic West side neighborhood of San Antonio. In 2010, OLLU became one of 25 universities recognized by the University of California Center for Urban Education for promoting Latino success in science, technology, engineering and mathematics (STEM). Consequently, CSME was well-positioned to contribute its connections within the Latino community to the ELISA project including recruitment of teachers of Latino students for the launch's workshop.

The agenda and format of the San Antonio Site launch was consistent with most site launches, focusing on a two-day intensive workshop experience for future GEMS leaders. It deviated from the ELISA model in two significant ways. First, the workshop sessions were on consecutive days, thus allowing no time between sessions for teachers to gather GEMS and ELISA-related resources, develop lessons and try them out with their students. Second, despite the fact that a community event was initially envisioned to be held subsequently to the GEMS Site launch, it did not materialize. The GEMS team seemed to have limited capacity for carrying through such an endeavor and there may have been a failure on the part of the ELISA team in communicating the integrated PD model that they were envisioning—more about this in Part 3 where the model is discussed in detail. Thus, workshop participants did not have the opportunity to try out what they had learned by 'manning' activity tables at a community event.

As a unique professional development opportunity for teachers, however, the GEMS Site launch can stand squarely on its own in providing GEMS leaders with strategies for teaching NASA science in Latino/Hispanic communities. The charge of the GEMS leaders is to conduct professional development workshops for other teachers, thereby disseminating and sustaining the training initially offered.

**Background of workshop participants**—A total of 42 teachers attending the workshop averaged 10 years of teaching experience. They were predominantly (83%) elementary teachers who most often cited 'science' or 'all pre-school/elementary curriculum' as the subjects they taught. They described their school environments as...

- 89% teaching in urban or suburban settings
- 74% in Title I schools with an average of 77% of their students receiving free/reduced lunches
- 89% of their students are minorities in science—female and non-Asian, non-White male students
- 82% of their students are Hispanic, ranging from 20% to 100% of their students

Of all workshop participants, 88% indicated that they were already using inquiry-based science or problem-solving mathematics curriculum materials. They reported using these methods on average 57% of their instructional time. A little more than a quarter (26%) of these teachers had implemented GEMS units prior to the workshop.

**Participants rate the workshop**—Teachers rated their understanding of the five workshop topics very highly as a 3.7 average on a 4-point scale. Furthermore, they indicated that the likelihood of using the GEMS units presented was a 4.3 average rating on a 5-point scale. The workshop itself was much to their liking as evidenced by 48% reporting that the experience fully met their expectations. An additional 32% revealed that they wanted even more from the workshop—more hands-on activities, strategies and GEMS materials. The remaining 20% said that they had entered the workshop without expectations.

Moreover, when asked about improving the workshop, 44% reported that no changes were necessary—again demonstrating their positive response to the experience. Among those offering suggestions for improvement, they mentioned modifying the workshop schedule, increasing the availability of teacher guides and updating technology.

The workshop was successful in meeting its goal to prepare GEMS leaders. When asked to rate their agreement with statements about their understanding of their role as GEMS leaders, the average rating was 4.2 on a 5-point scale. Participating teachers acknowledged that they understood 1) their role as a GEMS leader, 2) how they could use the San Antonio GEMS Site to support them in that role and 3) how they could use parents as partners in their endeavors.

**Implementation and dissemination**—Of the participating teachers, 27 anticipated that they would expose approximately 2,500 students to GEMS materials and ideas, each reaching an average of 92 students. Furthermore, 34 participants expected they would share the GEMS guides with more than 700 colleagues, an average of 21 fellow teachers for each respondent.

All participating teachers anticipated that they would implement the GEMS materials in their classrooms. Most of them cited multiple ways, with 71% indicating that they intended to make the materials an integral part of their basic curriculum. Seventy-one percent also reported their intention to use the materials as a resource/supplement to their curriculum. Not surprisingly, science and math were the subjects most often mentioned as the subjects in which they planned to incorporate the GEMS guides. Moreover, 60% of the workshop participants said they planned to share GEMS materials informally with parents, community members and other teachers, while 55% felt that they would use the materials in more formal venues such as professional development workshops.

Teachers anticipated few barriers for either implementing or disseminating GEMS materials, save for finding the time and resources to do so. When asked to reflect upon the role that the GEMS Site might play in assisting them to overcome any challenges, 48% said that they would be looking to the site to provide people resources. They expected to be able to enlist the site for advice, answers to questions, support, updates on new guides and assistance in lobbying administrators to embrace GEMS. They also saw it as a source of materials and resources.

### **Teacher Workshops/Community Event—San Rafael, CA**

In keeping with the envisioned model of integrating teacher professional development and public outreach initiatives, the October 2009 community event held in San Rafael was preceded by two teacher training workshops held in August and November 2008. Teachers were offered continuing education credits for their participation in the project. The time between workshops afforded teachers an opportunity to develop lesson plans and implement ELISA-related materials prior to ‘manning’ activity tables at the community event.

During these workshops, teachers were trained not only in conducting hands-on activities for their classrooms, but also in doing so for adult and youth participants at the upcoming community event. Teachers also received training in interacting with the public. It was not envisioned, however, that the professional development workshops would be completed almost a year prior to the community event. The protracted period of time between the last workshop and the event was caused by the untimely death of a Maya community leader. Out of respect for the leader and the members of his grieving community, the event was rescheduled.

The community event was conducted by the ELISA team in partnership with La Casa de la Cultura Maya at the Pickleweed Community Center in San Rafael, CA. Representatives from the Maya Community in California also contributed their input to this event. Open to the public, the event included talks by experts from Yucatan and NASA, workshops and activities for families, dance performances, social dance and traditional food. Teachers trained at the PD workshops manned the activity tables for families.

### **Formal Education—Teacher Workshops**

Inherent in this model that separates teacher workshops by several months is the possibility that certain teachers may not be able to complete the commitment to both days of training. Also in the case of San Rafael where the community event stretched into another year, maintaining the initial cadre of teachers throughout the project was made exponentially difficult.

Attrition became a problem in analyzing our data. Twenty teachers were involved in at least one aspect of the San Rafael experience—first workshop, second workshop and/or event. In order to tell the best possible story about the model, we have chosen in our analysis to look at the eight participating in both workshops and the seven taking part in the event as examples of the most deeply committed teachers. Complete data for all 20 teachers are available from Cornerstone. As an aside, four teachers succeeded in completing all three parts of the experience.

Focusing first on those eight teachers who maintained their commitment to both workshops, our findings follow in two sections summarizing ‘who they are’ and the outcomes of their workshop experience.

**Background of teacher participants**—Of the eight teachers, 88% percent taught in elementary schools, while 12% taught at middle school grade levels. These teachers averaged 13 years of experience. Additional background information includes...

- 63% teach in urban settings; 25% in suburban areas and 12% in rural environments
- 75% in Title I schools with an average of 85% of their students receiving free/reduced lunches
- 84% of their students are minorities in science—female and non-Asian, non-White male students
- 44% of their students are Hispanic, ranging from 10% to 87% of their students
- 57% of the teachers consider themselves Hispanic

Eighty-eight percent of the teachers said that they had previously used some of the topics covered in the workshop with their own students. The majority had used these topics as a resource or supplement. Others reported using these topics as an integral part of their basic curriculum and one teacher had actually used specific GEMS activities. Despite their familiarity with these topics, 72% of these teachers described their previous knowledge of workshop topics as being ‘just a little knowledge’ or ‘none at all’, while 28% reported having ‘a moderate amount’ or ‘quite a bit’ of knowledge.

At the conclusion of the second workshop, teachers said that they anticipated using the materials, ideas and activities about which they had learned—offering a mean rating of 4.0 on a 5-point ‘likely to use’ scale. Teachers expected to use the materials in multiple ways—38% planned to integrate materials into a science course, while 38% wanted to use them in social studies and multidisciplinary courses. In addition, 38% planned to use ELISA-related activities as a resource, 25% would use them to train other educators and 25% would incorporate them into a thesis.

#### **SAN RAFAEL TEACHER WORKSHOPS** **FAST FACTS**

- *Despite the fact that 20 teachers were reached during the entire San Rafael experience, only eight attended both workshop sessions*
- *88% of workshop participants teach elementary grades and 63% of their schools are in urban settings*
- *75% are in Title I schools with an average of 85% of their students receiving free/reduced lunches*
- *84% of their students are minorities in science—either girls or non-Asian, non-White boys*
- *57% of teachers consider themselves Hispanic and, on average, 44% of their students are Hispanic*
- *Prior to the workshops, 88% of teachers had taught ELISA-related topics, although they considered themselves only moderately knowledgeable about these topics*
- *Teachers creating lesson plans and implementing them reached 144 enthusiastic students and 31 colleagues*
- *Teachers shared workshop materials/ideas with 53 of their colleagues*

**Workshop outcomes**—Having three months between the two workshops, teachers had ample time to implement activities in their classrooms and share workshop materials with colleagues. In fact, seven of the teachers said they shared ELISA-related materials received in the workshop with a total of 53 colleagues.

As a ‘take-home’ assignment to be completed between workshops, teachers were asked to design a lesson plan. Of the eight teachers, six did so. One teacher with no classroom chose not to do the assignment and another teacher whose school was under a restrictive improvement plan was not permitted to deviate from the curriculum. Teachers rated the lesson design project as 4.4 on 5-point scale with ‘5-easy, straightforward’. Two teachers commented on the ease of designing the lesson plan, with one revealing that she received assistance from her visual aids department which helped her immeasurably. In contrast, two teachers noted that gathering resources to do the assignment was time consuming and another pointed out challenges in having to adapt her lesson to standards. Other highlights of their experience in developing lesson plans were...

- Five of the six teachers completing lesson plans shared those plans with colleagues, reaching 31 additional teachers
- Five of the six lesson designers tried their lesson plans out with 144 students
- Teachers reported that students were enthusiastic and positive about the lesson

Four of the eight teachers who completed the two-day workshop formed the core group who would man the tables at the community event held the following year. They were accompanied by three additional teachers who had received some portion of the training.

### **Public Outreach—Community Event**



‘The Astronomy of the Maya—Honoring the Maya in the International Year of Astronomy’ community event was held from 2:30 until 11:00 pm on a Saturday in October 2009 at the Pickleweed Community Center in San Rafael, CA. According to the 2000 U. S. Census only about 23% of the population of San Rafael is Hispanic or Latino. However, a vibrant Mayan community is an integral part of this population. The promotion and preservation of its culture is supported by Casa De La Cultura Maya, a partner in organizing the community event.

Mayan community leaders also played a key role in encouraging attendance.

The combining of Mayan astronomy with dance demonstrations and art exhibitions proved to be a natural draw for the public. The event featured a series of lectures for adults about Mayan traditions as well as six activity tables set up for children on the theme ‘From Space Science Discoveries to Mayan Culture.’ An estimated total of 700 people attended the event including mostly adults with 50 to 100 children. Data about the participants are based on an 8% sample of adults and youth who voluntarily completed questionnaires. The following summary of the event is presented from three perspectives—the teachers who manned the activity tables as well as youth and adult participants.

**Teachers' perspective**—All seven teachers who worked the activity tables at the San Rafael community event completed a survey designed to help us understand the event from their perspective. These teachers are considered deeply committed to the project and include four of the eight highly-dedicated teachers who attended both workshops and were part of our previous analysis. An additional two of the event team had attended the first workshop only and the seventh teacher accompanied a 'trained' colleague. It would not be a stretch to presume that this was one of the teachers with whom workshop materials and/or training had been shared.

Teachers worked at five of the six activity tables with at least two teachers manning each table. One activity, involving a telescope, was covered by a THEMIS team member and amateur astronomers. Teachers rated their own experiences in 'working' the tables and also their perceptions of the audience's engagement and interest in the activities. Across the five tables, their ratings ranged from 4.6 to 4.9 on a 5-point scale, indicating an overall positive reaction.

Teachers were asked about their perceptions of the impact of the community event. They were encouraged to provide any insights they had gathered about teaching in such an informal setting. They reported that...

- Community events such as San Rafael are a relaxed setting for both teachers and audience that provide an atmosphere conducive to learning and engagement
- Audience engagement yields benefits for both teachers and audience with the audience enjoying being involved with science activities, exploring and questioning and teachers learning about audience knowledge gaps and science misconceptions
- Teacher engagement yields benefits as they became reacquainted with forgotten experiments

Teachers were also encouraged to comment on professional development opportunities that followed the San Rafael model of combining two teacher workshops with a community event...

- Model offered a great experience for teachers and students alike—teachers reported that there should be more professional development combining workshops and community events and also cited this model as a good way to combine science and culture

#### **SAN RAFAEL COMMUNITY EVENT** **FAST FACTS**

- *ELISA partnered with Casa De La Cultura Maya and Maya Community of California to present the community event*
- *Seven teachers, including four who completed the two-day workshop, manned activity tables—an experience they rated very highly*
- *Teachers valued the relaxed 'event' setting for themselves and the participants, citing benefits for both including increased engagement*
- *Teachers endorsed the workshop/community event model, stressing the need for the event to immediately follow the workshops*
- *Teachers said the participants seemed delighted with and enthusiastic about the event, thought it should be offered in other communities*
- *700 participants including adults and 50 to 100 children attended; 8% completed questionnaires*
- *78% of the children completing questionnaires were elementary students with an average age of 9 years*
- *64% of the children visited at least four of the six activity tables*
- *Adults completing questionnaires identified with a variety of cultures—60% with Mayan, 35% with Mexican and another 35% with Hispanic/Latino; majority were predominantly Spanish speaking*
- *72% of the adults were between 21 and 50 years of age; 41% had completed high school or beyond*
- *79% of the adults took part in at least four of the six talks and demonstrations*
- *For 80%, attending an event combining science and culture was a first-time experience*

- Ensure two-day workshop and community event are held within two months of each other for optimal retention/practice of what is learned
- Putting what is learned in workshops to use at the event leads to teachers gaining confidence in their ability to present to the public

We also solicited teachers for their perceptions of the audience's reactions to the event activities. They said that the audience...

- Was delighted and enthusiastic
- Appeared intently interested in learning new things—one participant said it was his first time seeing solar panels at work
- Commented that the event was worthwhile and should be expanded to other communities

**Children's perspective**—Fourteen children completed a questionnaire designed to gather demographic information as well as their perceptions of the event. Although the questionnaire was available in both English and Spanish versions, only one child completed it in Spanish. Demographics revealed...

- On average, the children were close to 9 years old
- 78% of the children were in elementary school, 14% were in middle school and 7% were in Kindergarten

Children were asked about their motivation for attending the community event. They were given a multiple choice question and asked to identify the 'reason' for coming. Not surprisingly, 49% reported that they came because of others—as part of a field trip or accompanying parents or friends. Thirty-six percent said that their primary reason for attending the event was to gain knowledge or learn about new things. Finally, 14% just came to have fun.

Children who attended the event focused their energies on the activity tables. Of the children who completed questionnaires, 64% reported that they visited four or more of the six tables. The most visited table, 'Solar Clock', engaged 79% of the children, while the least visited, 'Sun-Earth Scale Model', attracted 43%. On a 5-point scale, children rated liking the activities tables on average as 4.4—with 'Solar Oven & Solar Energy' being the most popular and 'Sun-Earth Scale Model' the least liked.

**Adults' perspective**—Forty-three of the adults attending the event completed questionnaires designed to capture their demographics, their perceptions of the event and the impact the event had on their interest in science. Questionnaires were offered in either English or Spanish versions—12 chose English, while 31 choose Spanish. The data reveal the following profile of the adults...

- 72% of the adults completing questionnaires were between the ages of 21 and 50; 21% were 20 and younger, 7% were over 50
- 21% had completed high school; 20% had some college, college degrees or graduate studies
- Adults completing questionnaires identified with a variety of cultures—60% with the Mayan culture, 35% with Mexican and 35% with Hispanic/Latino
- 64% spoke only one language, 26% spoke two and 10% spoke three—in all cases, Spanish predominated
- For 80%, attending an event combining science and culture was a first-time experience

Adults were asked about their motivation for attending the community event. They were given a multiple choice question and asked to identify their 'reason' for coming—more than one response was allowed. Among the respondents, 72% reported that they came to learn new things, while 49% said that they like to learn about science and astronomy. Another 36% mentioned being asked by someone to attend. Surprisingly, only 41% and 38%, respectively, reported that they wanted their children 'to learn new things' and 'to learn science and astronomy'. We presume that the small percentages expressing concern about children indicate the small percentage of adults attending the event with children in tow.

Adults who attended the event focused their energies on the talks and demonstrations. Of those who completed questionnaires, 79% reported that they had taken part in at least four of the six offerings. The most attended talk attracted 88% of the adults, while the least popular demonstration garnered 65%. On a 5-point scale, adults rated liking the talks and demonstrations on average as 4.5.

### **Teacher Workshops/Community Event—Salinas, CA**

Another integrated professional development and public outreach initiative was held in Salinas, CA in 2010. The community event took place in October of that year, while the professional development workshops were held a month before and on the same day as the event. In this case, the timing of the workshops and event concurred with a key element of the 'ideal' model.

The community event took place at Hartnell College in Salinas, CA., one of the oldest educational institutions in the state. Hartnell is a two-year community college with a well-established track record in offering community events within the Hispanic/Latino community. The partnership forged between SSL's Center of Science Education and the Hartnell College Science and Math Institute allowed the ELISA team to offer the community event at the college's planetarium. The planetarium, featuring a state-of-art, full-dome digital projection system, was a draw not only for the public, but also for workshop participants who were offered the planetarium venue as a field trip for their students. The field trip was an additional incentive over and above the stipend teachers were offered for their involvement in the workshop/event professional development experience.

## **Formal Education—Teacher Workshops**

Despite the fact that the workshop sessions and the community event were held within a month's time, attrition still presented a challenge, particularly in analyzing/interpreting data for this report. Twenty-five teachers were involved in at least one aspect of the Salinas experience—first workshop, second workshop and/or event. In order to tell the best possible story about the model, we have chosen in our analysis to look at the eleven participating in both workshops and the twelve taking part in the event as examples of the most deeply committed teachers. As an aside, seven teachers succeeded in completing all three parts of the experience. Complete data for all 25 teachers are available from Cornerstone. Focusing first on those eleven teachers who maintained their commitment to both workshops, our findings follow in two sections summarizing 'who they are' and the outcomes of their workshop experience.

**Background of teacher participants**—Of the eleven teachers, 91% taught in elementary schools, while 9% taught at middle school grade levels. These teachers averaged 10 years of experience. Additional background information includes...

- 40% teach in rural settings, 30% in suburban areas and 30% in urban environments
- 56% in Title I schools with an average of 75% of their students receiving free/reduced lunches
- 83% of their students are minorities in science—female and non-Asian, non-White male students
- 77% of their students are Hispanic, ranging from 1-100% of their students
- 30% of the teachers consider themselves Hispanic

Eighty-two percent of the teachers said that they had previously used some of the topics covered in the workshop with their own students. Thirty-six percent had used these topics as an integral part of their basic curriculum, while an equal percentage used them as a resource or supplement. Additionally, 9% used them in a novel way by having their students write questions to astronauts. Despite their familiarity with these topics, 55% of these teachers described their previous knowledge on workshop topics as being 'just a little knowledge', while 45% reported having 'a moderate amount' or 'quite a bit' of knowledge.

### **SALINAS TEACHER WORKSHOPS FAST FACTS**

- *Despite the fact that 25 teachers were reached during the entire Salinas experience, only eleven attended both workshop sessions*
- *91% of the workshop participants teach elementary grades with 40% of their schools in rural settings, 30% each in urban and suburban*
- *56% are in Title I schools with an average of 75% of their students receiving free/reduces lunches*
- *83% of their students are minorities in science—either girls or non-Asian, non-White boys*
- *30% of teachers consider themselves Hispanic and, on average, 77% of their students are Hispanic*
- *Prior to the workshops, 82% had taught ELISA-related topics, although 55% reported having just a little knowledge of these topics*
- *Teachers reported exposing 378 students to ELISA-related materials/ideas from the workshop and sharing this treasure-trove with 26 fellow educators*
- *Teachers creating and implementing lesson plans reached 210 students who expressed appreciation for the hands-on activities as well as 32 colleagues*

At the conclusion of the second workshop, teachers said that they anticipated using the materials, ideas and activities about which they had learned—offering a mean rating of 3.9 on a 5-point ‘likely to use’ scale. Teachers expected to use the materials in multiple ways—45% planned to integrate materials into a physical science or Earth science course, while 64% wanted to use them as a resource/supplement in K-12. In addition, 36% planned to use ELISA-related activities to train colleagues at department meetings and 9% anticipated using these activities in a non-science curriculum, specifically English language development.

**Workshop outcomes**—Despite having only one month between the two workshops, teachers found time to implement workshop activities in their classrooms and to share materials with colleagues. In fact, the eleven teachers said they shared the workshop materials with a total of 26 colleagues. Ten of the eleven used ELISA-related ideas/materials with a total of 378 of their students.

Teachers were given the ‘take-home’ assignment to complete a lesson plan. Ten teachers created lesson plans. They rated the lesson design project as 3.8 on 5-point scale with ‘5-easy, straightforward’. Nine teachers described the experience. Three said they faced no concerns in doing their lesson plans, while the other six cited unique challenges. They found...

- Gathering resources to be a time-consuming process
- Matching standards when using the same lesson at two grade levels presented a dilemma
- Overcoming student limitations was difficult—students have limited exposure to science and/or have English language deficits
- Getting enough compasses, bar magnets was a problem due to school budget constraints

There were a variety of highlights in teachers’ experiences with lesson plan creation...

- Nine of the ten teachers completing lesson plans shared these plans with colleagues, reaching 32 additional teachers
- Eight of the ten lesson designers tried their lessons out with 210 students
- Teachers reported that students liked the lessons, appreciated the hands-on activities and wanted more

One of the workshop participants who taught English chose to write a bibliography instead of designing a lesson. She reported that she used the bibliography throughout the year to link Sun-Earth-Moon connection with English Language Arts (ELA) and meet History/Social Studies standards.

Seven of the eleven teachers who completed the two-day workshop formed the core group who would man the tables at the subsequent Salinas community event. They were accompanied by five additional teachers who had completed only one of the two professional development sessions.

## Public Outreach—Community Events



The ‘Family Celebration of Maya Culture and Astronomy’ community event was held from noon to 6:00 pm on a Saturday in October 2010 on the campus of Hartnell College in Salinas, CA. The college’s ethnic profile, including 59% Latinos, draws upon a community that boasts a Hispanic/Latino population of 64%.

The venue at the college’s planetarium presented an opportunity for both indoor and outdoor activities. The event featured ‘talks’ for adults about Mayan traditions as well as five activity tables set up for children on the theme ‘From Space Science Discoveries to Mayan Culture.’

It was estimated that as many as 1,000 adults and children attended the event. Information about event participants is based on data from a 19% sample of adults and youth who voluntarily completed questionnaire. Hartnell offered possible modifications to both the adult and children’s questionnaires in order to render them more culturally-sensitive. Cornerstone and the ELISA team incorporated all of Hartnell’s suggestions—creating a more ‘kid-friendly’ and visually engaging survey for children and shortening the adult questionnaire by removing demographic questions and focusing on culture and science issues.

The following summary of the event is presented from three perspectives—the teachers who manned the activity tables as well as youth and adult participants.

**Teachers’ perspective**—All twelve teachers who worked the activity tables at the Salinas community event completed a survey designed to help us understand the event from their perspective. These teachers are considered deeply committed to the project and include seven of the eleven highly-dedicated teachers who attended both workshops and were part of our previous analysis. An additional three of the event team had attended only the first workshop and two had participated solely in the second session.

### SALINAS COMMUNITY EVENT FAST FACTS

- *ELISA partnered with Hartnell College to present the community event*
- *Twelve teachers, including seven who completed the two-day workshop, manned activity tables—an experience they rated highly*
- *Teachers valued the relaxed setting for themselves and event participants, finding it conducive to learning and engagement*
- *Teachers endorsed the workshop/community event model, saying that their knowledge is enhanced when they can immediately implement what they have learned with ‘expert’ support*
- *Teachers said the participants were delighted and enthusiastic about the event and were interested in learning new things*
- *1,000 people including adults and children attended the event*
- *72% of the children were primary or elementary students with an average age of 9 years*
- *93% of the children visited at least four of the five activity tables*
- *Adults valued the community event with 77% indicating that they would have still come if the event had been solely science with no cultural aspects*
- *95% of adults said the community event combining culture and science had increased their interest in science*
- *62% of the adults reported that they were most impressed by the ‘standout’ activity tables that offered good explanations*

The twelve teachers each manned anywhere from one to three activity tables. Teachers rated their own experiences in 'working' the tables and their perceptions of the audience's engagement and interest in the activities. Across the five tables, their ratings ranged from 4.4 to 4.6 on a 5-point scale, indicating an overall positive reaction.

Teachers were asked about their perceptions of the impact of the community event. They were encouraged to provide any insights they had gathered about teaching in such an informal setting. They reported that...

- Salinas community event was a relaxed setting for teachers and audience alike, providing an atmosphere conducive to learning and engagement
- Benefits to teachers included learning flexibility, availability of 'experts'; and gaining confidence from repetition of activities
- Benefits to the audience included providing an opportunity for individuals of differing ability levels to participate and ask questions

Teachers were also asked to comment on professional development opportunities that followed the Salinas model of combining workshops with a community event...

- Model offered a great experience for teachers and students
- Extensive time commitment is worthwhile
- Putting workshop knowledge to immediate use at event increases teacher confidence; teachers gain confidence as the day progresses and event lets them practice what they learned
- Teachers confirmed that combining workshops with a community event is an 'ideal' strategy for professional development

In fact, 75% of the teachers mentioned that participating in the community event enhanced their content knowledge over and above what they had learned in the workshops. Having 'expert' support available as they were performing the activities enhanced their learning. Data from workshops without community events indicate that teachers want 'experts' to assist them once they return to their classrooms and begin to implement what they have learned. The community event mimics this opportunity. Teachers also said that they benefited by learning from and sharing with colleagues.

We also solicited teachers for their perceptions of the audience's reactions to the event activities. They said that the audience...

- Was delighted and enthusiastic
- Mentioned being interested in learning new things
- Suggested the addition of even more food booths to further enhance the cultural experience

**Children's perspective**—Eighty-nine children attending the event completed questionnaires designed to gather demographic information and background as well as their perceptions of the event. Although the questionnaire was available in both English and Spanish versions, all children completed it in the English version. Demographics revealed...

- On average, the children were close to 9 years old
- 37% of the children were in elementary school, 35% in primary grades, 24% middle school and 4% high school

Children were queried about their motivation for attending the community event. They were given a multiple choice question and asked to identify the 'reason' for coming—some offered multiple answers. Given the age of the children it is not surprising that 68% said that they came because someone brought them—they cited parents, teachers, Girl Scout troop leaders, siblings and friends. Thirty-seven percent reported that they came to gain knowledge because they like to learn new things or were interested in the Sun and the stars. Another 14% said came to have fun.

Children attending the event focused on the activity tables. Of the children completing questionnaires, 93% visited four or more of the five tables. The most visited table, 'Sun-Earth Scale Model', attracted 98% of the children and even the least visited tables, 'UV Beads' and 'Solar Oven & Solar Energy', engaged 90% of the youth attendees. On a 5-point rating scale the children rated liking the activities on average with a 4.5 with 'UV Beads' being the hands-down favorite. All five activities were mentioned as being favorites for at least some of the students.

**Adults' perspective**—In total, 96 of the adults attending the event completed questionnaires that were designed to capture the role cultural offerings played in drawing adults to the event, their perceptions of the event and its impact on their interest in science. Questionnaires were offered to the adults in either English or Spanish versions. Of the 96 respondents, 79 completed it in English, with the remaining 17 choosing the Spanish version.

While demographic data are routinely collected at such community events, the Hartnell College co-sponsors urged the evaluator to omit such questions. Their experience in working with the Latino community had revealed that this population reacts negatively to being asked what they consider as probing and personal information. Therefore, we chose to follow Hartnell's advice.

Adults were asked both open-ended and rating scale questions in order to understand the 'value' that they placed on community events that combined culture and science. Adults gave high ratings to such events, on average valuing the Salinas experience as a 4.7 on a 5-point scale. When questioned about whether they would have attended the community event if it had been focused solely on science, 77% said they would have done so, most often citing their own interest in science and/or a desire to expose their children to science. Without the cultural aspect of the event, 14% indicated that they would not have come. Finally, 9% were unsure about what they would have done if the cultural piece had been omitted. It appears that even though the majority of adults would have come even without the cultural aspects, they greatly valued this part of their experience.

Attracting anywhere from 43% to 96% of the adult participants, the event offered a variety of experiences including the science activity tables, a dance performance, a planetarium show, an Astronomy Fun Zone and talks related to science and culture topics. When asked to reflect on those experiences that most impressed them, participants gave multiple responses—62% were most impressed by the ‘standout’ activity tables where they received ‘good explanations’, 40% were awed by the event itself which they said was a great family time and good for the community and 33% mentioned the planetarium as a show stopper. A full 18% actually mentioned being struck by the unique weaving together of science and culture.

Inasmuch as the event combined science and culture, adults were asked if the experience helped them become more interested in science. Ninety-five percent agreed that their interest in science had been piqued, mentioning that they learned new things and that they were exposed to interesting ideas about the science/culture connection. They also noted that such events were good ways for both children and adults to learn; the fun and interaction promoted learning and provided a good family experience. An additional 4% said that their interest in science was already great and was not affected by the event, while 1% was uncertain.

### **PART 3—REALIZING THE MODEL**

The thrust of the ELISA project was to combine formal education with public outreach in order to provide a hands-on professional development opportunity for teachers followed immediately by a culturally-focused science event for Latino communities. By realizing this integrated ‘model’, the ELISA project sought to achieve its overarching goals to...

- Engage and educate teacher leaders and teachers of Latino students through sustained standards-based professional development activities in space and atmospheric sciences
- Inspire and engage Latino families in community outreach events by sharing modern science discoveries while at the same time connecting to their cultural heritages in science and their understanding of the world

Having provided in-depth descriptions of each venue in which the ELISA team and its partners attempted to implement a professional development/community event experience, we are now primed to turn our attention once again to the ELISA ‘model’ in order to ‘see’ the extent to which it was realized in each of these venues. As previously described in the introduction, the ‘ideal’ ELISA model embodies the following elements...

- Implementing two days of professional development workshops for teachers of Latino students; workshops are separated by a couple of months
- Holding the second workshop on the day of a Latino family-oriented community event
- Assigning teachers to create and implement a lesson plan between workshop sessions
- Having trained teachers ‘man’ the activity tables at the community event; a bi-lingual environment

- Offering incentives to teachers for their full participation and commitment to all aspects of the ELISA project

What follows in this section is a discussion of each of ELISA's three venues as it appears when we hold it up to the 'ideal model' and reflect back what it looks like—that is, what elements of the model the venue addresses well, where it falls short and what impact each venue seems to have made. The reader is reminded that we are holding each venue up to the 'model', measuring each one against the model's elements.

These three venues are not meant to be replications of each other. We will not go into comparative discussions, pitting what happened in one venue against the outcomes of the other two. These venues represent attempts to implement multiple elements of a complex model in three varied and complicated circumstances. The final part of this section is a brief summary of 'lessons learned' from these three attempts to implement the ELISA model.

Table 2 provides a quick visual display of how the elements of the 'ideal' model were played out at each of ELISA's venues. The table provides a handy reference for the discussion that follows.

ELEMENTS OF THE 'IDEAL' MODEL EVIDENCED IN PROJECT COMPONENTS		
GEMS Site Launch	San Rafael Workshop/Event	Salinas Workshop/Event
<b>Integrated Two-day Teacher PD Workshop and Community Event</b>		
Two –Day Workshop		
<ul style="list-style-type: none"> <li>❖ held on two consecutive days</li> <li>❖ trained 42 teachers</li> <li>❖ 82% of their students are Hispanic</li> <li>❖ teachers were not required to create/implement a lesson plan</li> </ul>	<ul style="list-style-type: none"> <li>❖ held three months apart</li> <li>❖ trained 20 teachers with 8 attending both days</li> <li>❖ 44% of their students are Hispanic</li> <li>❖ teachers creating and implementing lesson plans reached 144 enthusiastic students and 31 colleagues</li> </ul>	<ul style="list-style-type: none"> <li>❖ held one month apart</li> <li>❖ trained 25 teachers with 11 attending both days</li> <li>❖ 77% of their students are Hispanic</li> <li>❖ teachers creating and implementing lesson plans reached 210 students who expressed appreciation for the hands-on activities as well as 32 fellow teachers</li> </ul>
Community Event		
<ul style="list-style-type: none"> <li>❖ vision of holding subsequent community event not realized</li> </ul>	<ul style="list-style-type: none"> <li>❖ held nearly one year later</li> <li>❖ 7 teachers manned activity tables; 4 of whom had participated in both workshops</li> <li>❖ 700 adult and youth attendees largely drawn from Mayan community</li> <li>❖ 8% response rate for questionnaires</li> </ul>	<ul style="list-style-type: none"> <li>❖ held same day as second session of workshop</li> <li>❖ 12 teachers manned activity tables; 7 of whom had participated in both workshops</li> <li>❖ 1,000 adult and youth attendees drawn from 64% Hispanic community</li> <li>❖ 19% response rate for questionnaires</li> </ul>
<b>Incentives for Teachers</b>		
<ul style="list-style-type: none"> <li>❖ support from GEMS site</li> <li>❖ access to GEMS materials/guides/kits</li> <li>❖ additional PD opportunities</li> <li>❖ become a GEMS teacher leader</li> </ul>	<ul style="list-style-type: none"> <li>❖ opportunity to earn college credits for completing 15 hours PD by writing and implementing lesson plans using content and resources from workshop and by participating in bilingual space science stations at community event</li> <li>❖ free NASA classroom materials (GEMS guides and elementary lessons from 'Eye on the Sky')</li> </ul>	<ul style="list-style-type: none"> <li>❖ free NASA educational materials including posters, age-appropriate readers, lithographs and information about NASA teaching resources and field trip to planetarium</li> <li>❖ alignment to CA science standards highlighted in the workshop</li> <li>❖ stipend for attending each session of workshop as well as community event</li> </ul>

**TABLE 2.** Elements of the 'ideal' ELISA model as evidenced in project venues.

### **GEMS Site Launch**

The GEMS Site Launch proved to be extremely successful in training teacher leaders for the role of GEMS leaders—the primary focus for the two-day workshop. GEMS units, by definition, cover not only science topics, but also mathematics topics. The training in both of these topic areas is intensive inasmuch as the teacher leaders are being prepared, using a train-the-trainer strategy, to conduct their own workshops for fellow educators. The site launch’s mission was clearly accomplished. At the conclusion of the workshop, teachers reported understanding their roles as GEMS leaders and how the GEMS Site could assist them as trainers.

Moreover, these teachers indicated that they would be sharing with their students what they had learned in space and atmospheric sciences. They estimated that a full 82% of their students were Hispanic. In their roles as teacher leaders/trainers, they estimated reaching approximately 2,500 students and 700 colleagues. Because the teacher leaders are in preparation to train other teachers, one key element of the ELISA ‘model’, designing a lesson plan, was not required.

The GEMS Site launch falls short of the ‘ideal’ model in another key respect by not having a community event associated with it. Unfortunately, the envisioned community event for the San Antonio, TX site failed to materialize. It had never been envisioned for the event to immediately follow the second-session workshop. The original plan had been to take advantage of the Center for Science and Math Education’s connections within the Hispanic community and hold the event subsequent to the final workshop session.

Interviews with the ELISA team revealed that to them, it appeared that the GEMS Site coordinators had their hands full with the extensive amount of preparation and attention required to get a GEMS Site up and running. These coordinators seemed to feel that adding a community event was simply ‘too much.’ The prospect of orchestrating an event seemed to exceed their capacity. The ELISA team felt that for their part they had failed in communicating the critical elements of the formal education/public outreach model that they were envisioning. Realizing the community event would never materialize in San Antonio, the ELISA team turned its attention to seeking and developing other partnerships that would eventually produce opportunities exhibiting characteristics closer to their ‘ideal model’.

### **San Rafael Workshop/Community Event**

The San Rafael experience followed the ‘ideal’ model by incorporating both workshops and an event. While twenty teachers were reached by at least one aspect of the San Rafael experience, only eight teachers participated in both workshops and seven took part in the event—this attrition is partially due to the separation of workshops and event by over a year. These educators anticipated reaching student populations in which 44% were Hispanic.

For the adults and children who attended the community event, it was an enjoyable and novel learning experience. Most had never attended an event that combined science and culture. Latino families with a special interest in the Mayan culture were drawn to the event and found themselves engaging in the activities and learning new things in science.

From the perspective of the teachers, the timing of the workshops and community event was a mixed blessing. The two workshop days were separated by three months which allowed ample time for teachers to design and implement their assigned lesson plans. They rated the process as being fairly easy, although they did find that gathering resources was time consuming.

Teachers were put to the test, however, due to unplanned circumstances which resulted in the community event occurring more than one year after the second workshop. Because of this protracted time period between learning the activities and presenting them to the public, teachers' experiences were adversely impacted in the following ways...

- Retaining teachers in the project for the full nineteen months was difficult
- Teachers who stayed the course by participating in all aspects of the San Rafael experience were challenged by the long period of time between learning the activities and presenting them to the public
- Teachers lost confidence in being able to present to the public

On the other hand, teachers were quick to point out that the community event's relaxed setting provided an atmosphere conducive to learning and engagement for both themselves and event participants. They

*"I was very relaxed and the participants were engaged."*  
—San Rafael teacher

felt that they benefited from listening to the 'public' and learning about their misconceptions in scientific knowledge. Teachers felt that understanding these misconceptions positioned them to better prepare their own students for doing the ELISA activities. Furthermore, their initial lack of confidence in dealing with the public dissipated as they

repeated activities and fielded the public's questions.

The four teachers who stayed committed to the project throughout the entire fourteen-month experience were rewarded with the opportunity to earn college credits. Despite their protracted period of involvement, they found the integrated experience to be worthwhile. The addition of the community event to professional development provided a unique environment in which these teachers could interact with students and adults in a relaxed atmosphere, use their bi-lingual skills and practice and perfect their presentations of the scientific material. And they received college credits for their perseverance!

*"I have not had any other experience like this that I can remember, but more of these types of PD experiences are needed. The only thing close to this was a school-wide, multilingual event that took place at my school."*  
—San Rafael teacher

### **Salinas Workshop/Community Event**

The Salinas experience represents a faithful adherence to the 'ideal' model not only by incorporating both workshops and an event, but also by implementing all three within a one-month period. Moreover, its implementation benefited from the lessons that were learned from the GEMS Site launch and the San Rafael workshop/event experience.

In Salinas, while 25 teachers were reached by at least one aspect of the experience, only 11 teachers participated in both workshops and 12 took part in the event. These educators received training in standards-based science activities that they anticipated sharing with their students of whom 77% were Hispanic.

The Salinas venue also featured a newly forged and productive relationship with Hartnell College, a community college in a Latino community. According to the ELISA project team, this partner brought the following qualities to the project...

- Access to unique resources in the Latino community in which it is located
- Already-established community partnerships
- Knowledgeable staff
- Experience in holding community events at the college's planetarium

The ELISA team found a simpatico partner in Hartnell College. At the same time that the team was seeking a venue for the Salinas event, Hartnell College's planetarium administrator/educator was also seeking new partnering opportunities. Members of the ELISA team and Hartnell's educator had met at the ASP conference several years previously where the ELISA team had conducted a workshop to discuss effective strategies for engaging Latino/Hispanic audiences in astronomy—see Table 1. So the subsequent partnering represented a natural outcome of this initial introduction.

*“We now believe community colleges in predominantly Latino districts are essential in realizing the original goals of ELISA in ways that were not understood at the beginning of the project.”*  
—ELISA project team lead

The ELISA team had several face-to-face meetings with the staff at Hartnell College in order to ensure that the concept of an integrated formal education and public outreach model was well understood. Once on board, the Hartnell staff was forthcoming with its knowledge and experience, particularly with the Latino community. The ELISA team views this partnership as critical to actualizing the model. It is fair to say that ‘partnering with a two-year community college with unique resources and experience within the Latino community’ needs to be added to the list of essential elements for an ‘ideal’ model.

For the 1,000 enthusiastic adults and children drawn from a 64% Hispanic community, attending the community event was a delightful experience. The activity tables were well attended by children and adults alike. Children indicated that they not only liked the activities, but also learned new things. Adults gave high praises to the event for combining culture and science. The overwhelming majority mentioned that the event piqued their interest in science.

*“All event participants were extremely interested—lots of parent and child interaction.”*  
—Salinas teacher

The Salinas teachers' overall experience benefited from the workshops and event being timed in accordance with the model. Benefits included...

*“This is the way it should be—train teachers, give us materials and provide ample time to implement and try them and learn in a low-pressure community event.”*—Salinas teacher

- More teachers were able to complete their commitment to the project—there was less attrition
- One month between the first and second days of the workshop proved adequate for developing and trying out a lesson plan
- Putting workshop knowledge to immediate use at the event increased teacher confidence
- Teachers appreciated being able to perfect their activity presentations in the relaxed atmosphere of the community event
- Teachers affirmed that the combined workshops and event was an 'ideal' model for professional development
- Teachers appreciated having experts available at the community event to offer immediate support
- Teachers learned flexibility at the community event—learning to adapt their lessons to the audience

The Salinas teachers found the process of gathering materials/resources for lesson design to be time consuming. This was a sentiment expressed by the San Rafael teachers as well—despite the fact that they had three times longer in which to do the assignment. Although the Salinas teachers were successful in completing their lesson plans, they reported that they were somewhat pressed for time. Indeed, their average rating for ease in completing the lesson was slightly lower than that of the San Rafael teachers who had three months in which to accomplish the same assignment.

*“Putting things in practice lets us refine our teaching. At an event you practice the same presentation multiple times and get to refine—in a class it may take a year before you practice or present again.”—Salinas teacher*

The teachers' incentive for full participation and commitment to the project was also restructured for the Salinas experience. Rather than the 'all or nothing' college credit approach that was offered to San Rafael teachers only if they completed both workshops and event, Salinas teachers were given a monetary stipend payable in two stages. Completing only the first workshop earned them a nominal amount. Additionally seeing the project through to the end, by participating in both the second workshop and the event, earned them a far larger stipend amount. With many other opportunities for earning PD credits available to teachers, it is likely that the prospect of getting an immediate and tangible cash award was quite appealing.

*“It's a big time commitment but I enjoyed it.”  
—Salinas teacher*

### **Lessons Learned**

Together, the community events at both San Rafael and Salinas were successful in drawing nearly 1,700 adults and children predominantly from Latino/Hispanic communities. Both audiences proved to be engaged in the events that combined NASA-related science and culture.

Both groups of teachers involved with San Rafael and Salinas saw the benefits of a professional development experience that combined teacher workshops with a community event. These benefits emerged despite the fact that the two venues offered different experiences in timing, location and community demographics. Those teachers who were most dedicated to the project saw great value in the integrated PD 'model'. They have emerged from this project and gone forward with confidence that they can teach in a bi-lingual environment and better reach the Latino students that they currently have in their classes. Despite missing out on the complete model, teachers attending the GEMS Site launch were successfully trained as teacher leaders who will also reach a high percentage of Hispanic students.

Amidst this success, lessons were learned along the way that helped the ELISA project team improve the overall experience that the project offers. These lessons suggest that the 'ideal' model is best realized when the ELISA team...

- Partners with a predominantly Latino community college that has resources and experience with the Hispanic community and can thus offer a superior venue for Latino family-oriented community events
- Invests time to establish a solid working relationship with a partnering institution to ensure 'buy-in' on the concept of the integrated PD model and receive the best advice on creating a culturally-sensitive and appealing family event for the Latino community
- Keeps time between the first workshop and final event short enough to minimize teacher attrition
- Considers holding second workshop and community event 6-8 weeks after the first workshop to provide sufficient time for gathering resources for lesson design
- Structures incentives for full participation and commitment to the event that offer instant gratification, possibly a stage-wise monetary stipend to maximize continued involvement
- Maximizes evaluative feedback from children by ensuring that their questionnaires are engaging and visually appealing
- Maximizes evaluative feedback from adults by ensuring that their questionnaires are brief and non-intimidating, devoid of demographic probes