

NASA in the Community:

Diverse solutions to engaging families/ educators

Session Leader:

Leslie Lowes, Jet Propulsion Laboratory

Session Moderators:

Anita Sohus, Jet Propulsion Laboratory

Mike Shanahan, Bishop Museum

October 18, 2014

ASTC 2014 - NASA in the Community

Anita Sohus



**Association of Science-Technology Centers(ASTC)
Annual Conference
October 18-21, 2014**

Today's Topics and Presenters

Community Partnership and Relationships:

- Deb Dunkhase, Iowa Children's Museum
- Steve Fentress, Rochester Museum & Science Center
- Mike Shanahan, Bishop Museum

Reaching Underserved and Digital-Poor Audiences:

- Sandra Kerby, U.S. Space and Rocket Center
- Becky Wolfe, Children's Museum of Indianapolis
- Alie LeBeau, Aquarium of the Pacific
- Kimberly Kandros, NC Museum of Natural Sciences

Create Engagement Using Games and NASA Data

- Anthony Pelaez, Museum of Science and Industry (MOSI) Tampa
- Brian Levine, American Museum of Natural History

Round Table Discussions for each group

We will share . . .

- innovative ideas focusing on families, educators, and local communities from awardees under NASA's Competitive Program for Science Museums, Planetariums, and NASA Visitor Centers.
- the successes, challenges, adaptations, and benefits from diverse institutions who designed and implemented these NASA-themed projects for a variety of underserved audiences.

Short History of NASA's Competitive Program for Science Museums, Planetariums, and NASA Visitor Centers (Informal STEM Education)

- Congressionally authorized (Public Law 109-55) that also specified awards be limited to NASA-related STEM content: space exploration, aeronautics, space science, Earth science or microgravity
- Six cohorts (2008, 2009, 2011, 2012, 2013, 2014)
- NASA will continue to monitor awards made in FY 2014 and in prior fiscal years until the individual awards reach the end of their performance or funds are no longer available.
- NASA's STEM Education and Accountability Projects, or SEAP, is used to reduce program fragmentation through the competitive consolidation of NASA's Office of Education historic education activities (e.g., Informal STEM Education).

Learn More, Stay Tuned

Find today's panelists' (and other awardees) Projects/Products

<https://informal.jpl.nasa.gov/museum/CP4SMP>

Full history of STEM Education and Accountability Projects(SEAP) and NASA Visitor Centers, Museums, and Planetariums Opportunities at:

<http://www.nasa.gov/audience/foreducators/informal/mus-planetariums-index.html>

For NASA STEM content facilitation join the STEM Alliance hosted by JPL (a.k.a. Museum Alliance): <https://informal.jpl.nasa.gov/museum/>

Join the weekly Education EXPRESS service for NASA Education funding competitions and other types of Education announcements at:

http://www.nasa.gov/audience/foreducators/Express_Landing.html

To receive emails related to NASA's entire portfolio of competitive opportunities, including for scientific and technical research, program management and administration, please join NASA Solicitation and Proposal Integrated Review and Evaluation System or NSPIRES: <https://nspires.nasaprs.com>

2014 Key Space Mission Events

Key Mission Events

Launch schedules are subject to change.

Date	Time	Target	Spacecraft	Event
Oct 19, 2014		Comet Siding Spring	Mars Exploration Rovers, Mars Odyssey, Mars Reconnaissance Orbiter (MRO), Mars Science Laboratory (Curiosity), MAVEN	Mars: Comet 2013 A1 Siding Spring - close approach 86,000 miles
Oct 23, 2014		Titan	Cassini	Close flyby (altitude = 1,013 km; 629 mi) of moon Titan
Oct 24, 2014	7:52 p.m. EDT	International Space Station	Antares/Cygnus	Orbital-3 Commercial Resupply Services Flight
Oct 29, 2014		ISS	ISS Progress 57	Launch: Progress 57
Nov 11, 2014*		Comet 67P/Churyumov-Gerasimenko	Rosetta	Deliver Lander (Philae)
Nov 23, 2014		ISS	Expedition 42	Launch: Expedition 42
Dec 2014*		ISS	SpaceX 5 Commercial Resupply Services	Launch: SpaceX 5 Commercial Resupply Services flight
Dec 2014*		Asteroid 1999JU3	Hayabusa 2	Launch
Dec 4, 2014*		Human Exploration and Operations	Orion Multi-Purpose Crew Vehicle	First Launch of New Orion Spacecraft on Exploration Flight Test-1
Dec 10, 2014		Titan	Cassini	Close flyby (altitude = 980 km; 609 mi) of moon Titan

2015 Key Space Mission Events

Key Mission Events

Launch schedules are subject to change.

Date	Time	Target	Spacecraft	Event
2015*		Universe	Astro-H	Launch: Astro-H
2015*		Lisa Pathfinder	LISA Pathfinder	Launch
Jan 12, 2015		Pluto & Dwarf Planets	New Horizons	New Horizons, Start of Distant Pluto Operation
Jan 29, 2015*		Earth	Soil Moisture Active & Passive	Launch: SMAP
Feb 2015*		ISS	SpaceX 6 Commercial Resupply Services	Launch: SpaceX 6 Commercial Resupply Services flight
Mar 2015*		Space Weather	Magnetospheric Multiscale Mission	Launch
Mar 20, 2015		Sun		Total Solar Eclipse
Mar 23, 2015*		Asteroid Ceres	Dawn	Arrival at Ceres: Dawn
Jul 14, 2015	11:49 UTC	Pluto	New Horizons	Encounter-Closest Approach: New Horizons
Dec 2015*		Asteroid Ceres	Dawn	End of primary mission: Dawn

General format for the session

- Nine presenters clustered into three different areas in which awardees work with communities:
 - Community partnerships and relationships
 - Reaching underserved and digital-poor audiences
 - Creating engagement using games and NASA data

General format for the session

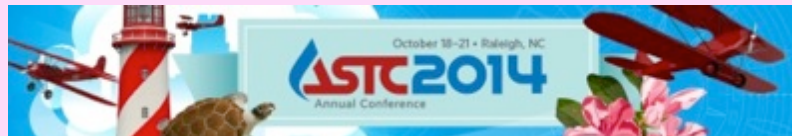
- We'll break into discussion groups (one for each topic area) after plenary session – think about the area you're most interested in.
- We'll summarize these group discussion on poster paper for final review.
- Please write down one thing you'd like discussed in breakouts.
- Please hold questions till the breakouts.

Community Partnership and Relationships

Deb Dunkhase, Iowa Children's Museum
Steve Fentress, Montshire Museum
Mike Shanahan, Bishop Museum

October 18, 2014

ASTC 2014 - NASA in the Community



**Association of Science-Technology Centers (ASTC)
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**Take Flight!
the science of aviation**

NASA Content: Aeronautics

**Aviation Themed
Exhibit targeting
youth ages 6-12**

**Project Duration: 2009-2014
Sustained with Annual Operating Budget**



October 18-21 • Raleigh, NC
ASTC 2014
Annual Conference

NASA Grant NNX09AL32G - Take Flight! Exhibit
The Iowa Children's Museum
Deb Dunkhase, Executive Director

Community-Based Exhibit Design Team: Our biggest asset and our biggest challenge

Unique Community Engagement!

Iowa Governor's STEM Advisory Council

Community Based Aviation Events

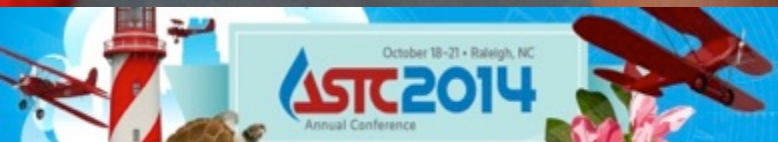
NASA Grant NNX09AL32G - Take Flight! Exhibit
The Iowa Children's Museum
Deb Dunkhase, Executive Director





**Take Flight! widened our audience
attracting youth ages 8-12 ... resulting in a
45% increase in annual attendance over the
5 year project.**

**This NASA project enabled The Iowa Children's Museum
to take on a STEM leadership role in Iowa.**



**NASA Grant NNX09AL32G - Take Flight! Exhibit
The Iowa Children's Museum
Deb Dunkhase, Executive Director**

**Most Meaningful Project Impact : Fun & Engaging Context
for Integrated STEM Informal Education**



The Iowa Children's Museum – Take Flight! Exhibit
Deb Dunkhase, Executive Director
ddunkhase@theicm.org



**Community Engagement Small Group Discussion:
The Benefits and Challenges of a Community-Based Exhibit Project
= Large Scale Win-Win!**



**The Iowa Children's Museum – Take Flight! Exhibit
Deb Dunkhase, Executive Director
ddunkhase@theicm.org**

NASA Science and Technology on the Family Calendar

**Rochester Museum &
Science Center**

**Rochester Institute of
Technology**

Rochester City School District

Rush-Henrietta Central Schools

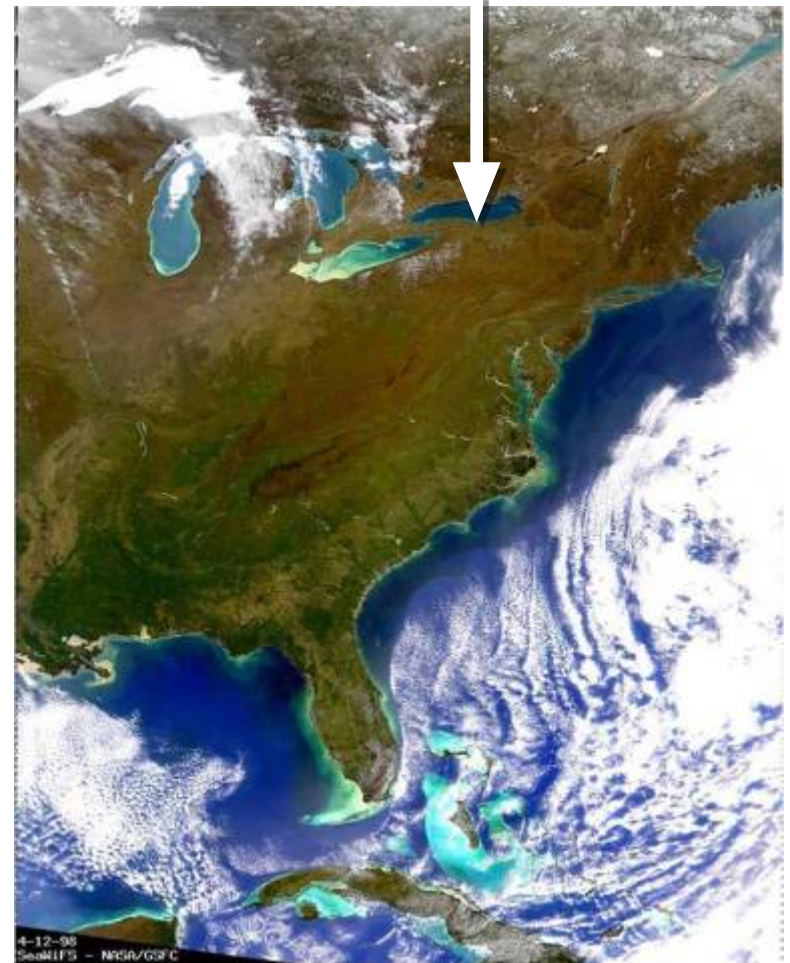
**West Irondequoit Central
Schools**

**Genesee Community Charter
School**

2009-2013

Steve Fentress, project manager
steve_fentress@rmssc.org

Rochester, NY



Rochester
Museum &
Science Center
Steve Fentress

Experience



Proposed	Actual
Use school districts to recruit six “cohorts” of families with middle school kids	Districts difficult. Better thru our mailing list and Facebook. Some kids do not have families able to participate, could not be reached with proposed program
Families study NASA, pick a theme, set their own schedule, set a performance date, work together 18 months	Real progress came when we set schedule and performance date <= 6mos. We set the theme for the final cohort
Middle school kids see STEM careers through college students	Some success. Our project was one of the many part-time jobs offered to students at RIT, not all STEM.
NASA content as driving force and key attractor	NASA was one element. Others: family together time, creative/craft opportunity, previous interest in space

Activities and outputs

- 105 two-hour family meetings, most on weekday evenings in the final 12 months
- 6 different public events, est. 5910 visitors
- 269 unique participants attended at least one meeting
- 106 participants around target age range (9-15)
- 87 unique individuals participated in their final event
- 61 signed up but never attended any meeting
- Special Planetarium days for one urban school unable to produce family cohorts – 327 attended



What worked well

- Setting structure, time limits, goals before recruiting
- Finally using the Museum's most experienced program managers
- Good guest speakers
- Heroic core of parents in one city school



Challenges and Lessons

Challenges

- Reluctance of school districts to be conduits for messages from outsiders
 - Did our own recruiting to fill in
- Mid-year resignation of City school supt.
 - Waited a year to resume with this district
- Slow collapse of evaluation subcontractor
 - New local evaluator, U of Rochester
- Expectations vs. reality about undergraduate students
 - Revised expectations about using students

Lessons

“Leave it to Beaver” type family is only one of many kinds

Food is important

People come with their own favorite information sources (space.com, io9, Fox news, YouTube search results)

You should plan for younger siblings

Devastating side-by-side view of kids with and without available supportive adults

More info: steve_fentress@rmsc.org





BERNICE PAUAHI BISHOP MUSEUM

HONOLULU, HAWAII

*CELESTIAL ISLANDS: Using
NASA Earth Sciences to
Reach Hawaii's Educators
and Students*

*NASA Grant Number:
NNX12AL34G*

Co-I: Mike Shanahan,
Director of Visitor
Experience and
Planetarium, Bishop
Museum.

mikes@bishopmuseum.org



Products:

- 1. Creation of NASA ESS program that integrates digital planetarium and NOAA's Science on a Sphere;
- 2. Adaptation of that program for portable digital dome; Six units of NASA ESS resource-based classroom curricula;
- 24 teacher workshops to share that curricula;
- Development of a permanent exhibit on NASA earth science systems at Bishop Museum.



USE OF NASA RESOURCES

- Bishop Museum has the support and assistance of the Goddard Space Flight Center as well as Hawai'i-based NASA and astronomy organizations for this project.
- Due to the need for distance learning, the NASA Digital Learning Network will be a central access to NASA resources for the project.
- Other partners:
 - Classroom elementary teachers;
 - Hawai'i Department of Education;
 - Doris Ash and Wendy Meluch, evaluators

Educator/community involvement

- **NASA STEM Elementary Teacher Cohort:**
 - Develop NASA ESS-based curricula grades 3-5;
 - Provide guidance on creation of NASA-themed programs and exhibits
 - Provide community events on neighbor islands that are among the Celestial Islands' products.
 - Curriculum proposal approved by NASA spring 2014.



- **Worked well:**
 - Teacher team giving guidance
 - Direct access to NASA
 - NASA “seal of approval”
 - Combining Science on a Sphere and digital planetarium
- **The lessons learned:**
 - such collaborations due take time and do take careful coordination and planning; each institution has its own internal culture, priorities, communication style and structure. Expect the process to take time.



Reaching Underserved and Digital-Poor Audiences

Sandra Kerby, U.S. Space and Rocket Center
Becky Wolfe, Children's Museum of Indianapolis
Alie LeBeau, Aquarium of the Pacific
Kimberly Kandros, NC Museum of Natural Sciences

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Engage & Equip to Empower:

Building an S-STEM Generation (E³)

PI: Dr. Deborah Barnhart, CEO and
Executive Director

CoPI: Sandra Kerby, Director of
Camp Operations

NASA CP4SMPVC Award:
NNX14AD15G

February 2014 – January 2018



Engage & Equip to Empower:

Building an S-STEM Generation (E³)

USSRC's Science in Orbit exhibition promotes NASA's ISS activities to the public and STEMcon provides professional development for formal/informal educators of underserved/underrepresented students.



Engage & Equip to Empower:

Building an S-STEM Generation (E³)

Communities

NASA's MSFC five state region
Informal/formal educators



Partnerships

Johnson Space Center
Science Museum of Minnesota

Engage & Equip to Empower:

Building an S-STEM Generation (E³)

Building Partnerships

Honeywell

Northrop Grumman

Boeing

University of Alabama at Huntsville (UAH)



Title 1 Schools

Underserved

Underrepresented

Engage & Equip to Empower:

Building an S-STEM Generation (E³)

Meaningful Moments

Hunger

Relationships



Impact

Continuing sustainability and partnership



Curious Scientific Investigators: Flight Adventures

Urban School District
Collaboration

Becky Wolfe,
Science Programs Manager

Project Messages

- Science, technology and math help us understand how flight works.
- Early pioneers of flight used models to advance aviation.
- NASA research has used models to improve flight technology, safety exploration.
- You can be an aviator by making testing, repairing and flying model aircraft.



Flight > adventures



Discover the science of flight through the eyes of a young girl and her grandfather as they explore how birds, kites, planes, and models fly.

Show information

Flight Adventures was produced by The Children's Museum in partnership with the Academy of Model Aeronautics and AMA's Prostateline with funding through AMA's Competitive Program for Science Museums and Institutions (CPMSMI).



Based upon work supported by NASA under grant award Number NNS11046 L-01. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Aeronautics and Space Administration.



CURIOS SCIENTIFIC INVESTIGATORS

Flight > adventures

A Girl of Study for Grades K-2

Underserved School Collaboration



- Targeted field trip and PD
- 4th grade teachers and students
- Urban district - >85% free/reduced lunch
- No cost to schools
- Program coincided with science pacing guide
- Provided classroom supplies to teachers

Lessons Learned

- Collaboration with curriculum staff supports field trip as learning experiences
- Listening and responding to district led to district endorsement of program and increased participation.





Our Instrumented Earth - Award #NNX12AL16G

Connecting Underserved Families to Data-Related Conversations through NASA Night at the Aquarium of the Pacific



Alie LeBeau
Education Programs Manager
alebeau@lbaop.org 562-951-1630

Our Instrumented Earth – July 2012-June 2015

Science on a Sphere Film
Two Day Teacher Workshop
NASA Night Events

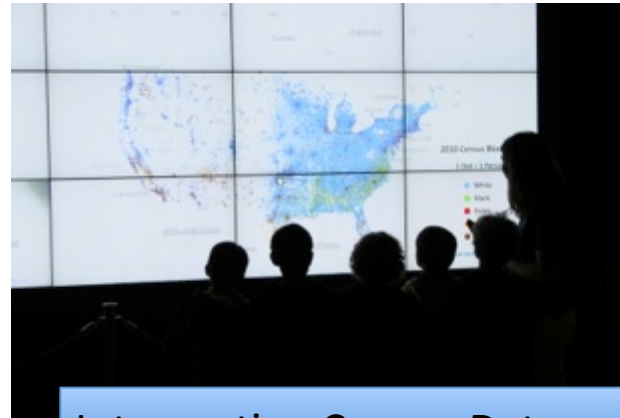


Understanding global systems and local impacts through the El Nino story.
“Learn how satellites and observing systems are telling us about our changing planet.”

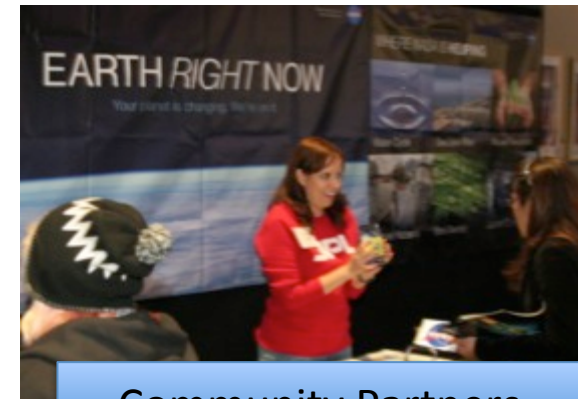
Our Instrumented Earth

NASA Night: February 4, 2014 – Serving Title 1 schools

“I loved all the conversations about data and how this data is helping us understand changes on our Earth. The data can be used in the classroom to build lessons and help students analyze and interpret information. “



Interpreting Census Data



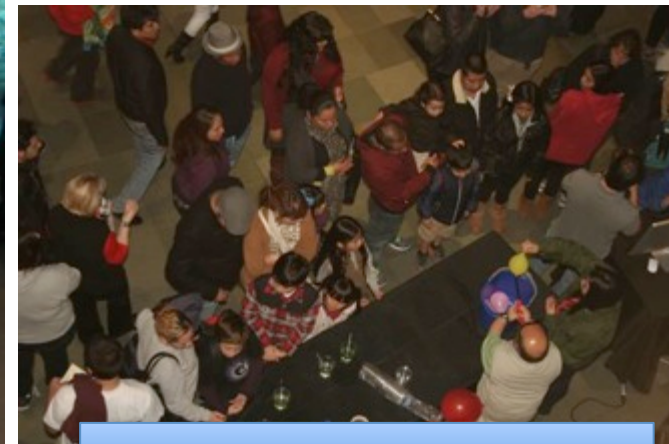
Community Partners



Exploring Technology



Collecting Data on Fish



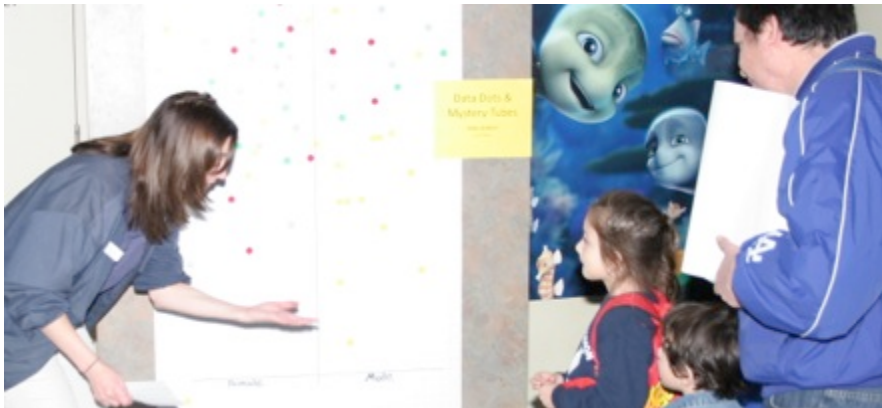
Demonstrations

Our Instrumented Earth

NASA Night: Successes and Challenges

What worked:

- Simple activities and simple messages
- Creating relationships with teachers
- Opportunity for families to learn together



Challenges:

- Crowding and traffic flow issues
- RSVPs and logistics
- Teacher assigned “stamping”



NASA in the Community: Diverse Solutions to Engaging Families/Educators



NASA in the Community: Diverse Solutions to Engaging Families/Educators



NASA in the Community: Diverse Solutions to Engaging Families/Educators



Permanent exhibits aligned with all NASA Mission Directorates.



NASA in the Community: Diverse Solutions to Engaging Families/Educators



NASA in the Community: Diverse Solutions to Engaging Families/Educators



- What worked well and Lessons learned:
Establish good working relationship with your assigned Program Officer!!!

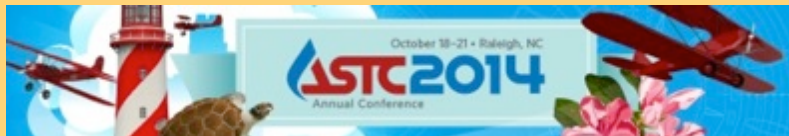
For more information, contact Kimberly Kandros,
Director of Grants, at
kimberly.kandros@naturalsciences.org

Create Engagement Using Games and NASA Data

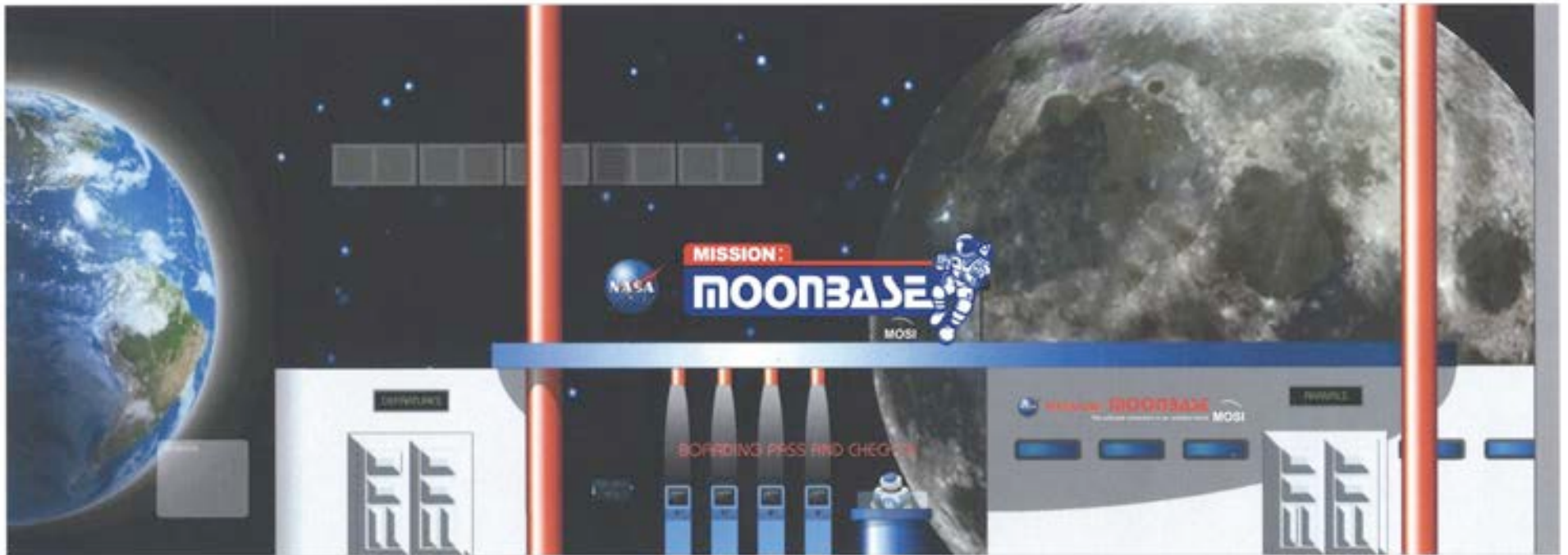
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Anthony Pelaez
Director of Innovation
Museum of Science & Industry
anthonyp@mosi.org



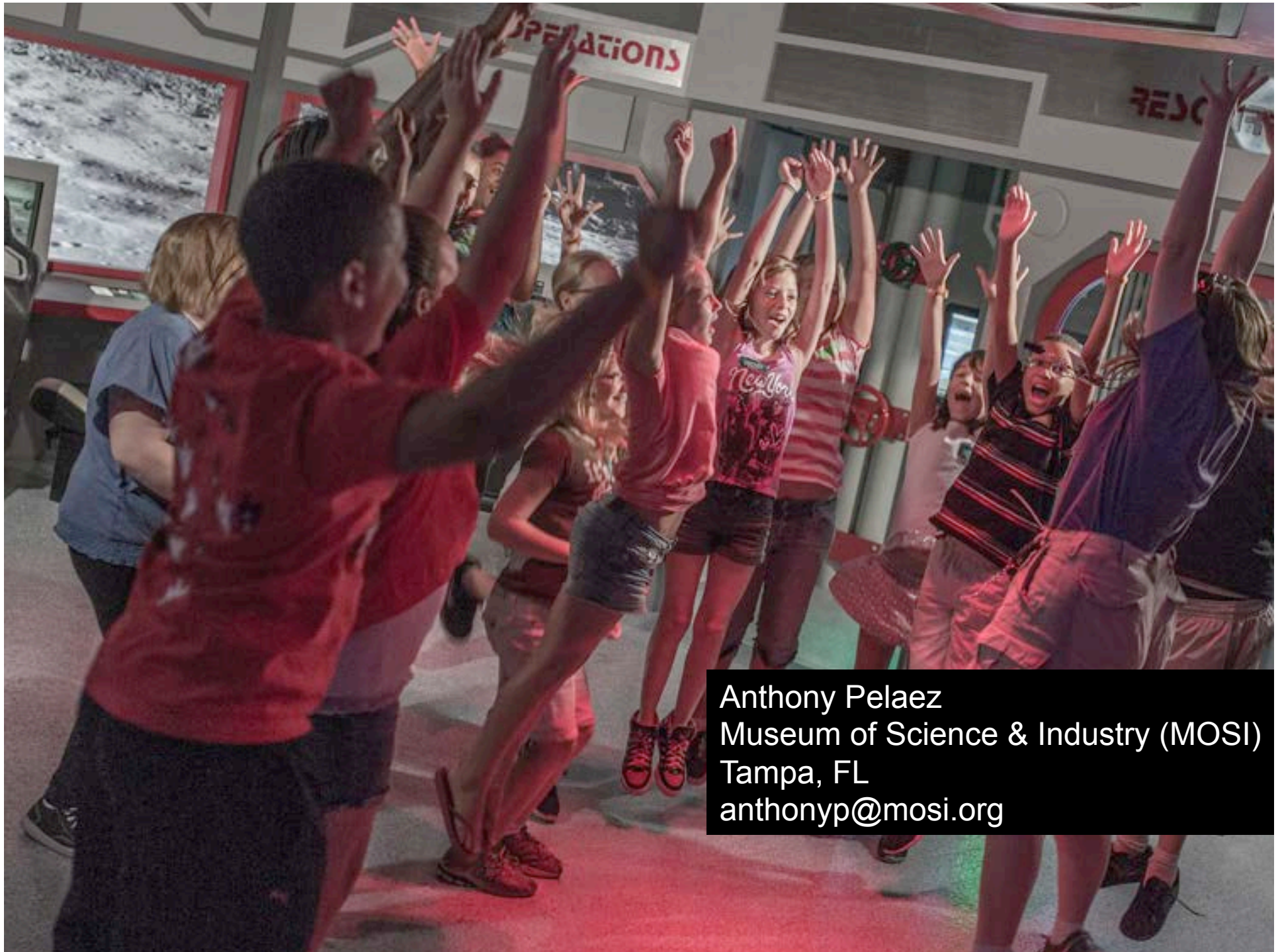
Mission LEAP a.k.a
Mission: Moonbase
Grant #: NNX10AD91G
Grant years: 2009 – 2012



Mission: Moonbase Immersive educational simulation

- Video gaming tech based on NASA research
- Prototyped with students and adults throughout development
- Capable of running in exhibit mode or mission mode





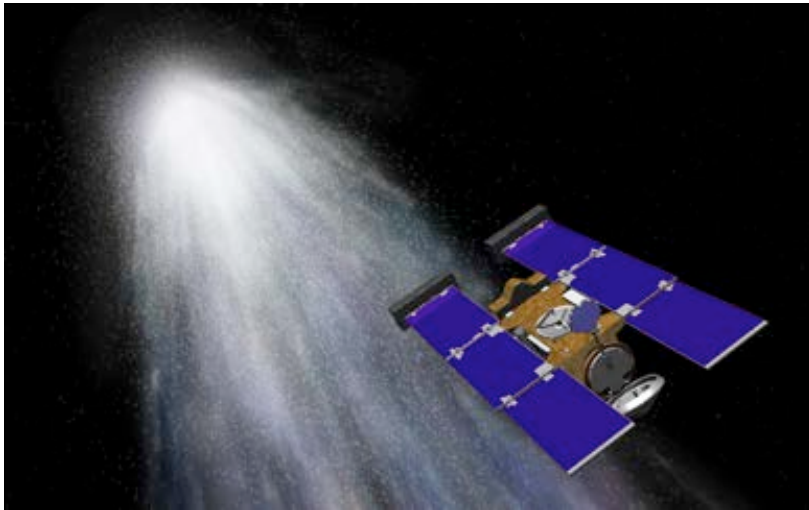
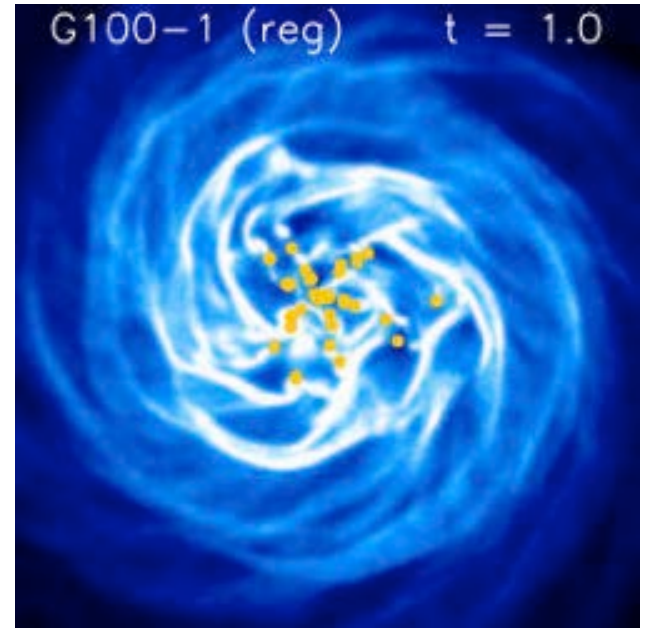
Anthony Pelaez
Museum of Science & Industry (MOSI)
Tampa, FL
anthonyp@mosi.org



STATE OF NEW YORK MEDICAL TO
CONSULTANTS IN THE FIELD OF
AND OF THE STATE LIFE AND ENVI

KNOWLEDGE VISION

<http://www.amnh.org/SRMP>







Today's Topics and Presenters

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- Steve Fentress, Rochester Museum & Science Center
- Mike Shanahan, Bishop Museum

Reaching Underserved and Digital-Poor Audiences:

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Create Engagement Using Games and NASA Data

- Anthony Pelaez, Museum of Science and Industry (MOSI) Tampa
- Brian Levine, American Museum of Natural History

The Iowa Children's Museum – Take Flight! Exhibit



General Info

- The Iowa Children's Museum is a 28,000 active learning environment situated in Coralville, Iowa (home to The University of Iowa) serving 170,000 children and adults annually.
- NASA Grant Award #NNX09AL32G in 2009
- NASA Content Area: **Aeronautics**
- The funding was used to create an aviation exhibit and associated programming.
- Exhibit elements include: Flight Simulators, Stomp Rockets, Hot Air Balloon, Cessna 150 (real), Pig Parachute, NASA Wright Brothers Flight Simulator, Flight Cage, Wind Tunnel, Air Blaster, Air Traffic Control Tower, Amazing Airways, Flight School.
- Aviation programs include: School Field Trips, Scout Programs, STEM Family Nights, Educator Professional Development Programs, Day Camps



Community Involvement

- The Iowa Children's Museum designs and fabricates all of our exhibits in-house using local expertise (volunteer) on our development teams.

- The Take Flight exhibit design committee was made up of **28** community members that included parents, educators, engineers, pilots, businesses, retirees, University of Iowa science educators and physics professors, aviation mechanics, airport personnel, electricians, construction companies, boy scouts, members of the Ninety-Nines (female pilots), IT expertise, and the Iowa City Aerohawks (remote control airplane club).
- The design process took 18 months of numerous meetings to build consensus on our vision to reach the project goals.

Grant Impact

- The project enabled the Museum to create an exceptional STEM exhibit that features the forces of flight using context that has broad appeal to a diverse community of out-of-school learners.
- With the new Take Flight! exhibit, the Museum was invited to sit on the Governor's STEM Advisory Council (chaired by Lt. Governor Reynolds) to provide leadership to all Iowa non-profits that deliver out-of-school STEM education.
- This exhibit widens the appeal of The Iowa Children's Museum to a new audience of older children (ages 8-12) resulting in a 45% increase in annual attendance since opening the exhibit in 2009.

Meaningful Demonstration of Impact

- Evaluation data clearly show significant increases in student interest in aeronautics, science, technology, engineering, and math; as well as an interest in future STEM careers.
- Nothing is as powerful to truly understanding the impact of this exhibit as observing the high energy and excitement of kids as they explore aeronautics!

What Worked Well?

- Assembling a community-based exhibit design team that consisted of local expertise built strong ownership of this project throughout diverse aspects of the community.
- Our NASA grant dollars were leveraged to raise \$190,000 in additional funding.
- The Museum used the NASA grant project to highlight our *Playing is Learning* philosophy and its impact on increasing student interest in STEM.
- Building/maintaining this exhibit in-house works great to keep it fresh and operational.

Challenges?

- Working with volunteers to complete the project was problematic in terms of the completion date due to sporadic time commitments from the volunteers. In the end, we had to hire fabrication assistants to finish the project which put us over budget.

Project Sustainability

- Our Take Flight project activities have been absorbed into the Museum's annual operating budget. Once the exhibit was fully opened, we did raise the cost of admission \$1/person (*from \$7 to \$8*).

Future Steps

- Provide state-wide professional development for educators who deliver STEM active learning to pre-K to 6th grade youth using the Take Flight! exhibit as context to help educators understand the science of "Forces".
- Add a new component to the exhibit that features flight platforms as a climbing structure in the top level of the exhibit (\$250,000 project).

Contact Information:

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The Iowa Children's Museum
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ddunkhase@theicm.org
www.theicm.org





What NASA content did you address and what museum components did it consist of?

- Exoplanets, astrobiology, astronaut training, electronics, Earth observation, etc. NASA content was the sprinkles on the icing on the cake at the end. The core of the project was the challenge of coordinating activities with a four-year college, three school districts, a charter school, and an out-of-town evaluator.

How were family, educators, and community involved?

The plan we proposed in 2009:

- Use school districts to recruit six “cohorts” of families with middle school kids
- Families study NASA, pick a theme, set their own schedule, set a performance date, work together 18 months with us and Rochester Institute of Technology, and present a public activity program based on their work
- Middle school kids see STEM careers through college students
- NASA as driving force and key attractor

Actual experience completed 2013:

- Recruiting kids through school districts was difficult, even when administrators expressed enthusiasm at proposal time.

We filled in most cohorts via our mailing list and Facebook.

- Some kids do not have families able to participate, could not be reached with proposed program
- Real progress came when we set meeting schedule, time commitment (within one school year or semester) and performance date. For our final cohort, we set the theme
- Our project was one of the many part-time jobs offered to students at Rochester Institute of Technology, not all STEM majors or enthusiastic about STEM.
- NASA was one element in attracting participants. Others: family together time, creative/craft activity opportunity, previous interest in space-related topics

How did the grant make a difference to your institution and to your community?

Activities and outputs included:

- 105 two-hour family meetings, most on weekday evenings in the final 12 months
- 6 different public events, est. 5910 visitors
- 269 unique participants attended at least one meeting
- 106 participants around target age range (9-15)
- 87 unique individuals participated in their final event
- 61 signed up but never attended any meeting
- Special Planetarium days for one urban school unable to produce family cohorts – 327 attended

Describe your project’s most meaningful moment or circumstance demonstrating an impact on families, educators, or community

The gap between kids with and without access to supportive adults is devastating. Compare:

- 1) One particularly stressed city school found itself unable to supply a critical mass of participant families, even when we provided busing at no charge. After a year of trying, as an alternative we agreed on special Planetarium days for the entire school. The school postponed the visits twice before settling on a date. Only about half of the grade 6-8 students were allowed to leave school to attend.
- 2) To fulfill our promise to create six cohorts, we recruited a cohort via our Museum's Facebook page and mailing list. An active group of educated parents, grandparents and kids came together 3 weeks later and produced an ambitious public event in 10 weeks.

What worked well?

- Finally setting structure, a goal, and a schedule for a multi-week family program before announcing it, rather than waiting for participants to decide it, as originally envisioned in our proposal.
- Finally turning to our museum's most experienced program manager, replacing two new people hired in succession for the grant who left successively for longer-term jobs.
- Discovering one school in the troubled Rochester City School district with a heroic principal and a core of involved parents

What challenges did you have? Did you overcome them? What did you do to adapt?

- Too-vague propositions to participant families about goals and schedule, assuming they would decide these on their own. To overcome, we changed procedure to compress schedules and clearly define goals.

- Abrupt resignation of Rochester City School superintendent mid-year, disrupting our original recruiting plan for that district. We restarted City recruiting the following school year, selecting schools ourselves.
- From suburban districts, enthusiastic initial reception of idea from administrators, then a slow and complex process to get recruiting messages from us, as outsiders, to students and parents. We adapted by starting new recruiting a year later, supplemented with people recruited through our own mailing list.
- Our original, nationally known evaluation company slowly going out of business during our project. We finished the project with evaluation by University of Rochester education school.

How will you sustain the activities funded by your project? What is your vision for future steps with the accomplishments of this project?

- In future activities with families or informal groups of children, provide and respect basic tools for all activities: room reservations, craft materials, flip charts, easels, tape, projectors, extension cords, room dividers, wi-fi, point-and-shoot camera, signup sheets, appropriate food

Full report available to professionals upon request. Contact:

Steve Fentress, CP4 project manager
Director, Strasenburgh Planetarium
Rochester Museum & Science Center
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Rochester, NY 14607

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www.rmsc.org

Bishop Museum

Celestial Islands: Using NASA Earth Sciences to Reach Hawaii's Educators and Students

August 2012 – July 2016

NASA Grant Number: NNX12AL34G

PI: Blair Collis, President and CEO, Bishop Museum

Co-I: Mike Shanahan, Director of Visitor Experience and Planetarium, Bishop Museum

What NASA content did you address and what museum components did it consist of?

- Celestial Islands is focused on NASA Earth Systems Science (ESS), and Bishop Museum is working primarily with NASA Goddard Space Flight Center in terms of NASA content.
- Products include: 1) a program on NASA ESS that combines Science on a Sphere (SOS) with a digital planetarium experience; 2) a traveling version of that program for a portable digital dome; 3) curricula on NASA ESS for grades 3-5 developed by our teacher team; 4) twenty-four HI DOE accredited workshops to disseminate that material to teachers and other educators, to be held on O'ahu and all other major Hawaiian Islands (Kaua'i, Maui, Lana'i, Molokai, Island of Hawai'i); 5) a new permanent exhibit at Bishop Museum on NASA ESS.

How were family, educators, and community involved?

An important focus for Bishop Museum is to find ways to get direct input from current classroom teachers as we create educational products for their students. To this end we've hired a team of seven current classroom educators as our Celestial Islands teacher cohort, both to create curricula and to give us guidance on creating NASA-based museum educational products that best meet the needs of classroom teachers and their students. We have one teacher from each of the major Hawaiian Islands (Kauai, Maui, Island of Hawaii, Molokai) along with Oahu, to provide input into particular needs of each, very different, island.



How did the grant make a difference to your institution and to your community?

We are also training the teachers on how to use a digital portable planetarium. The teachers will present the planetarium show developed by this grant to their local communities.

Describe your project's most meaningful moment or circumstance demonstrating an impact on families, educators, or community.

We're still in development phase; being able to take NASA's feedback on our proposed set of curricula, redoing the proposal to align with that feedback, revising the proposal and getting the green light to proceed from NASA was the highlight to date.

What has worked well?

- Giving the Museum a direct link to frontline teachers via this teacher team gets us beyond the 'battle of the hunches' in making programs that are better designed for our students and formal educators.
- Direct access to NASA earth science content; NASA 'seal of approval' means a lot, that logo to this day is a very respected brand.
- Combination of Science on a Sphere and digital planetarium provides an opportunity to show vivid, detailed full-earth satellite images on sphere, then use planetarium to explore appearance of these satellites in the night sky.

What challenges did you have? Did you overcome them? What did you do to adapt?

- One needs to recognize that collaborations are hard, and coordinating the interests and priorities of the museum, of NASA, and of frontline teachers scattered across 5 islands can be a challenge.
- Also some delays in getting feedback from NASA on content due to government shutdown and time demands was a challenge. Our NASA Grant Officers were key in moving this forward.

Solutions:

- Regular meetings with teacher team, including Google hangout meetings, with teachers a big help (remote communication very important since many of the teachers are by design on neighbor islands).
- We dedicated one person on the Bishop Museum team to be the designated 'go to' person for the teacher team.
- We made it a priority that all teachers had a good level of comfort with technology.

How will you sustain the activities funded by your project? What is your vision for future steps with the accomplishments of this project?

- Bishop Museum has made a conscious change to going after grant products that support its own priorities.
- We have a hunger for new products for our dome and we especially want to test SOS and digital live planetarium programs as a unified educational experience, something we have experimented with since 2011.
- We need a new exhibit and NASA focus is ideal for planetarium lobby. The model of the teacher team actually derives from an earlier grant from US DOE on voyaging and it is one we'll continue to use in the future.
- The online learning center (see the link to the learning center below), the electronic means of distributing our content for this grant, will be the 'go to' place for the museum's educational content.

Bishop Museum general website: www.bishopmuseum.org

Bishop Museum Online Learning Center website: <http://www.bishopmuseumeducation.org/>

Note: this will be a primary portal for distributing curricula and NASA content as we develop it; currently this site is the location for the educational products created under *All Together Now*, Bishop Museum's 2011-2014 Dept of Education grant on teaching science through traditional navigation)

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What NASA content did you address and what museum components did it consist of?

- The *ISS: Science in Orbit* exhibit will promote STEM literacy to the general public as guests of the U.S. Space & Rocket Center (USSRC) visit the exhibit and participate in the International Space Station (ISS) experience through interactives, gaining knowledge of the work done on the ISS.
- *ISS: Science in Orbit* for museum guests will be implemented in 2016. It will showcase current experiments in progress on the space station and will have interchangeable racks to keep current as ISS changes experiments.
- *Space-STEMcon* is an Educator Professional Development activity. *S-STEMcon* reaches out to educators in NASA'S Marshall Space Flight Center (MSFC) five state service area.
- The professional development at *S-STEMcon* focuses on reaching the underserved/ underrepresented community.

How were family, educators, and community involved?

- The first *S-STEMcon* (in 2014) reached out to formal and informal educators, which provided a direct conduit to their students and communities.
- USSRC utilized direct partnerships with the NASA MSFC Education Resource Center (ERC). Their team presented NASA curriculum directly to the participants.
- The University of Alabama in Huntsville partnered with us in the effort to provide the opportunity for educators to receive graduate course credit.
- *ISS: Science in Orbit* will utilize interactive technology to stimulate interest in STEM fields and nurture aspirations of our museum guests interested in pursuing a STEM career.
- The project will create a new dual-use learning environment about living and working in space, stimulating visitor and student group interest in the engineering behind the ISS, and current science taking place aboard it.
- Community groups' involvement increases through sponsorship of camps and daily group

events touring the *ISS: Science in Orbit* exhibit.



How did the grant make a difference to your institution and to your community?

- Over the four year grant period, more than 1.2 million visitors will have participated in this uniquely NASA experience through *ISS: Science in Orbit*.
- Over the four year period, 280 educators will each earn 32 hours of continuing education (PD) credit through participation in the program using NASA-based curricular resources which connect to national standards
- At least 40% of total teacher participants will come from schools serving underserved/underrepresented students.
- The grant will enable the establishment of an annual S-STEM conference for formal, informal, and pre-service educators that will exist beyond the grant period.

Describe your project's most meaningful moment or circumstance demonstrating an impact on families, educators, or community

- During the first *S-STEMCon*., there was a stronger connection made between the participants and the NASA Education Resource Center team than previous workshops. The participants, being from the five state area serviced by MSFC, were able to meet face to face with their representatives. Through their appreciation of the opportunity and of the connection with NASA, we

(USSRC) have been able to sustain a relationship with these educators. We are working towards creating a “Blue Ribbon” educator advisory team.

- We anticipate more visitor appreciation of the contribution of the ISS as a test bed for future exploration and for benefits on earth and their everyday lives.
- *ISS: Science in Orbit* is a continuous science lab and we anticipate increasing the museum guests’ awareness of its significance and impact.

What worked well?

- Overall, the participants in the first *S-STEMcon* said that the information and workshops presented were useful and that they would take them back to the classroom. Implementing the program in the immersive environment adds to the overall impact and excitement created and then carried back into the classroom/community.



What challenges did you have? Did you overcome them? What did you do to adapt?

- The timeframe and turn-around for the first year was a challenge. It was difficult to publicize the offering in a way to receive the desired number of participants. This we see as a first year issue and do not foresee this being a challenge in the remaining three years of the grant.

How will you sustain the activities funded by your project? What is your vision for future steps with the accomplishments of this project?

- When *ISS: Science in Orbit* is implemented, we will have incorporated it into our exhibit floor, and it will impact camp, educators, and museum guests alike for as long as it is relevant to the mission.
- Through *S-STEMcon*, we have already seen a closer relationship with our NASA ERC and have increased integration into our educator camps as a result.
- Sustaining the program will take continuing the strong partnerships formed in order to operate the current program. Approaching other companies/organizations with the results that we have over the four year period to provide sponsorship/scholarships to the program is a solution to sustaining the program. The USSRC provides scholarships to students each year, there is potential to provide the opportunity to provide to educators and carry on this program.

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**NASA CP4SMPVC Award: NNX14AD15G
 February 2014 – January 2018**

Curious Scientific Investigators: Flight Adventures
Jennifer Pace-Robinson, PI (2010-2013)
Children's Museum of Indianapolis



What NASA content did you address and what museum components did it consist of?

Under NASA grant #NNX10AK16G, the Children's Museum of Indianapolis worked with NASA's Aeronautics Mission Directorate for CSI: Flight Adventures. Specifically, we worked with Dryden Flight Research Center (now Neil Armstrong Flight Research Center), and showcased the ways NASA uses models to develop and test new flight technologies. Our project consisted of a small exhibit area, a full-dome multi-media show, a unit of study and a menu of programs for families, and school groups.

How were family, educators, and community involved?

Our project targeted elementary schools from the central school district in Indianapolis. As an urban district, access to the museum can be limited, so the grant allowed us to develop a partnership with Indianapolis Public Schools to target a specific grade that

studies aeronautics. Our school programs team worked closely with the elementary science facilitator to identify a grade (4th grade) that would pair well with the aeronautics content of our programs. Through the grant, we were able to provide targeted professional development, a field trip without cost to the students of schools and buses for each school that participated. We also planned the field trips during the 4th quarter of school, when flight was being taught, per the district curriculum pacing guide.

How did the grant make a difference to your institution and to your community?

- There were a myriad of benefits to the museum. One long-term benefit was building our relationship with NASA. Learning that NASA resources extend far beyond space exploration was a huge eye opener and opened up resources for our programs.
- Our targeted school project was a huge benefit. It allowed us to test a model that proved to be effective. By working with curriculum coordinators and talking through the current curriculum being used in the school, we prevented assumptions of what the teachers needed to know. It also allowed our PD facilitators the opportunity to merge the unit of study and field trip with the curriculum kit adopted by the district.

Curious Scientific Investigators: Flight Adventures
Jennifer Pace-Robinson, PI (2010-2013)
Children's Museum of Indianapolis

Describe your project's most meaningful moment or circumstance demonstrating an impact on families, educators, or community.

Over the course of our grant, we were able to bring in over 1,000 students to participate in our flight programs, at no cost to the students. All of the schools were in areas of high poverty. It was also a focused field trip that mirrored what was being taught in the classroom. Through our partnership, the museum demonstrated strong ties to the curriculum, opening doors for all schools in the district to attend.

What worked well?

With our school partnership, frequent communication was vital. This helped us avoid assumptions about what the teachers would need for resources and the type of experience the district felt was valuable for students. The district provided the museum with the flight and rocketry kit used in the classrooms, and we paired the museum's unit of study with the kit lessons.

What challenges did you have? Did you overcome them? What did you do to adapt?

Timing was a challenge. We were constrained by the school schedule, museum programs and grants. To overcome this, we had to decide which constraints were the most pressing to accommodate. In the end, it was getting trips in by the grant deadline and making sure that as many schools could attend as possible.

How will you sustain the activities funded by your project? What is your vision for future steps with the accomplishments of this project?

- We rolled the programs developed for schools and teachers into our regular operating budget. Knowing that grant funding would eventually end, our team worked hard to develop programs that could be sustained through our standard operating budget. This meant using our grant funds for development or purchase of larger, non-consumable items that could be used for a number of years.
- This project propelled us to seek out (and win) a second NASA award. We kept some of the key components from our first award that proved successful. For school groups, we sought out school districts that had an interest in space exploration, but were still high need. We approached the project with the partnership model in mind.

Becky Wolfe
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Museum Target Audience: Families with children birth through middle school

Annual Visitation: 1.2 million visitors

NASA Funded Projects:

CSI: Flight Adventures

CSI: Beyond Spaceship Earth

Project websites:

<http://www.childrensmuseum.org/exhibits/flight-adventures>

<https://www.childrensmuseum.org/legacy-games/flight-adventures>



What NASA content did you address and what museum components did it consist of?

- The Aquarium of the Pacific, in Long Beach, CA, serves 1.5 million people a year. Recent market surveys indicate that its audience is one of the most diverse of any aquarium in the country.
- “Our Instrumented Earth” presents earth systems science and how we monitor our earth, emphasizing the importance of gathering data about our planet in order to see changes and trends.
- The major portion of CP4SMP funding went to the development of a film for Science on a Sphere, and a smaller portion went towards a 2-day teacher workshop, targeting local Title 1 schools, to provide teachers with the resources and confidence to introduce their students to collecting, analyzing, using, and interpreting data.
- NASA Night is a portion of the teacher workshop and an opportunity to connect the Aquarium to members of the community who may not normally visit and provide them with family science night themed “data are everywhere.”
- **Grant dates: 7/2012-3/2015.** The film is now being played daily in the Aquarium’s Ocean Science Center, and is available to over 100 sites through NOAA’s Science on a Sphere Network. The second teacher

workshop is October 17-18, 2014 and the next NASA night is scheduled for 11/5/14.

How were family, educators, and community involved?

- Title 1 teachers who participated in the October 2013 workshop invited parents, other teachers and students to a free night event at the Aquarium called “NASA Night.” Once at the Aquarium, participants enjoyed 12 interactive stations staffed by Aquarium educators and partners from California Science Center, Northrup Grumman, JPL, National Weather Service and UC Irvine Hydrology Lab. Activities included collecting data about the fish in a kelp forest, contributing data about age and gender, interpreting information about census data, “driving” a Mars rover, and asking scientists about their jobs.

How did the grant make a difference to your institution and to your community?

Over 2800 teachers, students, and family members attended the event. Many families, representing the diverse Southern California demographics, had never been the Aquarium before. Aquarium educators, partners and the external evaluator reported rich questions-based conversations. Aquarium management was excited to see the event reaching a new audience and supported the idea of future programs. The event established strong relationships with teachers who provided access to these underserved audiences.

Describe your project’s most meaningful moment or circumstance demonstrating an impact on families, educators, or community

Tons of positive feedback from Aquarium educators and community partners about the quality and quantity of interactions, and interest in doing more types of these events.

"I loved conversations about data and how this is helping us understand changes on our Earth. The data can be used in the classroom to build lessons and help students analyze and interpret information." - Teacher

What worked well?

- The Aquarium serves a diverse audience, but NASA Night reached a larger portion of our Hispanic and Cambodian audiences and provided opportunities for families to learn together. Evidence suggests this is an important element to student success. Documenting adults and students having conversations with each other, as well as peers, is evidence of success.
- Simple activities and simple messages provided opportunity for rich interactions and conversation. Aquarium educators used question strategies to engage in data-related conversations rather than simply giving instructions or using purely explanatory language.
- Using teachers to invite and coordinate school-specific details was essential to reaching the intended audience.

What challenges did you have? Did you overcome them? What did you do to adapt?

- It was difficult to estimate the students and families planning to attend. Estimates were given by teachers, but invitations were challenging. Having direct communication with trusted teachers was needed to plan for the event.
- The turn-out was overwhelming. Visitor flow and crowds during the event impacted some of the interactions and conversations. Some teachers had

assigned a "passport stamping" activity that demonstrated participation. The list of stations on the "passport" did not reflect all the interactions at the event and created some confusion. Many students were more focused on collecting stamps than discussing with staff. In the future, more communication with teachers and suggestions for better "proof of participation" will be discussed.

- Evaluation of the event indicated that many parents focused on their child's interactions and may not have identified the opportunity to engage as well. Future events will encourage participation by all participants, including adults.

How will you sustain the activities? What is your vision for future steps with the accomplishments of this project?

The second NASA Night on November 5 allows us to build on success. While the funding provides stipends for scientists to participate, the infrastructure is in place and the impact has been demonstrated. Similar events can be hosted in the future, and teachers can be targeted to bring students back to the Aquarium.

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"Our Instrumented Earth" Quiz:

http://www.aquariumofpacific.org/exhibits/ocean_science_center/oiequiz

Press Release:

http://www.aquariumofpacific.org/news/story/aquarium_partners_with_nasa_oms_i_to_create_new_public_program

The North Carolina Museum of Natural Sciences (NCMNS) is a **free** museum and targets audiences of all ages, education levels and socioeconomic backgrounds. It has an annual attendance of ~**1.2 million on-site visitors** with an additional 30,000 individuals served off-site.

What NASA content did you address and what museum components did it consist of?

- In 2009, the NCMNS was awarded a three-year NASA grant for its Nature Research Center project, which added a new 80,000 sq. ft. wing. The Nature Research Center (NRC) project provided NASA with a presence through permanent exhibits and STEM programming. (No NASA funds were used for construction.) The NCMNS' project addressed all NASA Mission Directorates through a continuum of exhibits, events, workshops & programs.
- Earth science exhibits aligned with NASA's Science Mission Directorate; space science exhibits aligned with the Human Exploration Systems Directorate; the Exploratory Gallery aligned with the Aeronautics Mission Directorate. Exhibit clusters include ***Postcards from Space***, where visitors can browse a collection of meteorites that includes relics from our Solar System's formation and a piece of Mars; ***Beyond Our Planet***, where visitors can learn about NASA's telescopes, see a moon rock, and find an astronomy-related citizen science project; ***Researching Weather***, where visitors discover the methods used to study weather (balloons, rockets, weather stations and satellites); ***Our Changing Climate*** where visitors can watch videos that show evidence of climate change and hear scientists and non-scientists describe how climate change might affect your life; and finally the ***Exploratory Gallery***, where visitors

see breakthroughs in engineering and modeling. Over 2 million people to date have viewed these exhibits.

- Funding also supported Astronomy Days, an annual, two-day festival on all things space. The event is aligned with all Mission Directorates and 40,499 individuals were reached over 3 years.
- Educator Workshops aligned with all Directorates (173 educators reached) and participants from low-performing schools were given priority registration.

How were family, educators, and community involved?

- During the design of NRC exhibits, the NCMNS worked with NASA staff and consultants to ensure scientific messages were accurate. In addition, it worked with diverse youth focus groups to ensure messages were engaging and relevant. The NCMNS worked with community groups that support underserved audiences (Boys & Girls Clubs, YMCA, etc.) to promote attendance at Astronomy Days, and promoted its educator workshops to low-performing schools.

How did the grant make a difference to your institution and to your community?

- The grant has reached **2,468,013** individuals (and counting!) over the three-year period. Without NASA grant dollars, in-kind resources, and access to NASA expertise, the NCMNS would not have been able to provide the community with access to NASA content.

Describe your project's most meaningful moment or circumstance demonstrating an impact on families, educators, or community

- Astronomy Days 2011 featured former NASA astronaut Jose Hernandez, the first Mexican-American astronaut. The child of migrant workers, Hernandez provided a heart-felt talk about his humble upbringing, tenacity in pursuing his dreams, and the obstacles he overcame. He provided two English-language presentations to the public and met privately with a group of children of migrant workers. The talks were inspiring to both English-speaking and Spanish-speaking children and families. The NCMNS worked with community groups that serve migrant workers and bussed families to the Museum for this event.

What worked well?

- The NCMNS established a great working relationship with its NASA Technical Officer who connected us with opportunities beyond what was described in the grant to get NASA messages out to new audiences.
- Examples include hosting live downlinks with: 1. NASA Extreme Environment Mission Operations (NEEMO) during which Museum visitors observed and posed questions to NASA aquanauts working live in the Aquarius undersea research station; and 2. NASA's Desert Research and Technology Studies (RATS) during which NASA engineers, astronauts, scientists and technicians discussed their mission simulations in the Arizona desert and fielded questions from students. During each of these webcasts, children of migrant workers and students from low-performing K-12 schools were invited.

What challenges did you have? Did you overcome them? What did you do to adapt?

- The Nature Research Center project was largely a capital project to develop, create and install new exhibits. As with many large-scale capital projects, certain costs were exceeded, leaving the NCMNS with insufficient funds in other line items (such as our educator workshops).
- The NCMNS worked closely with its assigned NASA Technical Officer, who was able to use in-kind NASA resources (such as use of regional NASA staff to lead workshops and access to the NEEMO and Desert RATS downlinks) to pull us back on track and serve diverse audiences. In the end, the NCMNS served an additional 127,341 people beyond the original scope of the grant!

How will you sustain activities funded by your project? What is your vision for future steps with accomplishments of this project?

Most of the line items in our grant were one-time exhibit costs. For Astronomy Days, the NCMNS partnered with universities, nonprofits, and private companies that have experienced the event's success and are primed to be the next generation of sponsors.

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Mission: Moonbase



Museum of Science & Industry (MOSI)

Mission: Moonbase

Funding start: 2009

Date of project completion: 2012

What NASA content did you address and what museum components did it consist of?

The purpose of Mission: Moonbase was to create an educational experience in which students and families could experience the possibility of on the moon brought alive through NASA research in human spaceflight, lunar science, and off-world human colonization. The Mission: Moonbase experience is made possible through interactive gaming simulations that recruits participants to be members of the lunar colony responsible for operating areas such as robotics, agriculture, mining, and life support through their interaction with gaming simulations. The experience is made more meaningful for students with the help of an immersive, theatrical environment, augmented reality, and facilitation by museum educators. Although Mission: Moonbase is made continuously available for museum guests, it can also operate as a team-based experience for students with additional STEAM-based activities that foster space-related careers and exciting possibilities of becoming off-world pioneers.

How were family, educators, and community involved?

Mission: Moonbase consists of a variety of educational gaming simulations that were designed with the help of research derived from prototyping sessions with students and educators. These prototyping sessions provided valuable data on how to best deliver NASA-based educational content through video gaming simulations.



Mission: Moonbase

How did the grant make a difference to your institution and to your community?

The grant funding and access to NASA researchers made Mission: Moonbase a reality. It has become an exciting space exhibition for families visiting MOSI and an inspirational team experience for schools, youth groups, and adult groups.

Describe your project's most meaningful moment or circumstance demonstrating an impact on families, educators, or community

Since its opening in 2012, Mission: Moonbase has engaged over 250,000 participants in public and student group scenarios on the potential benefits and challenges of human habitation on the moon. Because Mission: Moonbase is a scenario based on living in the future, the participants are excited and inspired by the futuristic concepts and technologies brought to life in the experience. Mission: Moonbase has become a renowned component of MOSI's space programming currently used by youth programs, camps, and other science and engineering educational projects.

What has worked well?

- Mission: Moonbase inspires students in human space exploration and space-related careers using STEAM.
- The gaming simulations and immersive environment still allow for the incorporation of hands-on activities for customized mission scenarios.
- Mission: Moonbase is capable of operating as a museum exhibition and mission simulator for teams.
- Mission: Moonbase has become a popular experience at MOSI for families, educators, and students.

What challenges did you have? Did you overcome them? What did you do to adapt?

- Adapting NASA research and scientific data into gaming simulations required continuous prototyping with a wide-range of participants.
- Utilization of cutting-edge technologies with futuristic look with limited funding demanded creativity and theatrical special effects.

How will you sustain the activities funded by your project? What is your vision for future steps with the accomplishments of this project?

Mission: Moonbase's role as an important group experience and museum exhibit that promotes STEAM and space exploration is ensuring its sustainability. MOSI will ensure to update the Mission: Moonbase experience with new technologies and content as developments arise.

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AMNH, NASA Science Research Mentoring Program
NASA Grant #NNX09AL36G



What NASA content did you address and what museum components did it consist of?

AMNH has research departments in Astrophysics and Earth/Planetary Science, collectively the Physical Science division. The content of our courses and the research placements included topics of AMNH's research interests and associated data: observational stellar astronomy including astrometry, nearby low-mass stars and brown dwarfs, supernovae, etc.; planetary missions; geochemical and geophysical processes and analysis; and meteoritics. Images and other data from most projects incorporated from various NASA assets including the Hubble Space Telescope and the Stardust mission, to name a few.

How were family, educators, and community involved?

The program created 250 free high school spots per year in our After School Program, in courses co-taught by scientists and educators, incorporating the content above as well as research methods and findings. Up to 18 spots per year were available for students interested in carrying out a year-long mentored research project, during which they received a stipend as well as college/career prep in addition to the research opportunities. At both levels, students interacted directly with scientists in an effort, in part, to enculturate them into the world of professional science research.

We incorporated the families of the research students into two annual events. A mid-year Family Night brought together students, families, and AMNH staff in NASA SRMP and the concurrent NSF-sponsored version of SRMP, to meet each other and for a special evening including

dinner and special experiences (special exhibits, lectures, etc.). The graduation ceremony at the end of the year included a poster session of the students' work as well as short stage presentations of each project.

The curriculum developed for the courses was published online and has been distributed and promoted at AMNH teacher professional development events, and at conferences like NSTA. Additionally, the scientists that worked with us went through trainings on working with high school students, as well as pedagogical and mentoring techniques, content, and background.

How did the grant make a difference to your institution and to your community?

The grant allowed us to take an idea that had been running for years and solidify a model, incorporating scientists and educators at all levels. Structures, policies, mechanisms, and relationships were created that have continued. Including the biology and anthropology fields, hundreds of students have passed through mentorship, thousands through the courses, and dozens of students have published in journals and at conferences.

At a rate approaching 100%, students that have participated in the mentorship have gone on to college, with many studying science and actively involved in research at their schools. The scientists involved in SRMP have also been able to use their experiences in applications for jobs and grants, pointing to their roles as teachers and mentors, and their experience with running research groups.

Describe the most meaningful moment or circumstance demonstrating an impact on families, educators, or community.

During the graduation poster session and symposium, the students present their data, their analysis, and interpretations in front of hundreds of people including: their peers and families; AMNH scientists, educators, and other staff; school teachers and principals; VIPs; and press. Leading up to the graduation, students attend special advisory sessions geared towards preparing them for college and career, and professional scientific process including making posters, writing papers,

AMNH, NASA Science Research Mentoring Program
NASA Grant #NNX09AL36G

and presenting to an audience. Most of the time, graduation goes flawlessly – it is clear that the youth are comfortable and experts in their topic, enacting the role of the scientist.

What worked well?

- Integrating the scientists at all levels, and providing salary and appointments.
- The mentor and teacher trainings and the co-design and co-teaching of the courses.
- Evaluation – the feedback was phenomenal and helped us iteratively improve the model.
- Retention in the mentorship – of the 52 students that started, 50 graduated. We credit various support systems and individual attention as being big factors in this.

What challenges did you have? Did you overcome them? What did you do to adapt?

- Finding mentors – determining which scientists were available months in advance was not always feasible, and schedules sometimes changed during the project year. We worked with each on an individual basis, as needed, encouraging remote contact when necessary.
- Recruitment of minority and underserved students in part due to our location. We concentrated our recruitment efforts at nearby Title 1 schools, but travel time to/from the Museum is a huge concern for students. This was not fully resolved, however we consistently had equal if not more girls than boys participating in the mentorships.
- A partnership and subaward with a local college and their summer coursework to provide spots for the mentees in classes. Ours and their timing and recruitment practices of did not lead to many students taking advantage. We renegotiated with the college and cover just the students that were able to, however they did not ever provide some of the coursework as originally discussed.

- Retention in the courses – as extracurricular, we are often faced with students not finishing courses. Some of the SRMP courses were very math intensive, and to counter those ‘scared off’ by it, we started requiring that students finish 9th grade before starting our courses. Curriculum was also reorganized to make the courses feel less formal, with more hands-on components.

How will you sustain the activities funded by your project? What is your vision for future steps with the accomplishments of this project?

NASA SRMP ran from 2009-2013. Between the NASA and the NSF funding, we built and solidified the model, as well as our relationships with the science departments. The evaluations provided the framework, findings, and solid track record. With these, fundraising started to continue the program after the federal grants ended. The Pinkerton Foundation was very impressed by all of the work, and funded us, asking us also to expand. We chose, with their sign-off, to create a network of SRMP-like programs around New York City, incorporating several key aspects from our model (co-teaching, co-involvement of scientists and educators, scientist trainings, symposium/poster-session graduation, etc.). This is now known as the SRMP Consortium, and is managed out of AMNH. In the 2014-15 school year, the consortium consists of 14 partner institutions.

We have impressed others as well. Several smaller donations from various corporations and foundations have been used for operating costs and incorporated additional science topics – in particular, Doris Duke funds a biodiversity strand of courses, research, and other inclusions. The Davis Family donated money to set up annual scholarships – three for SRMP students in the amount of \$30,000 each (\$7,500/year for four years). And an anonymous donor created a multi-million dollar endowment to keep SRMP at AMNH running indefinitely.

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<http://amnh.org/SRMP>

<https://informal.jpl.nasa.gov/museum/CP4SMP/nasa-science-research-mentoring-program>