Disruptive Engagement: Reaching new communities, reaching for the stars with NASA

Session Leader:
Leslie Lowes, NASA Jet Propulsion Laboratory

Session Moderators:
Amelia Chapman, NASA Jet Propulsion Laboratory
Tammy Rowan, NASA Marshall Space Flight Center
Disruptive innovation...
Objective 2.4

Advance the Nation’s STEM education and workforce pipeline by working collaboratively with other agencies to engage students, teachers, and faculty in NASA’s missions and unique assets.
NASA Education Mission

Advance high-quality STEM education using NASA’s unique capabilities.

NASA is committed to funding competitive, evidence-based programs in STEM education that will benefit aspiring learners, educators, and institutions, and contribute to national goals.
CP4SMPVC+

Competitive Program for Science Museums, Planetariums, Visitor Centers Plus Others
Today’s Topics and Presenters

- Changing Perceptions – Museums as a Resource for the Community
  - Bryan Wunar, Museum of Science and Industry, Chicago
  - Derrick Pitts, Franklin Institute

- Drawing Them In – Immersive Experiences They Can’t Pass Up!
  - Becky Wolfe, Children’s Museum of Indianapolis
  - Kay Taylor, U. S. Space and Rocket Center
  - Katelyn Wamsted, Girlstart

- Bridging the Distance – Remote Access through Technology
  - Hadley Anderson, Bishop Museum
  - Lindsay Bartholomew, Patricia and Phillip Frost Museum of Science
Session Format

• Overview presentations from awardees
  – Think about the “disruption” issue you are most interested in
  – Please write down one thing you’d like to have discussed in the small group

• Break into discussion groups on each “disruption”

• Time at end for reviewing challenges and successes from other groups

• Please hold questions for the discussion groups
Calendar Resources
PLEASE Evaluate Our Session
Changing Perceptions – Museums as a Resource for the Community

Bryan Wunar,
Museum of Science and Industry, Chicago
Derrick Pitts, Franklin Institute
Changing Perceptions – Museums as a Resource for the Community

Our disruption is:

...to engage audiences that are not current museum goers

...and broaden participation in science by underrepresented groups,

...museums must explore not just new ways to extend learning beyond their walls

...but ways to create meaningful partnerships for the welcome infusion of science into underserved communities.
OUR PLACE IN SPACE (OPIS)

Museum of Science and Industry, Chicago IL

NASA Grant # NNX14AQ66G

Bryan Wunar
Director of Community Initiatives
Center for the Advancement of Science Education
MSI Youth Centered Model
OPIS Teacher Course

Goals:
• Improve teachers’ space science content knowledge
• Increase teachers’ use of hands-on and inquiry-based strategies
• Build teachers’ use of external resources, including NASA assets

• 4th-8th grade teachers with limited science experience
• High needs schools
• Sustained, academic year course and summer institutes
• 96 teachers (serving ~7,200 students)
OPIS in Out of School Time

Goals:
• Disseminate adapted OPIS materials for use in out of school time programs
• Build capacity of community partners to integrate space science into their existing programs
• Engage children, youth, and families in science exploration

• Network of school, library, and community-based partners
• High needs communities
• Afterschool and summer learning experiences
• 523 facilitators (serving ~22,314 students afterschool and additional ~99,044 summer 2015, awaiting final participation for summer 2016)
The Franklin Institute Science Museum - Philadelphia

‘Breaking Eggs to Make Omelets: Disrupting the Norm Of Community Service ’
D.H. Pitts, Chief Astronomer, Planetarium Programs Director

TFI Size: 453K sq.ft.; Annual Attendance: 985k +150K outreach
The Place and The Project

• The Franklin Institute Science Museum
  – Mission: Inspire a passion for learning about science and technology; since 1824.
  – Most visited museum in Pennsylvania; directly reach more than 1 million students, adults, families each year.

• The Project – ‘City Skies’
  • Defeat the urban observing myth
  • Introduce underserved audiences to astro/space education career possibilities
NASA Content/ Museum Components

• Space Exploration
  – Solar System; emphasis on observation.
  – Broad Array of Museum Components Used: planetarium, observatory, teacher training, outreach programs, Phila. Science Festival, Community Outreach Programs Network.
‘City Skies’ as the Agent of Disruption?

• Rather than wait for community to come to us as a destination, we offered opportunities to enrich the community science experience with (NASA) science content.

• Used that content and programs spun from it to develop and reinforce new community relationships and discover more effective ways to serve engaged communities.
How was the disruption harnessed to enhance TFI’s mission?

- Realized that our best chance of being a best partner is to facilitate their exploration of what content is best for their constituents whom they know better than we do. This allows us to provide that which will more effectively inspire a passion for learning abt sci/tech b/c it’s what they want to learn abt, not what we tell them they need to learn about.
- Positive outcome: 5 community centers formed their own science experience collaborative who are jointly creating positive shared science experiences and programs using materials developed and used in the TFI NASA-funded program ‘City Skies’.
Drawing Them In – Immersive Experiences They Can’t Pass Up!

Becky Wolfe, Children’s Museum of Indianapolis
Kay Taylor, U. S. Space and Rocket Center
Katelyn Wamstead, Girlstart
Drawing Them In – Immersive Experiences They Can’t Pass Up!

Our disruption is:

...the interruption of the day-to-day familiar routines

...through immersive STEM experiences

...that allow visitors the opportunity to see themselves from a different perspective

...and to open up new pathways for discovery.
Beyond Spaceship Earth

Becky Wolfe
Manager, Science Education and Resources
Project Overview

- **NASA Content**: Human Exploration
- **Project Components**: Exhibit, Curriculum and Programs
Recreate the Station

“One of the frustrations of an astronaut is how to explain the magic of space. It is a bit like Alice in Wonderland.” - Dr. David Wolf, retired astronaut.
Museum Mission

To create extraordinary experiences across the arts, humanities and sciences that have the power to transform the lives of children and families.
Importance to the Field
The STEMcon Equation:
Immersive Experiences + Intense PD = Learning to be Learners Again

Dr. Kay Taylor
Director of Education
U.S. Space & Rocket Center
Huntsville, AL
U.S. Space & Rocket Center • STEMcon Professional Development • $x = \{IE^U + \sin(pd/\alpha)\} \Delta_t$

Curriculum & Instruction
S-STEM Activities
Immersive Learning
Disrupting the Comfort Zone, Dispersing Authority

\[ x = \{IE^U + \sin(pd/\alpha)\} \Delta_t \]
Customize Lesson Plans • Network • Work with NASA Educators • Launch Rockets
Train Like an Astronaut • Crash Rockets • Conduct a Mission • Design a Mission
Patch Work with NASA Educators • Expand Your Teaching Toolbox • Test Yourself •
Tour NASA • Learn Space History • Envision Space Future • Launch a Payload • Meet
an Astronaut • Be a Kid • Look at the Stars • Rediscover Wonder • Be a Better Teacher

The STEMcon Equation:
\[ x = \{IE^U + \sin(pd/\alpha)\} \Delta_t \]
Girlstart: Informal STEM Education for Girls

girlstart.org
89% of girls reported that they are MORE interested in STEM
Always Be INSPIRED
Bridging the Distance – Remote Access through Technology

Hadley Anderson, Bishop Museum
Lindsay Bartholomew, Frost Museum of Science
Bridging the Distance – Remote Access through Technology

Our disruption is:

...using technology in innovative ways

...to reach a multitude of audiences over vast distances

...while creating access to real scientific data and resources.
CELESTIAL ISLANDS:
Using NASA Earth Sciences to Reach Hawaii’s Educators and Students
NASA Grant Number: NNX12AL34G
PI: Mike Shanahan
Presenter: Hadley Andersen
Senior Science Educator
NASA Content:

- NASA Earth Sciences/Earth System Science

Museum Products:

- 3rd-5th grade curricula combining NASA earth sciences and Hawaii as an earth system science laboratory
- Teacher workshops
- Planetarium/SOS program on satellites and ESS called *Eyes on Island Earth*
- Portable Digital dome version of that program
- Exhibit on NASA Earth Observing System and ESS
Bridging the Distance: Remote Access through Technology

Addressing the disruption:

• Handing over the creation of curricula to currently-active classroom teachers, hired on contract to create product; going directly to the users of curricula to create the curricula.
• Use of on-line workshop segments along with face to face workshop sessions to deliver curricula and PD credit to local teachers on neighbor islands in an affordable way.
• Enabling the downloading of curriculum from our Online Learning Center to help teachers where internet reliability is questionable.

Enhancing our mission:

• Bishop Museum needed to find creative, affordable ways to address its educational mission; this workshop format allowed us to do that without breaking the bank in terms of staff travel costs.
• Museum wanted to get beyond ‘battle of the hunches’ in terms of determining what teachers and students really need from the museum; building a team of currently-active teachers in the grant, and having them not only create curricula but also give feedback on planetarium-SOS program, exhibit, etc. a big help.
Bridging the Distance: Remote Access through Technology

What worked well:

• Workshop model – mixing face to face and online
• Mix of museum staff and NASA STEM teacher working together for community events.
• Google: Docs, slides, sites, chat, hangouts, etc.
• Teleconferencing
• Offering professional development credit through the Hawaii Department of Education

Challenges:

• Many different players in the NASA team: teachers, museum staff, two evaluators, curriculum expert, remote education expert on contract. Solution: accept that it’s hard and will take a lot of work; online communication combined with face to face meetings helped the team.
Bridging the Distance – Remote Access through Technology

PI: Dr. Judy Brown (NNX14AD07G)

Co-PI: Lindsay Bartholomew
Director of Technology and Youth Development

Patricia and Phillip Frost Museum of Science
Miami, FL
NASA content (Science Mission Directorate)
• Interdisciplinary STEM involved in exoplanet detection, observation, understanding

Project Components
• Virtual world of 3D simulations and interactive experiences
• Interconnected summer camps for middle school students with nationwide partners
• Integrated online educator implementation guide/curriculum
• Professional development webinars on curriculum resource and technical needs
• Exhibit kiosk for museum visitors to interact with virtual world
Addressing the Disruption

Instead of “traditional” use of technology... bridge the distance in new ways.

Use online and 3D virtual world technology to:
• Create connections between students that would not otherwise meet
• Provide access to scientists and resources “on students’ turf”
• Build connections to real data so students can take ownership
• Increase capacity for other educators to utilize curriculum in various settings
• Being a resource for professional development, on content and technology
• Being a platform to create connections between audiences, resources
• Providing access and connections for traditionally hard-to-reach audiences
• Integrating programs and resources into museum exhibits and visitor experiences
Technology (the ultimate modern - yet traditional - disruption) can be a tool to:
• Focus attention
• Create connections and find common ground
• Share access

Successes, Challenges, and Adaptations
• Let’s discuss!

Do YOU think we’ll find an “Earth twin?”

Information on vMAX resources:
lbartholomew@frostscience.org
Today’s Topics and Presenters

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  – Bryan Wunar, Museum of Science and Industry, Chicago
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• Drawing Them In — Immersive Experiences They Can’t Pass Up!
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  – Hadley Anderson, Bishop Museum
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Learn More, Stay Tuned

For NASA STEM content facilitation join the Museum Alliance hosted by JPL: 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
What NASA content did you address and what museum components did it consist of?

Our Place In Space (OPIS) is a series of space science and engineering design programs developed by the Museum of Science and Industry, Chicago (MSI). Core content of the programs centers on the investigation of the universal laws of force and motion, the phenomena that stem from the Earth-Moon-Sun relationship, the characteristics of solar system, and the nature of electromagnetic energy. The engineering design cycle serves as a common thread through each component, allowing learners to explore the science content through a process of asking, imagining, planning, creating, and improving. OPIS also models the use of the science inquiry learning cycle and hands-on teaching methods, as well as the ways the Next Generation Science Standards can be modeled and taught both in and out of classrooms.

How did your project address Changing Perceptions – Museums as a Resource for the Community?

In order to address the disruption and position the Museum as a community resource, MSI considered a learning ecosystems approach, placing an emphasis on reaching the influencers of youth as a means of broadening impact. This effort included:

- Structuring the program to support science learning in schools, communities, and families.
- Building capacity of key stakeholders to engage youth in science learning in many different venues.
- Supporting in school science teaching and learning through sustained professional development of middle grades teachers. The teacher education course was designed to build their space science content knowledge, expand their pedagogical skills, and enhance their ability to use external resources to support instruction.
- Adaptation of school-based resources to support out of school time learning. Professional development and implementation support for afterschool program providers focused on integration of science into existing afterschool program structures.
- Summer learning resources were developed to engage families during the critical period when school is not in session and to support libraries in building a presence for science across Chicago.

How did you harness the disruptive issue to enhance the mission of your museum?

- Year-long teacher education course and summer institute for 96 middle grades teachers (serving 7,200 students).
- Workshops for 523 out of school time educators (serving 22,314 children).
- Partnership with Chicago Public Library to bring science learning to 80 branches.
- Develop 8 weeks of summer learning activities integrated into city-wide summer learning challenge (serving...

- Ecosystem approach integrated as an ongoing program framework across institutional programming beyond the grant period.

**What worked well in your project as it addresses Changing Perceptions – Museums as a Resource for the Community?**

- Integration of space science and engineering as one of five regularly offered teacher courses to address the full scope of middle grade science content.

- Opportunity to explicitly address Next Generation Science Standards with teacher participants, establishing approach to be used across full complement of teacher education courses.

- Establishing a mechanism for building the capacity of afterschool providers to integrate science learning into existing programs in communities across Chicago.

- Developing a partnership with the Chicago Public Library to build a presence for NASA and MSI in addressing summer learning needs for Chicago’s children and families.

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

- Teachers are facing the challenge of transitioning to NGSS. This project provided a structured way for MSI to explore how to effectively support teachers in making the transition.

- Out of school time programs are offered in many types of settings and have many different formats. The project needed to be extremely flexible to be successful in a diversity of learning environments.

- Librarians were initially resistant to the idea of building science into their literacy programs. Helping them expand, rather than replace, the learning opportunities they offer gained buy in from library staff.

**How will you sustain these activities or adapt them with the changing priorities of the audience?**

The Museum of Science and Industry has built the learnings from OPIS into its programmatic framework to ensure that key components can continue to be offered for our audiences. The credibility associated with NASA support helped to secure additional funding to sustain the program beyond the grant period.

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

- NASA Content: Space exploration
  - Solar system exploration specifically

- Museum Components
  - Planetarium, Observatory, teacher training, Outreach program, Philadelphia Science Festival, Community Outreach Program networks.

How did your project address the disruption “Changing Perceptions – Museums as a Resource for the Community“?

- Offered opportunities to enrich community science experience using astronomy, telescopes, and NASA as driving force and key attractor.

- Used the content and program spun from it to develop and reinforce new community relationships and discover more effective ways to serve the community.

- Included churches as community centers where families can learn about astronomy, space exploration and NASA’s missions.

- NASA was one element in attracting participants. Others: family together time, creative/craft activity opportunity, previous interest in space-related topics

How did you harness the disruptive issue to enhance the mission of your museum?

- Learned that our best chance of being a valued partner is to facilitate the partner organizations’ exploration of what is appropriate science content for their audience, then we facilitate co-development of appropriate programming.

- Positive outcome: Hunting Park Community Science Collaborative – Five community centers who now jointly create positive science experiences and program using materials developed and used in the TFI NASA-funded ‘City Skies’ program.

- Discovered and harnessed our chaotic ubiquity. Allows more efficient and effective application and use of resources both human and materiel.
What worked well in your project as it addresses “Changing Perceptions — Museums as a Resource for the Community“?

- Flexibility of every type on our part was very important to absorb the wide variety of issues that affect the urban community center experience.

- Listening to our partners as they described what partnership means to them; stepping back from the ‘leadership’ position to the collaborator position; redirecting our efforts from ‘driving the bus’ to being an integral part of the bus.

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

Constantly changing staff and administrators. Admittedly, this is the most challenging aspect of working with community centers: continuity. This one factor requires many additional hours of communications and management.

How will you sustain these activities or adapt them with the changing priorities of the audience?

We are determined to use the example of the Hunting Park Collaborative to maintain our focus on the needs expressed by the communities we serve. We who provide programming in communities are now coordinating our information about each site we work with and sharing information about the programs we do at each site.
What NASA content did you address and what museum components did it consist of?

Our project focused on the Human Exploration Mission Directorate, specifically the International Space Station. In our museum exhibit, the keystone to our project, we focus on the challenges and solutions to living and working in space. We also addressed the science conducted on the ISS. To complement the exhibit, we created a teacher curriculum and programs for children and families.

How did your project address immersive experiences?

- Physical exhibit that places visitors in the ISS environment.
- Exhibit design used a 360 degree design, with graphics on the floor, ceiling and walls, to reflect the use of all available spaces on the ISS.
- Companion programs, in the exhibit that expand on content.
- Staff take on roles, such as an astronaut in training, while interpreting the exhibit.
- Hands on interactive elements, real video and opportunities for pretend play round out the immersive environment.

What worked well in your project as it addresses immersive experiences?

- The museum used a long, narrow exhibit area, rather than a boxy exhibit hall. It was a framework similar to the ISS in size.
- NASA as our partner gave us access to real images and allowed us to tour NASA facilities capture the real experience.
- Exhibit includes artifacts, and real images.

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

- So much content! There were many directions we could go with ISS environment.
- Clear objectives and evaluation outcomes kept the project focused and helped make decisions.
- Matrix of all of our content and where it could be addressed – exhibit or programs.
- Common goals/messages across programs and exhibits helped us manage all of the content.
How will you sustain these activities or adapt them with the changing priorities of the audience?

- Designed the exhibits using panels. This was a great way to keep it realistic, but also means we can swap out the elements.
- Key to keeping the experience fresh, and relatable is the programs. These are more adaptable than exhibits.
- Use of mobile technology with our staff. Providing our floor staff with iPads, they can tap into current NASA missions or social.
- Empowering staff to research current missions so we don’t focus on what happened the moment we created the exhibit.

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The STEMcon Equation: Immersive Experiences + Intense PD = Learning to be Learners Again

NASA CP4SMPVC grant NNX14AD15G,
Dr. Kay Taylor U.S. Space & Rocket Center
September 26, 2016

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

STEMcon brings NASA science education and professional learning together with the excitement of Space Camp to provide a professional development experience unlike any other. Over the course of four days, educators take part in more than 32 hours of curriculum development, space science activities and challenges and take part in simulated astronaut missions.

How did your project address this disruption: “Drawing Them In - Immersive Experiences They Can’t Pass Up”?

The program is built around uprooting educators out of their comfort zone into an immersive, unfamiliar environment.

• We pair engaging, collaborative STEM professional development sessions with the excitement of Space Camp.

• We bring together NASA resources and experts and work with teachers to develop new pedagogical strategies and expand their professional tool box.

• We make use of our museum, housing one of the world’s finest collections of space artifacts, and our Space Camp educators’ program that allows educators to train like astronauts and take part in simulated missions.

• We provide a learning environment that is rigorous, fun and challenging. Teachers come away with a renewed appreciation for the ways students learn and the sense of accomplishment that accompanies mastering a new task.

How did you harness the disruptive issue to enhance the mission of your museum?

At the conclusion of the funding period, we will have served 280 educators from the five states within the MSFC educational outreach service area (Alabama, Tennessee, Arkansas, Iowa and Missouri).

These educators will join the over 10,000 educators who have gone through the Space Academy for Educators through the years and will continue to promote space education in their classrooms.

What worked well in your project?

• Providing educators with experiences steeped in the history and future of spaceflight, such as touring Marshall Space Flight Center, and meeting rocket scientists and astronauts.

• Providing educators with opportunities to network, learn from one another and share their own experiences.

https://informal.jpl.nasa.gov/museum/CP4SMP
The STEMcon Equation: Immersive Experiences
+ Intense PD = Learning to be Learners Again

NASA CP4SMPVC grant NNX14AD15G,
Dr. Kay Taylor U.S. Space & Rocket Center
September 26, 2016

- Challenging teachers to embrace uncertainty. Teachers aren’t in charge of the schedule, they don’t have mastery of the material involved in the activities and they have to adapt and move quickly to keep up.

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

With NASA funding offsetting tuition expense and providing a partial travel stipend, the primary challenge has been getting teachers to commit to a multi-day professional development program. Upon completion of this 4-day program, educators receive 32 CEUs and can apply their experience toward completing a 3-hour graduate-level education credit through the University of Alabama Huntsville.

- Working with data from our external evaluators, we refined our selection of pd activities, as well as the manner of how we conducted the sessions, in response to educator requests.
- Calling upon previous STEMcon and Space Academy for Educators alumni to reach out to teachers in their districts to work as ambassadors for the program.
- Publicizing the program through NASA assets, such as NASA Express. We have enhanced our social media publicity as well. To that end, our initial recruiting challenges have been overcome, and we will finish out the grant cycle in summer of 2017.

Going forward, filling the program without tuition support for educators will be challenging. Bottom line, it requires an educator who will commit time and energy to attend, and who is willing to work to locate funding, whether within the school district or an outside source to offset costs of attending professional development at the USSRC.

How will you sustain these activities or adapt them with the changing priorities of the audience?

Using feedback from evaluations, we have adapted our days’ schedules to increase time for collaboration and reflection, to tweak sessions and content offerings. We have incorporated the engineering design process as a catalyst for teacher sessions, as well as brought in such adaptive excercises as breakout boxes and robotics.

We will continue to seek ways to help fund teachers to attend the program, as well as work with teachers to find funding sources on their own.

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

Girlstart used NASA-rich content areas including center of gravity, kinetic & potential energy, physics, the engineering design process, robotics, life sciences, earth processes and more to create meaningful and relevant camp themes to provide immersive experiences our girls couldn’t pass up.

Girls designed & programed their own video games,
- built underwater robots,
- soldered solar powered vibrating dinosaurs,
- learned to fly drones,
- explored 3D design and printing, and more.

How did your project address this disruption: Drawing Them In- Immersive Experiences They Can’t Pass Up?

Girlstart Summer Camps
- Offer week-long (40 hour) day camps for girls entering the 4th through 8th grades.
- Camps include a balance of hands-on STEM activities, relevant technology, collaborative team building and informal camp fun!
- Camp themes ranged from Once Upon a Time to Circus Circus to Hermione’s Mayhem of Mazes.

Girlstart After School
- Free, weekly STEM after-school program designed to increase girls’ learning hours in STEM.

- Intensive intervention involves sequential, informal, hands-on and inquiry-based activities in topics across the STEM acronym, designed to build girls’ skills in collaboration, creative problem solving, and critical thinking, as well as their STEM knowledge and their interest and confidence in STEM activities, studies, and careers.

Girls in STEM Conference
- Conference brings 4th through 8th grade girls together with female role models in STEM careers for a day of hands-on STEM workshops.
- The conference is designed to introduce girls to professional women working in STEM, who inspire the girls to consider and pursue STEM careers.

Community STEM Programming
- Free, family-friendly programming involves hands-on STEM learning activities for thousands of girls, families, and community members across Central Texas and beyond each year. By offering a wide variety of free programming at many sites throughout the community, we are able to reach a broad cross-section of our population.
- Through these activities, Girlstart is able to strengthen STEM learning at schools and other community locations that we cannot yet serve through our more intensive programs.
  - DeSTEMber is an online initiative to spark STEM excitement with 31 days of fun, free and innovative activities. 31 days of hands-on fun. www.deSTEMber.org

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September 26, 2016
Girlstart
Katelyn Wamsted

ASTC 2016 – Disruptive Engagement: Reaching new communities – reaching for the stars with NASA

https://informal.jpl.nasa.gov/museum/CP4SMP
o STEM Studio and Mini-Planetarium ('Starry Nights') for the Austin community, the first publicly accessible, permanent planetarium in the region. Planetarium experiences are linked with hands-on astronomy activities.

How did you harness the disruptive issue to enhance the mission of your museum?
- 104 camps serving close to 2800 girls from diverse backgrounds.
- Girlstart After School is the largest program of its type in the nation (2015-16: 55 programs, 18 school districts). It is also a diverse program: of the 1,441 girls who participated in Girlstart After School in 2015-16, 64% are Latina, 13% are white, 11% are African-American, 4% are Asian-American, and 8% identify as multiethnic or are of another self-identified ethnic group.
- In 2016, 130 women leaders gave a combined 601.5 hours, were presenters and co-presenters at Girls in STEM Conference, offering 34 different workshops in STEM topics.

What worked well in your project?
- Using NASA-rich content to create engaging curriculum.
- Partnering with schools/community organizations.
- Exceeding our metrics: 94% of participants understand that doing well in STEM in college can lead to a better job.
- Girlstart girls are more likely to perform better on standardized tests in science and math, more likely to be commended to the pre-AP track for science and math in middle school, and evaluation demonstrates that Girlstart girls, following their program involvement, take advanced and pre-AP STEM courses at dramatically higher rates. For program report visit https://issuu.com/girlstart

What challenges did you have? Did you overcome them? What did you do to adapt?
- Continue to adapt and modify our curriculum. Sold out camp!
- Camp’s physical spaces change from week to week, but still have to provide program that draws them in.
- As we grow, we are committed to maintaining the same high quality of programming that has come to define our brand, even as we double the numbers of girls we will serve. Our large and diverse community of supporters is helping us address this challenge, and we also plan to bring on several consultants to ensure that our program expansion is successful, impactful, and goes smoothly.

How will you sustain these activities or adapt them with the changing priorities of the audience?
Every year we do a curriculum audit to determine what activities were most successful in regards to implementation, content and engagement. Girlstart is committed to sustaining our programs and, as possible, expanding the reach of the programs that we were able to implement, thanks to the CP4 program.

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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 worked 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 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) Hawai‘i Department of Education-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) new permanent exhibit at Bishop Museum on NASA ESS.

How did your project address Bridging the Distance: Remote Access through Technology?

• Handing over the creation of curricula to currently-active classroom teachers, hired on contract to create product; going directly to the users of curricula to create the curricula.
• Use of on-line workshop segments along with face to face workshop sessions to deliver curricula and PD credit to local teachers on neighbor islands in an affordable way.

How did you harness the disruptive issue to enhance the mission of your museum?

• Bishop Museum needed to find creative, affordable ways to address its educational mission; this workshop format allowed us to do that without breaking the bank in terms of staff travel costs.
• Museum wanted to get beyond ‘battle of the hunches’ in terms of determining what teachers and students really need from the museum; building a team of currently-active teachers in the grant, and having them not only create curricula but also give feedback on planetarium-SOS program, exhibit, etc. was a big help in achieving this goal.
What worked well in your project as it addresses Bridging the Distance: Remote Access through Technology?

- Workshop model: mixing face to face and online
- Mix of museum staff and NASA STEM teacher working together for community events.
- Google: Docs, slides, sites, chat, hangouts, etc.
- Teleconferencing
- Offering professional development credit through the Hawaii Department of Education

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

- Many different players in the NASA team: teachers, museum staff, two evaluators, curriculum expert, remote education expert on contract. Solution: accept that it’s hard and will take a lot of work; online communication combined with face to face meetings helped the team.

How will you sustain these activities or adapt them with the changing priorities of the audience?

- Portable digital dome will remain active
- Online learning center remains a chief means of getting educational content out there, and will be added to with additional grant and other educational product

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

vMAX addresses the widely interdisciplinary science around the detection, observation, and understanding of exoplanets (planets beyond our own solar system). Main project components consist of a virtual world of 3D simulations and interactive experiences that students explore through their own avatars; interconnected summer camps for middle school students with museum and science center partners nationwide (US Space & Rocket Center, Huntsville, AL; Chabot Space & Science Center, Oakland, CA; SciPort: Louisiana’s Science Center, Shreveport, LA; New York Hall of Science in Corona, NY); integrated online educator implementation guide and curriculum; and exhibit kiosk for visitor interaction with the virtual world.

How did your project address this disruption:
Bridging the Distance – Remote Access through Technology?

Instead of traditional uses of technology, vMAX uses new and varying technologies to bridge distances and create remote connections in new ways, including:

- Students attending a weeklong summer camp, which includes both hands-on activities and experiences exploring a virtual world with 3D simulations of exoplanet data, models, and observation tools, and during which students investigate real exoplanetary systems and NASA data.
- Students interacting live with students at other camp locations via the virtual world, and connecting with NASA scientists and other scientists working with exoplanets.
- vMAX project team creating a flexible, online resource for educators, based in standards, including problem- and design-based learning, and integrating experiences in virtual world simulations and real world activities.

These activities created opportunities to:

- Connect students across the country who would not otherwise meet
- Provide access for students to scientists and technology resources “on students’ turf” (e.g. a technology medium in which they are more comfortable)
- Build connections to real NASA data on exoplanets, so students can take ownership of real data for their own projects and ideas
- Create resources and increase capacity for educators to connect with each other and utilize resources, via a professional development webinar series.

How did you harness the disruptive issue to enhance the mission of your museum?

vMAX enhanced our mission by creating resources to build personal and nationwide connections, reach broader audiences, and integrate program resources into museum
exhibits. Activities included:

• 11 weeklong summer camps held at the five partner institutions nationwide, for 247 middle school students
• 11 professional development webinars (content and technical) for educators nationwide; attendees included 46 middle school teachers, 74 informal educators, 55 pre-service teachers, 8 college level teachers (as of 9/16/16)
• An estimated 5,520 middle school students indirectly reached via educators attending webinars
• A projected attendance of 750,000 visitors to potentially interact with vMAX exhibit in the first year of our new museum

What worked well in your project?

• Letting student and teacher feedback from initial implementation years inform the balance of virtual versus real world interactions in camp experiences
• Creating multiple ways to use technology in programs to ensure students with varying levels of comfort in speaking and technology use could find ways to interact with students at partner sites
• Connecting students with “the real thing” – interacting with real scientists, working with real data, and experimenting with real design and engineering processes

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

• Institutional variations in infrastructure, staffing, technical expertise, and time zones made coordination and replication at times difficult to keep on equal footing; we worked with each partner to identify ways to structure the experience that worked for individual institutions
• Variations in students’ interests and personalities at each partner site, which made for lopsided live connections at time; we found ways to use different levels and types of interactions via the virtual world, Skype, etc, to allow students to interact in ways that were more comfortable for them

How will you sustain these activities or adapt them with the changing priorities of the audience?

Future activities for vMAX include:

• Continuing dissemination via professional development webinar series
• Adapting the vMAX curriculum and resources for broader audiences, including high school students, after school audiences, and museum visitors
• Development and implementation of virtual world aimed for a museum visitor experience within a new museum exhibit

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