



**Building Science Capital and Engaging
New Audiences in STEM Experiences**



Presenters:

Hardin Engelhardt, Marbles Kids Museum

Megan Ennes, NC State University

Sarabeth Gordon, Pensacola MESS Hall

Tara Henderson, Explora

Dr. Gail Jones, NC State University

Hope Thomson, Morehead Planetarium and Science Center

Jan Weems, North Carolina Museum of Natural Sciences



AGENDA

- Introductions
- Icebreaker
- What do we know about science capital?
- How are museums building science capital?
- What can your museum do?

Ice Breaker: Bingo!

- Walk around and ask if the statements in the boxes apply to the people you meet
- They initial the box; no more than 2 per sheet
- Free space: Initial *one* box that applies to you!

FAME: Families and Museums Exploring

If we build science capital and family science habitus with youth and their families...

We will enhance the participation of the youth in STEM leisure activities, increase their science self-efficacy and interest in STEM, and ultimately enhance STEM career aspirations.



Science Capital

Science Capital: the academic, social, and cultural aspects of a students' life that may or may not encourage interest and participation in science.

Family Habitus for Science: science and engineering is “‘who we are,’ and ‘what we do,’ and what is ‘usual for us’” (Archer et al., 2012)



Mediating Processes:

- Successful Family Experiences
- Shared knowledge of STEM careers
- Interactions With Community Mentors
- Peer Community
- Access to STEM Tools and Resources

Embodied Experience:

- STEM Family Investigations
- Career Information
- Community-Based Mentors
- Museum Educators
- Take Home Activities
- Follow Up Experiences



FAME Family Program

Environment:

- Engaging Museum Science Program
- Food
- Transportation
- Convenient Time
- Flexible Scheduling and Attendance

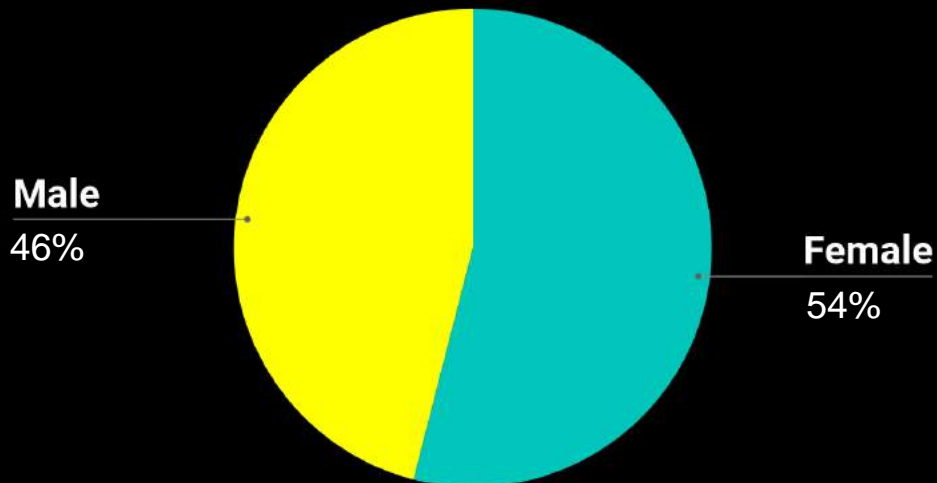
Program Outcomes:

- Enhanced Interest and Knowledge About STEM and STEM Careers
- Enhanced Sense of Community in STEM
- Enhanced Science Capital
- Enhanced Family Science Habitus
- Increased Interest in STEM Careers

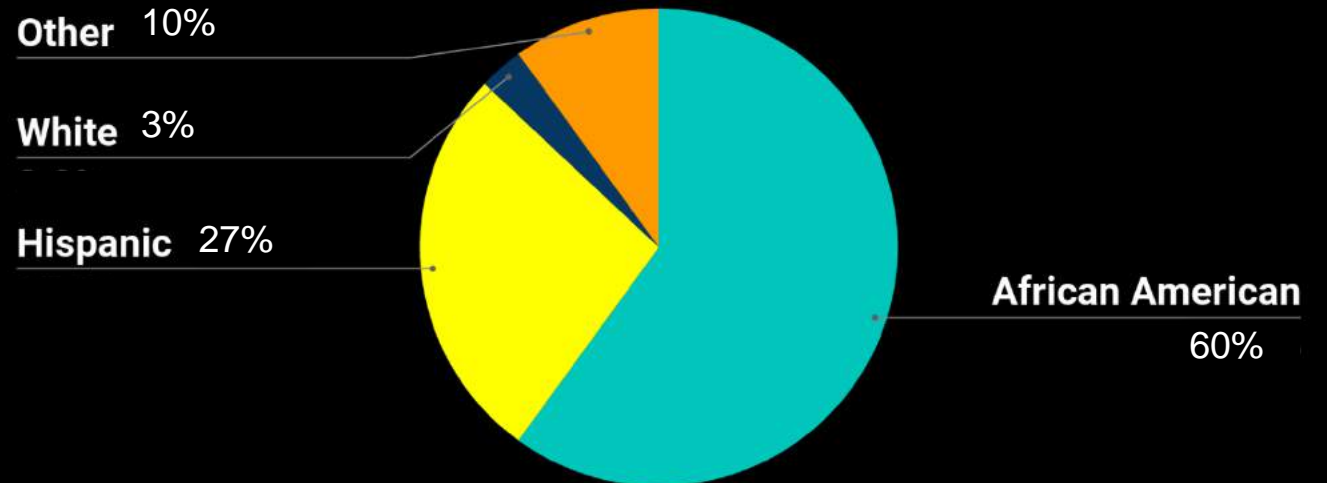
Participants

- 48 youth and their families completed the entire program

Percentage of Participants by Gender



Percentage of Participants by Race



- 12.5% spoke Spanish at home
- Attendance for the 10 programs totaled 1400

Early Findings- Youth

- Significant growth for self-efficacy and science experiences

“She has decided she wants to be a bridge engineer. Which was something that she had never, ever vocalized. I think the last time I asked she wanted to be a pet sitter, so to go from being a pet sitter to ‘hey I want to build bridges’ speaks to how excited she is about what she has experienced.”

“Yes, it does [change the way I feel about science] because I used to think science was boring because in school I didn’t really get what it means or I wouldn’t understand what they were talking about. Then in science club it’s more fun than at school.”

Early Findings- Siblings

- Impacts reached much farther than our target youth

“I wanted to let you know that Cameron is receiving the principal’s award for science on April 18 at [his school]. Cameron has learning disabilities and could never achieve a grade higher than a D. **He is now averaging a 98 (A).** I credit you all for his increased interest and improvement with his science grade. Thank you for welcoming him and including him in all of the events even though he’s in the 7th grade.”

“Our other son also loved coming to these events. It was actually really good for him and us because we often think of our other son (the one enrolled in the program) as being the real science/math kid and him (the sibling) into reading and sports. **But he is absolutely just as interested in science.** Thanks for helping us see that.”

Early Findings- Parents

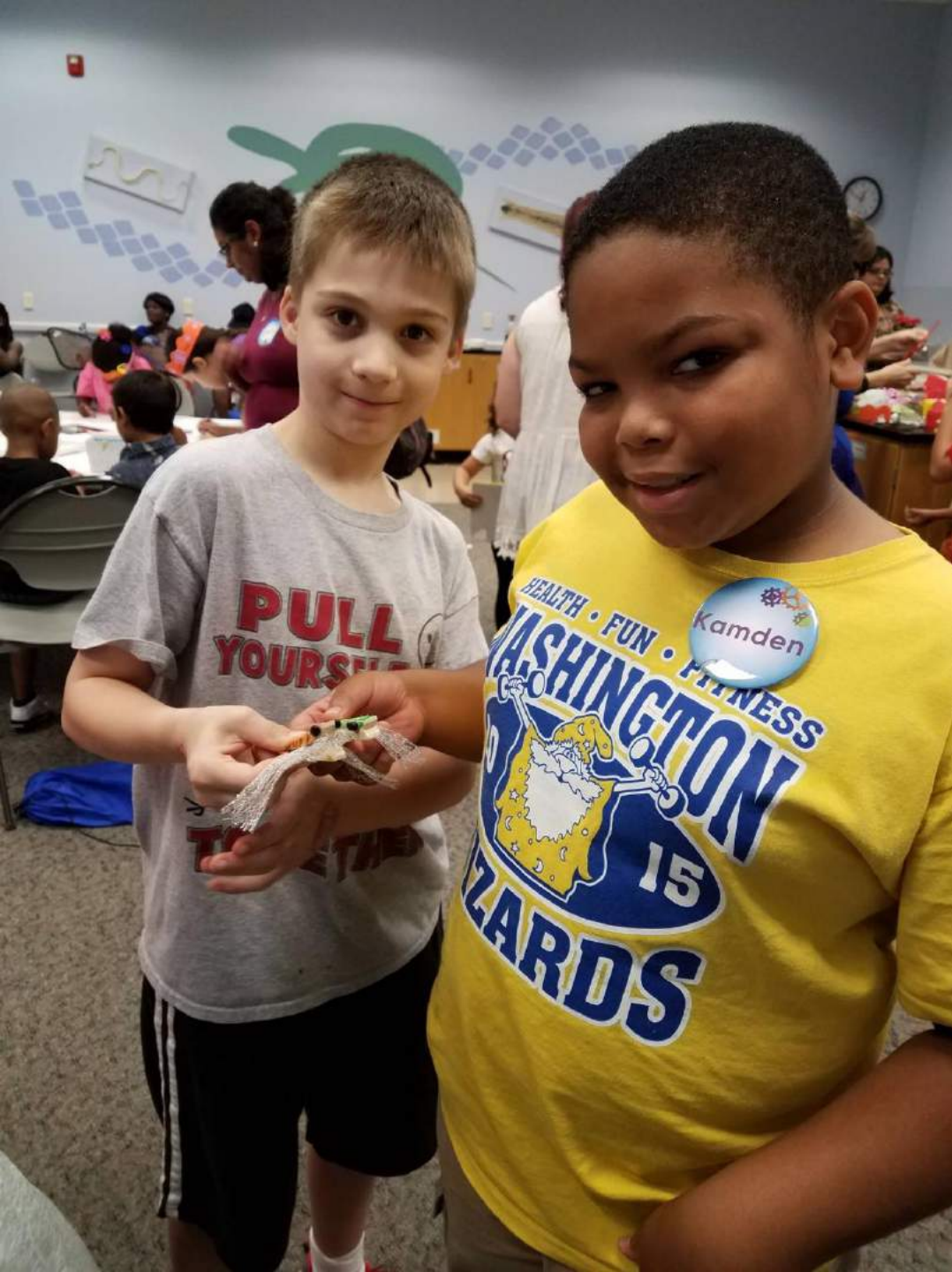
- 100% of parents reported a positive impact
- 3 parents decided to return to school for a STEM degree

“It’s made it easier to see if I can try again to go back to school... Seeing with the people that were doing the instruction and the people that helped it and giving some background about what they were doing. Listening to them talk about what they do and the types of jobs that they may do, and what they do when they do, do their job and, main thing, knowing it was all local. Different parts of the state but it’s all still local.”

“It definitely opened our world to science. I actually developed a “like” relationship with science. Not quite with the “love” thing yet... I mean, we have conversations about space. At night, we’re looking at the moon to see if we know if it’s a full or half moon, stuff like that. To see if we can find the big dipper, the north star. With every activity that we’ve had, it’s really opened our world up to the world around us.”



Marbles Family Science Club



Program Overview

- Monthly gatherings attached to planned public events
- Shared meal
- Scaffolded programming
- Participation in public event
- Closing gathering
- Take-home activities
- Consistent leadership
- Incentives for participation



Participants

- 3rd graders and their families recruited from highest needs elementary schools in district
- Groups underrepresented in STEM careers
- Schools and partners assisted with recruitment
- Kids interested in STEM with few opportunities for out-of-school STEM learning
- Adult participation required



Findings

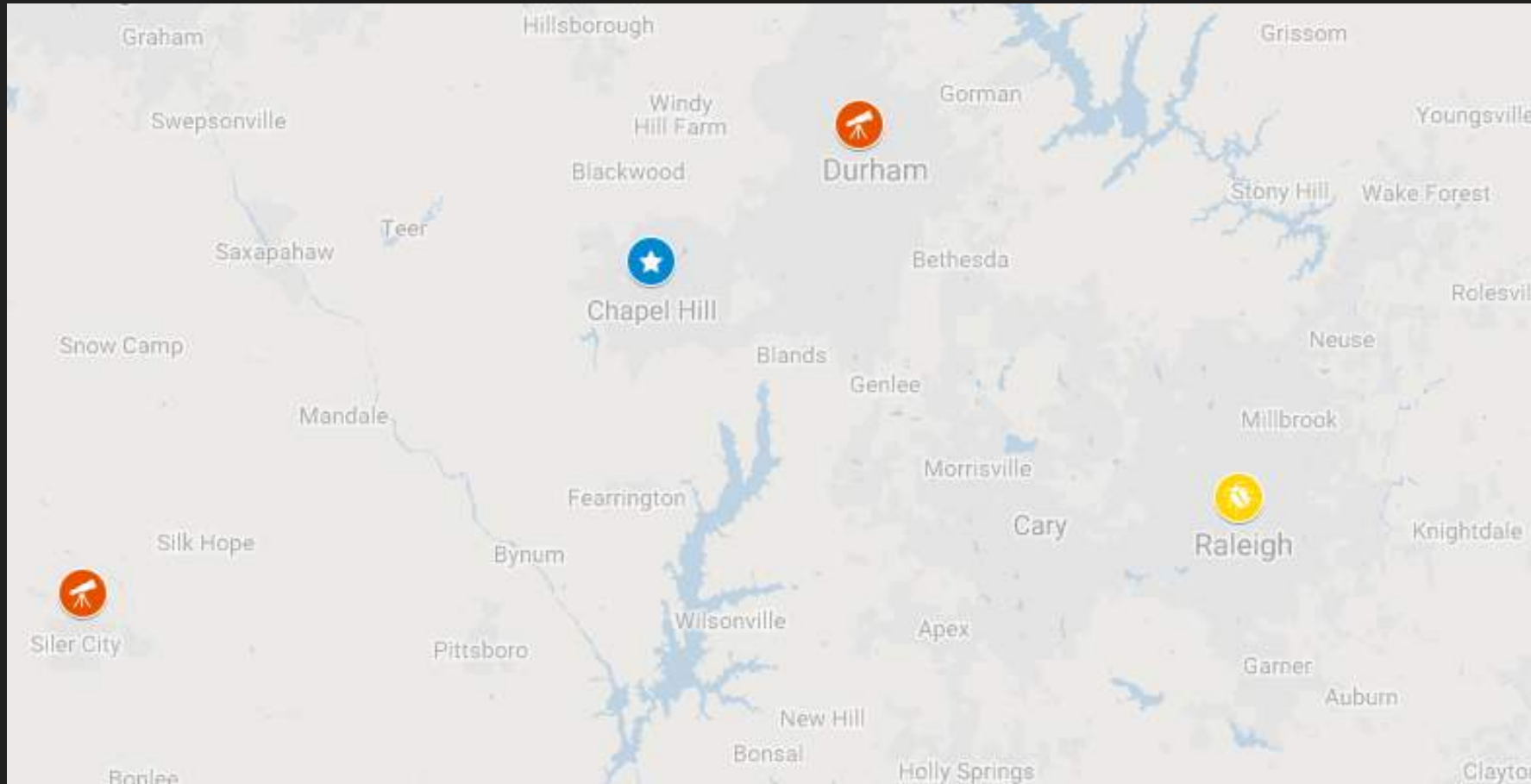
- High levels of attendance
- Repeat visitation to museum
- Increased comfort with unfamiliar settings and activities
- Heightened interest in other STEM programs
- Heightened engagement in school
- Sense of belonging and ownership
- Importance of relationships



Lessons Learned

- Lead with relationship-building and fun
- Careful recruitment
- Ongoing communication critical
- Think sustainability from the start

Morehead Planetarium and Science Center



Problem: Discomfort with Morehead



- Historic building
- College campus
- Unfamiliar territory

Solution: Make it fun!

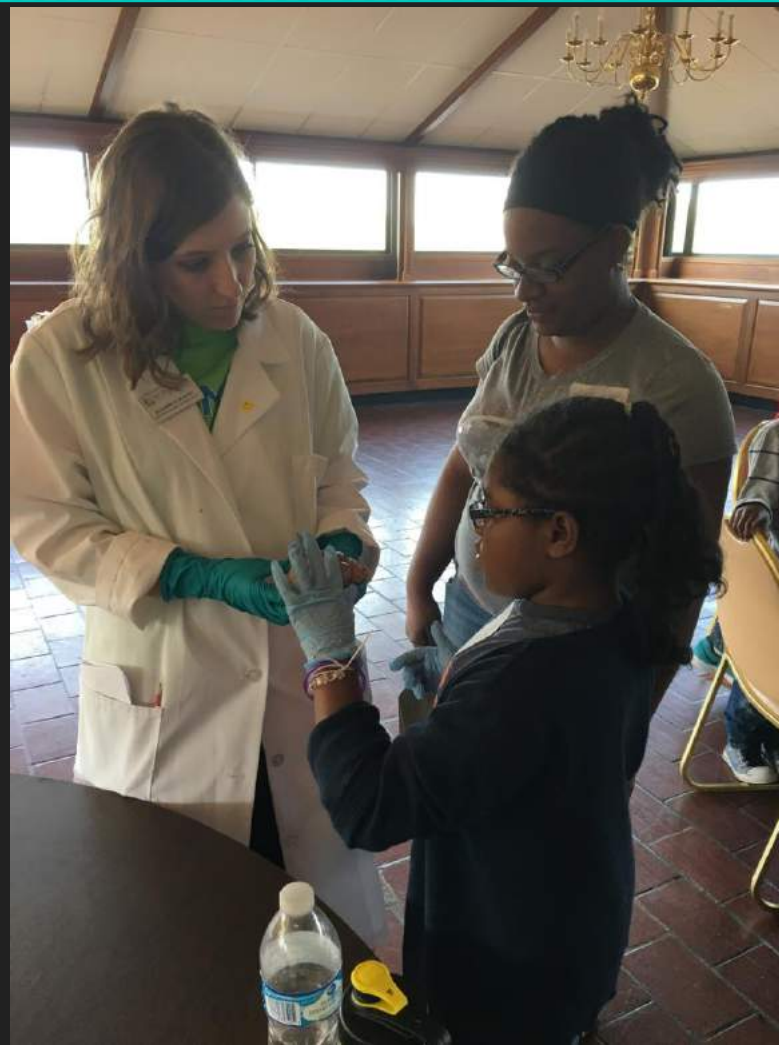


Sky Stories @ Stagville State Historic Site



- Close to home
- Experienced partner
- Historical ties

Other Challenges



North Carolina Museum of Natural Sciences



To illuminate the natural world and inspire its conservation.

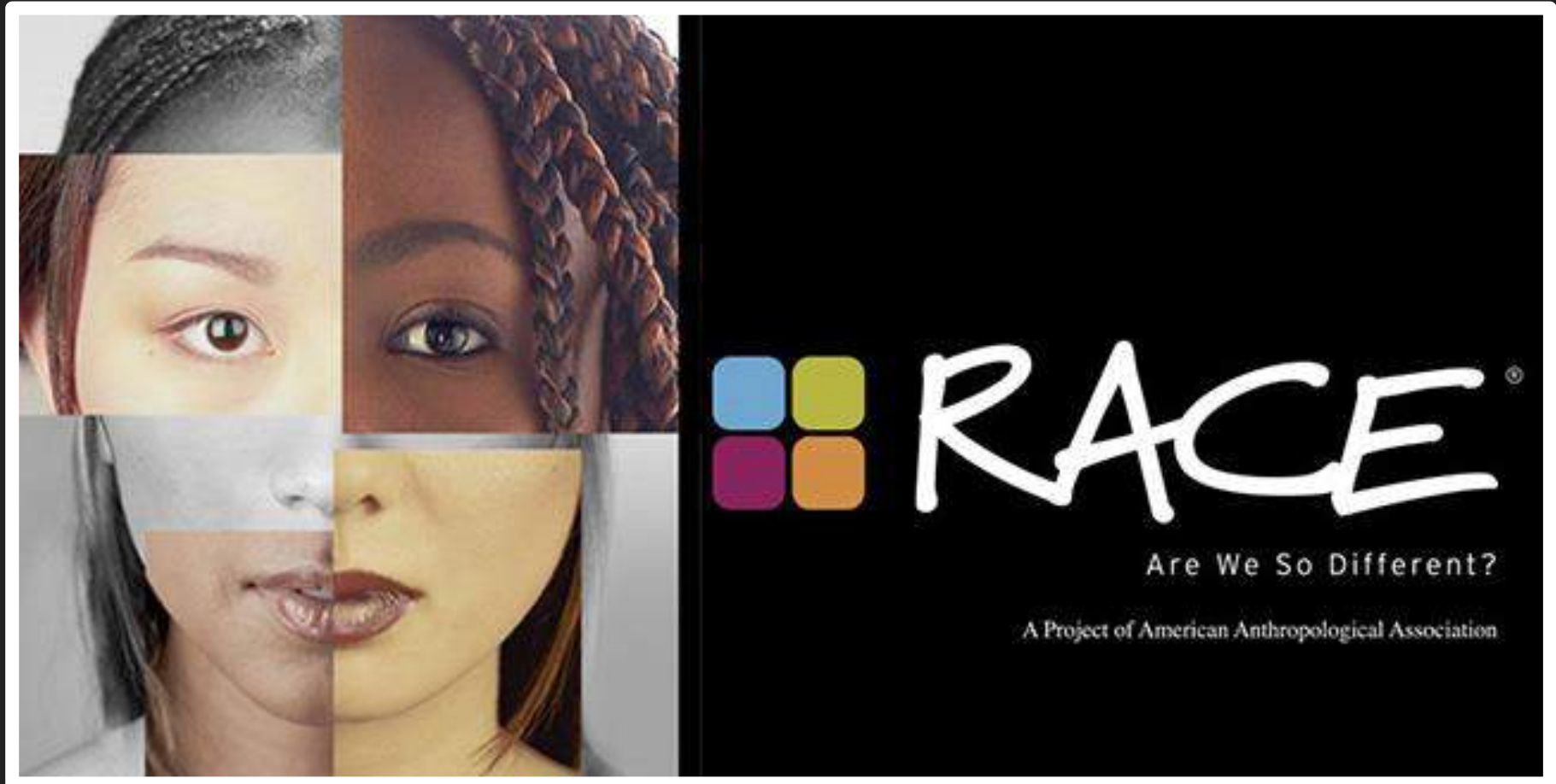
Family Explorer Club
Pivotal Events &
Key Concerns

- Opening Program
- Astronomy Days
- Bird Banding

NCMNS: Opening Program

How to come together
as a learning
community?

- Cultural Conversation
- Sharing a Meal
- Extension Activity



NCMNS: Astronomy Day



How to make scientist
“real” people?

Find a scientist with:

- a strong personal narrative
 - who communicates well
 - can participate in an intimate setting

NCMNS: Prairie Ridge EcoStation



NCMNS: Bird Banding

How to make the outdoors inviting for families?

- Adapt to the needs of the families: extra warm clothing & hot chocolate & flexible time schedule
- Provided authentic science research experience
- Embrace and celebrate nearby nature



To illuminate the natural world and inspire its conservation.

NCMNS: Family Explorer Club



Astronaut
Douglas
Wheelock and
Family Explorer
Club
January 2018

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Creating opportunities for inspirational discovery and the joy of lifelong learning through interactive experiences in science, technology, engineering, art, and math.



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A Few Basic Facts for the Navajo (Diné) Nation

- Largest reservation covering over 27,000 miles.
- Most homes do not have electricity, running water, or telephones.
- ~ 50% (180,000) of Navajo tribal members live on or near the Navajo Nation.
- 32% of households have an income of less than \$15,000.

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**WELCOME
TO
ASHKII HAPPY
KIDS DAY**



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The Explora Family Science nights are an amazing opportunity for inter-generational fun and learning. Explora has provided these opportunities to the remote tribal communities on the Navajo reservation where these experiences are rarely available.

Alana McGrattan, DCA, State Tribal Libraries Coordinator

The students asked if Explora would be coming back to the Navajo Nation Chapters for more education science fairs.

Church Rock Chapter House

Please send Explora our Way again for fall and spring semester of SY18-19 at NO COST to our school since we don't have much funding to expend.

Principal at Naschitti Elementary

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Challenges:

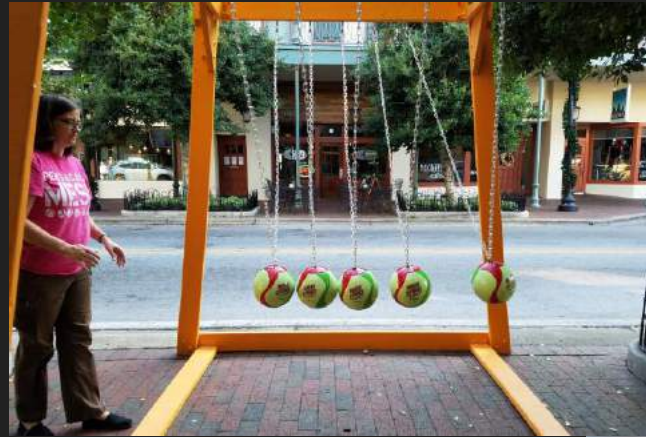
- Building relationships - in person conversations are essential
- Lots of driving!!!!
- Knowing when all the other events in community are happening to avoid conflicts
- Time is relative



PENSACOLA MESS HALL

Science on the Street

- Part of a 2 week arts & culture festival
- All interactive exhibits
 - 4-6 Large
 - 6-8 Be the Experiment
- 24 hours a day for 12 to 14 days
- Located along a main downtown street
- All weather conditions
- Non-facilitated



Essential Items

- Big, visual, photographic
- Well placed logos
- Hardy construction
- All weather materials
- Extensive planning
- Consider all possible interactions



Challenges

- Exhibit placement
 - Lighting
 - Surrounding businesses
- Signage
- Theft
- Considering all possible interactions



What Can Your Museum Do?

- Who is not being reached by current community STEM programming?
- What kinds of STEM opportunities may engage this identified audience?
- What factors would support participation?
- What are you already doing?
- New ideas for feedback?

Thanks to Our Partners



NSF ITEST 1614468
NSF DGE 1252376

Contact us!

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