2018 MOBILE LABORATORY COALITION CONFERENCE REPORT

Mobile Laboratory Coalition

2018 MOBILE LABORATORY COALITION CONFERENCE

The 2018 Mobile Laboratory Coalition's 13th annual conference was held July 24-27 in Detroit, Michigan. There were 68 conference participants representing 41 programs and companies from across the US, as well as two international programs.

Hosted by MdBio Foundation, Inc., Seattle Children's Research Institute and Triune Specialty Trailers, the conference took up residence on the campus of Wayne State University. New this year were multi-speaker workshops that included several sessions from first time presenters.

Workshop topics included a wide variety of topics including:

- Curriculum demonstrations
- Getting started with your mobile lab program
- Engaging diverse audiences
- Disaster preparedness and response
- Evaluation
- Technology

The conference also hosted a lively poster session with 16 presentations, and mobile lab tours on campus at Wayne State. Post-conference surveys highlighted networking opportunities and educational content provided in the workshops.

Thank you all for your attendance and participation. Without so many quality contributions from our members, we would not have such a worthwhile conference each year. It was great to connect with you in Detroit and I look forward to seeing you next year.

Sincerely,

Joseph Wilkerson

2018 MLC Conference Organizing Committee:

Joe Wilkerson, MdBio Foundation, Inc.
Jennifer Colvin, MdBio Foundation, Inc.
Janeé Pelletier, MdBio Foundation, Inc.
Alexandra Main, MdBio Foundation, Inc.
Amanda Jones, Ph.D., Seattle Children's Research Institute
Sarah J. Weisberg, M.Sc., BioBus, Inc.
Patricia Irizarry, Ph.D., Rutgers University
Sherry Painter, Ph.D., LeMoyne-Owen College
Don DeRosa, Ph.D., Boston University
Harry Kurtz, Triune Specialty Trailers

CONFERENCE SUPPORT

Funding for this year's conference was provided in part by the Science Education Partnership Award (SEPA) program at the National Institute of General Medical Sciences NIGMS at the NIH under Award Number R13 OD021977. The views expressed in written conference materials or publications and by speakers and moderators do not necessarily reflect the official policies of the Department of Health and Human Service; nor does mention of trade names, commercial practice, or organizations imply endorsement by the U.S. Government.

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MdBio Foundation, Inc.

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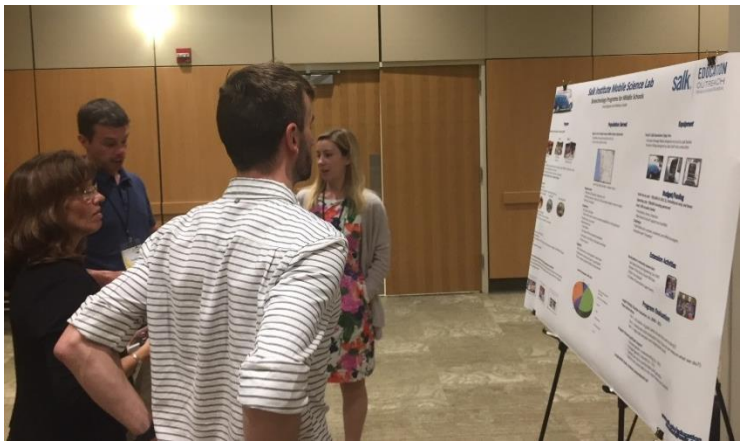


CONFERENCE SCHEDULE

WEDNESDAY, JULY 25

8:00 – 8:30am Registration, coffee & networking

8:30 – 8:45am *Welcoming Remarks*

Dr. Sarah Weisberg
Behalf of Mobile Laboratory Coalition
BioBus, Inc.

Interim Dean Catherine Lysack
Eugene Applebaum, College of Pharmacy and Health Science, Wayne State University

What to Expect at this Year's Conference

Joe Wilkerson, MdBio Foundation, Inc.

8:45 – 10:15am Keynote Session: Really, What Could Go Wrong? Mobile Lab Disaster Room Tabletop Exercise

Facilitated by **Janeé Pelletier**, MdBio Foundation, Inc.

10:15 – 10:30am Break

10:30 – 11:20am Keynote Session: Brave Initiatives: Girls Building a Better World through Code

Dr. Robin Brewer, Detroit Lead, Brave Initiatives

11:30 – 1:00pm Lunch and Annual Business Meeting

1:00 – 1:50pm Plenary Session: A Blueprint for STEM Success

Michelle Reaves, Detroit Area Pre-College Engineering Program (DAPCEP)

1:50 – 2:05pm Program Introductions Round 1

2:05 – 2:30pm Break and Set up for Poster Session

2:30 – 4:00pm Concurrent Workshop Sessions

Design and Build a Mobile Lab Workshop

Facilitated by Joseph Wilkerson, MdBio Foundation, Inc.
Jennifer Colvin, MdBio Foundation, Inc.
Steve Creech, Wyland Foundation
Rebecca Dowd, MilliporeSigma
Dr. Ben Dubin-Thaler, BioBus, Inc.

Active Attacker: Emergency Preparedness for Active Shooter Situations

Lieutenant Dave Scott, Wayne State University Police

4:00 – 6:00pm Poster Session

THURSDAY, JULY 26

8:30 – 9:00am Registration, coffee & networking

9:00 – 9:50am Concurrent Workshop Sessions

Engaging Diverse Learners with New Technology and Methods

Facilitated by Dr. Patricia Irizarry, Rutgers University
The Scope of STEM and Diversity: Engaging Girls in STEM
Lori Harvey, Hitachi High Technologies
Engaging Middle School Students from Underrepresented Minorities in the STEM Disciplines
Dr. Patricia Irizarry, Rutgers University
Partnering with Verizon Innovative Learning to Bring High End Technology to Mobile Education
Dr. Benedetta Naglieri, MdBio Foundation, Inc.

Community Collaboration: Development of Successful Mobile Programs

Shiloh Slomsky, Little Traverse Bay Bands of Odawa Indians, SEEDS Project

9:50 – 10:00am Break

10:00 – 10:50am Concurrent Workshop Sessions

Instructor Exchange Program: Lessons Learned from Doing Someone Else's Job

Facilitated by Dr. Amanda Jones, Seattle Children's Research Institute
Corey Coombs, Seattle Children's Research Institute, Science Adventure Lab
Patrick Flanagan, Ocean Learning Lab and Immersive Experiences (OLLIE)
Dr. David Garbe, Pennsylvania Society for Biomedical Research (PSBR)

The Curiosity Cube: Engaging Employees and Communities using a Retrofitted Shipping Container

Rebecca Dowd, Millipore Sigma

11:00 – 11:50am Concurrent Workshop Sessions

Evaluating Program Impact

Facilitated by Joseph Wilkerson, MdBio Foundation, Inc.
Program Evaluation of Informal Science Settings
Roya Heydari, BioBus, Inc.
Three Phase Evaluation to Measure Success of Impact of Salk Mobile Science Lab on Students and Teachers
Dona Mapston, Salk Institute for Biological Studies
Evaluation Onboard the MXLab: Strategies and Lessons Learned
Joseph Wilkerson and **Emily Freeland**, MdBio Foundation, Inc.

Solar Circuits with Science on Wheels

Dr. Sherry Painter, LeMoyne-Owen College

11:50 – 1:15pm Lunch

1:15 – 2:05pm Concurrent Workshop Sessions

Mobile Learning for Mobile Labs

Dr. Carla Romney and **Dr. Donald DeRosa**, Boston University

Is Your Science Diverse? Promoting Equity of Access in Your Mobile Lab Program

Daniel Wheeler, Morehead Planetarium and Science Center

2:30 – 4:00pm Mobile Lab Rodeo

4:30 – 8:30pm Old School Game Night & Dinner

FRIDAY, JULY 27

8:30 – 9:00am Registration, coffee & networking

9:00 – 9:15am Program Introductions Round 2

9:15 – 10:15am **Keynote Session: "Yes, And..." The Power of Improv to Improve your Teaching**

Pj Jacokes, Producer and Co-owner, Go Comedy!

10:15 – 10:30am Break

10:30 – 10:45am Program Introductions Round 3

10:45 – 11:30am Workshop Session

Thinking Outside the Box: New Ways to use Mobile Labs

Facilitated by Dr. Donald DeRosa, Boston University

Incorporating Google Expeditions in Curriculum

Chris Chung, Sustain-ED and **Dr. Donald DeRosa**, Boston University

Mobile Education's Role in Disaster Relief: A Template for Innovation

Emily Freeland, **Joseph Wilkerson**, and **Jennifer Colvin**, MdBio Foundation, Inc.

PLENARY SESSIONS

Really, What Could Go Wrong? Mobile Lab Disaster Room Tabletop Exercise

Wednesday, July 25, 8:45 – 10:15am

Presenter: **Janeé Pelletier**, *Vice President of Communications and Events, MdBio Foundation, Inc.*
Reporters: **Emily Freeland**, *MdBio Foundation, Inc.*
Mary Hall, *Bio-Bus Program, Georgia State University*
William Roden, *Seattle Children's Research Institute*

Session Description

A group activity to work through different "disaster" scenarios surrounding a mobile lab program that could potentially happen on any given school and/or funder visit. Participants were separated into groups and assigned roles (instructors, managers, administrators, etc.). Decisions were required to be based on resources that participants would normally have access to and could not be changed later on in the scenario. Table groups reported on what they learned and how to better prepare their teams for emergency situations.

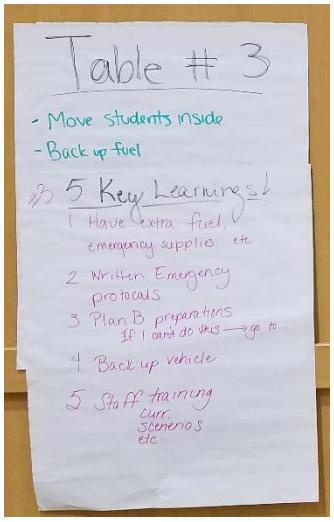
Working in Teams through a Disaster Scenario

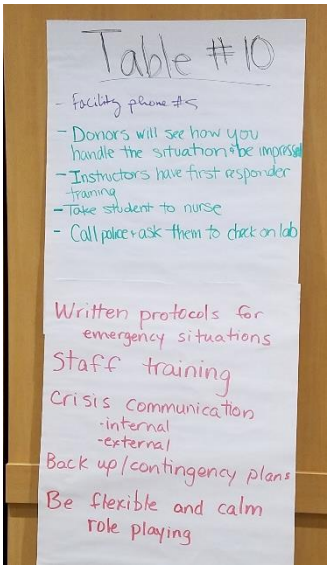
Situation: You have a school visit with five classes teaching two different lessons. A funder is coming to the lab with a camera crew and it cannot be cancelled. Your group may only work with resources that you have in real life to get through a disastrous day!

Problems and Possible Solutions

- Lab is broken into
  - Go inside school to use land lines
  - Call police
  - Take photos and video before touching anything
  - Move activities inside classroom
  - Rearrange teaching schedule to consolidate groups
  - Check equipment/take inventory
  - Turn class into forensics lesson
- Storm with strong wind and heavy rain, water leak near generator
  - Check weather in advance
  - Tarps
  - ID source of leak
  - Move teaching inside
  - Shut off generator
- Generator ran out of fuel
  - Back-up generator
  - Send someone to get more gas
  - Back-up fuel
- Tagged with gang graffiti
  - Graffiti removal (special cleaning product) carried on bus
  - Control media narrative
  - Cover with posters
- Student pulling out posters from cars (unknown topic or reason)
  - Inform school staff if they are unaware
  - Ensure instructors are aware so they are not surprised by disruptions
- Supplies delayed
  - Do a different activity if possible

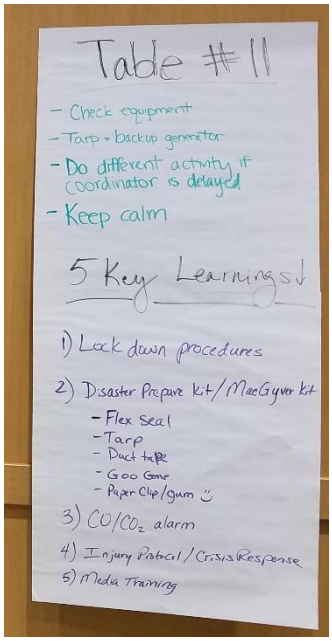
- Funders arrive early
  - Ask students to make presentation/engage with the funders
  - Funders will see how you handle the situation, be impressed
  - Tour of the school
- Student faints
  - Let teacher take the lead
  - Contact school nurse
  - Check bus systems (carbon dioxide, carbon monoxide)
- Student protest, media questions staff, students approaching vehicle
  - Lockdown protocols (if situation requires it)
  - Keep calm
- Driver can't pick up lab until the next day
  - Ask partners if they have a driver connection you can leverage
  - Ask police to patrol overnight
  - Go to hotel in personal vehicles
  - Overnight security from private company
  - Call tow truck/use school bus driver





Lessons Learned

- Emergency action plans needed (illness, shooter, etc.), ensure up to date and posted
- Establish media plan and train all staff on it - organization wide/crisis communication (internal/external)
- Purchase back up supplies, i.e. generator and fuel
- Maintain all safety equipment and trainings
- Identify outside resources in advance and utilize them when needed
- Shared (online) incident reports – AirTable
- WIFI calling
- Drills for emergency procedures (such as bomb threat or active shooter)
- Written procedures and operation checklists
- Develop lockdown procedures
- Identify local recourses (esp. if remote)
- Extensive contact information for various school personnel
- Plan B (C, D, ...) for vehicle moving
- Toolkits/disaster prepare kits/first responder kits
- Stay calm, think logically, cross training of staff
- Communication procedures
- Learn to de-escalate
- CO/CO2 detectors/alarms
- Set staff expectations and school expectations
- Turn negatives into positives (teaching/learning moments)
- First responder training for instructors



Participants

Gary Barnett, Region 13 Education Service Center
Michelle Blodgett, Michigan Farm Bureau
Robin Brewer, Brave Initiatives
Lorenza Calcaterra, Sainsbury Wellcome Centre (UCL, London)
Becky Carter, Seattle Children's Research Institute
Alex Chang, Seattle Children's Research Institute
Chris Chung, Sustain-ED
Jennifer Colvin, MdBio Foundation, Inc.
Oscar Contreras Villaroel, Ecoscience Foundation
Yosuke Kawamura, Nagoya Institute of Technology
Chuck Keeler, Utah STEM Action Center
Dimitri Klebe, National Space Science & Technology Institute
Harry Kurtz, Triune Specialty Trailers
Sarah Kurtz-McKinnon, Triune Specialty Trailers
Seneca Lee, BioBus, Inc.
Ji Sun (Sandy) Lee, Pasadena City College
Alexandra Main, MdBio Foundation, Inc.
Kara Mann, Liberty Science Center

Corey Coombs, Seattle Children's Research Institute
Kimberly Cox-York, Colorado State University
Hannah Crawford, Greenwood Genetic Center
Michele Dahlberg, Scientopia
Nancy DeJarnette, University of Bridgeport
Natasha Deleon, Puerto Rico Vector Control Unit
Don DeRosa, Boston University CityLab
Jeanette Diaz, Pasadena City College
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Monika Tucker, San Diego Children's Discovery Museum
Bruce Waller, Institute for Advanced Learning and Research
Sarah Weisberg, BioBus, Inc.
Daniel Wheeler, Morehead Planetarium and Science Center
Joe Wilkerson, MdBio Foundation, Inc.

Brave Initiatives: Girls Building a Better World through Code

Wednesday, July 25, 10:30 – 11:20am

Presenter: **Dr. Robin Brewer**, *Detroit Lead, Brave Initiatives*
Reporters: **Patrick Flanagan**, *Ocean Learning Lab and Immersive Experiences (OLLIE)*
David Garbe, *Pennsylvania Society for Biomedical Research (PSBR)*
Mary Hall, *Bio-Bus Program, Georgia State University*
Daniel Wheeler, *Morehead Planetarium and Science Center*

Session Description

Brave Initiatives is a coding camp for high school girls that introduces them to coding but also encourages and empowers them to solve real-world problems that they care about. It is designed to help young women think critically about issues in their community and how they could be addressed with technology.

Goals of Brave Initiatives

- Huge lack of diversity at the "tech development table"
- Have girls get out of their comfort zones, and ask them to do things that they've never been asked to do
- Self-efficacy - confidence and belief that they can code/be a coder
- Social impact - connect tech to something bigger than just the tech itself - their community/peers
- Develop curriculum that places technology in the context of real-world uses and impact--more appealing to female students
- To increase female interest in coding/technology
- Increase diversity, by targeting areas where female coding is particularly low (African American, Latinx, etc.)
- The goal of Brave is not to say that everyone must be a coder, and everyone has to go to college, but to broaden exposure and awareness to reduce fears of coding - connected with their interests in neuroscience, makeup, etc. Encourage interdisciplinary connections.

About Brave Initiatives

- Mobile Lab for coding camp for high school girls
- Started in Chicago
- Expanding from 1 city with 60 girls in 2016 to a goal of 7 cities with 2,000 girls in 2021
- Camps
  - Monday through Friday, 9-5pm

    - Build websites by learning HTML, CSS, JavaScript
    - Work on team-building, user-centered design, iteration, public speaking
    - Provided at no cost
- Workshops
    - Half-day programs on Saturday mornings, 9-1pm
    - Talk more about real-world applications
    - Focus on program design and learn other things like Python, 3D Printing, VR/AR, games for social good
    - Paired programming/team building

Examples of Camp Products

- One team built the *Stand Together Society* website in five days to combat bullying
- Another team developed a game to talk about how to build healthier eating habits in the cafeteria
    - The game is tied to their cafeteria swipe cards, and if you purchase something in the cafeteria that's healthy (in real life), your character (in the game) gets more points
- Other websites for healthy bodies, menstrual cycles, etc.

Basic Principles

- Never start on a computer, never stay on a computer – They don't look at a line of code until the end of Day 1, and there is no coding on Day 2. Frustration is real, so they try to balance experiences on and off computers
- Embody the experience as much as possible. Start the day doing rock, paper, scissors in the hall - not just an unrelated activity, but leads into the outline of the pseudo-code
- Emphasize the impact beyond code - e.g. games for social good. Talk about the impact of games for raising awareness for social goals such as regulating emotions or women's health.

Operating Model

- Develop relationships with cities, organizations, and businesses in the community to get funding for the program
    - Seek sponsorship before going into the city as much as possible
- Find and train local champions - companies who want to host the camp, but might not know how
    - Train the trainer - camp attendees that are extremely interested are trained throughout the year after their camp session to learn more about leadership
    - They then come back to train the next group of students the following year (full-circle concept)

Operating Cities

- Detroit
- Indianapolis
- Kingston, Jamaica
- Chicago
- Planning on extending to Jakarta, Taipei, and a Native American reservation in New Mexico

Overall Planning Questions when Developing Programs and Partnerships

- Expansion - As you expand to new areas, you need to be flexible and fit your program to individual local needs
- Where is the greatest need?
    - Ann Arbor has more resources, so they held it in Detroit
- How does transportation work?
    - In Chicago, downtown was easy to get to by public transit
    - In Detroit, downtown has more expensive parking
- What do families value?
    - Parents want to make sure their kids have access to safety, food

- In other cases, families want their kids to learn how to give presentations, or have opportunities to learn beyond the camp
- What resources are available?
  - Kingston had very slow internet - only three people could connect to the internet at a time, so it was hard to Google for debugging, or upload their code
- What is school like?
  - In Kingston, they don't do 9-5, and they had to structure the day differently
  - Some breaks involved naps or yoga
- At the end of the camp, provide independent breakout sessions for families and parents so they can learn more about tech and how they can work with their children to explore this area further.

Outcomes and Measurement

- Identity and beliefs about self
- Short-term success: Pre and post surveys
  - Self-identity in this space
  - Design
  - Public speaking
- Long-term success
  - How many girls are returning to camp in subsequent years?
  - How much are they sharing with friends?
  - What do they go on to do after camp?

Participants

Rick Armstrong, Farber Specialty Vehicles
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Michelle Blodgett, Michigan Farm Bureau
Lorenza Calcaterra, Sainsbury Wellcome Centre (UCL, London)
Becky Carter, Seattle Children's Research Institute
Alex Chang, Seattle Children's Research Institute
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Bruce Waller, Institute for Advanced Learning and Research
Sarah Weisberg, BioBus, Inc.
Daniel Wheeler, Morehead Planetarium and Science Center
Joe Wilkerson, MdBio Foundation, Inc.

A Blueprint for STEM Success

Wednesday, July 25, 1:00 – 1:50pm

Presenter: **Michelle Reaves**, *Executive Director, Detroit Area Pre-College Engineering Program (DAPCEP)*

Reporters: **Bruce Waller**, *Institute for Advanced Learning and Research*
Sherry Painter, *LeMoyne-Owen College*

Session Description

This session describes DAPCEP's (Detroit Area Pre-College Engineering Program) efforts toward creating a successful STEM program. Michelle Reaves discussed lessons learned and success stories.

DAPCEP History

This program was founded by Mr. Hill in 1976 to increase the number of historically underrepresented students pursing STEM degrees. Started in direct partnership with Detroit public schools. 256 students in 1976 were involved with summer programs. Today there are 10,500 students at all levels. This program has innovative partnerships (in-school and out-of-schools), K-College programing and is a non-profit organization.

Obstacles & Lessons Learned

Obstacle	Lessons Learned
Parent involvement: parental support needed to ensure student success	⇒ Created parent advisory committee ⇒ Parent/student classes for K-3 students
Capacity: supply vs. demand; only highest GPAs used to control class size; perceived elitism	⇒ Increased university and corporate partnerships ⇒ Increased community outreach to change perceptions of elitism
Single focused curriculum	⇒ Shifted from engineering focus to STEM focus
Transportation: barrier to low income population	⇒ Created multiple bus depots ⇒ Created pop-up workshops
Earlier exposure: negative attitude toward math and science; low scientific vocabulary; lack of problem solving skills	⇒ Reduced program start age ⇒ Increased curriculum rigor based on students' capabilities
Increased competition: STEM is the "new black"; church, schools, non-profits, community organizations, and sports/bands are creating STEM programming	⇒ Cutting edge curriculum ⇒ Increased marketing (social media) ⇒ Acceptance that they couldn't meet all the needs by themselves anyway
Change in philanthropic landscape: single source funding went in a different direction; recession in 2008; new funding requirements	⇒ Needed to diversify their funding sources for future ⇒ Implemented tuition model ⇒ Measured impact to be able to speak to the funders ⇒ Chose to remain steadfast in mission
Expand Reach: perceived elitism; shift in population; change in educational landscape	⇒ Increased community outreach ⇒ Expand to all southeastern Michigan ⇒ Large capacity engagements

Framework Strategy

Rigorous curriculum standards, parent involvement, college partnerships (working with GEAR-UP), role model/life application (with corporate partners and alumni) all supporting student achievement.

Current Program Model

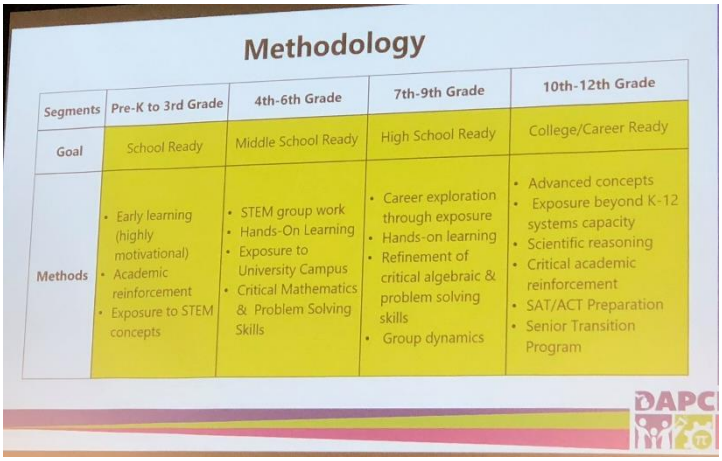
- Engage students at all levels. Start them early.
- Elementary age
  - Explorers program: pre-K-3
  - Pathfinders program: 4-12 grade self-selected courses
- Middle school age
  - Pathfinders program
  - Pop-Up workshops
  - DAPCEP in-school
- High school age
  - Pathfinders program
  - Pop-Up workshops
  - DAPCEP in-school
  - Talent tours and Bridge programs
  - Multi-year engagement
    - PAAMEE (Preparing African American Males for Energy and Education) – NSF funded project focused on working with African American males.

Program Demographics

- ~70% of participants qualify for free/reduced lunch
- Mainly target 4-12th grade
- Roughly 50/50 male/female
- Public, private, charter schools all served

Methodology

- Pathways
  - Exposure
  - Interest
  - Focus
  - Commitment
- Competency Building
  - Teamwork
  - Decision-Making
  - Ethics



Impact

- Alumni: 70,000 students
- 68% are in STEM careers
- Strengthen current program models and curriculum

Overall Planning Questions when Developing Programs and Partnerships

- Ensure rigorous and cutting-edge curriculum
- Exposure to community college and skilled trade careers
- Intentional recruitment of underserved in southeastern Michigan
- Strategic expansion in key areas of the country

Final Thought

"Be who you needed when you were younger..."

Participants

Gary Barnett, Region 13 Education Service Center
Michelle Blodgett, Michigan Farm Bureau
Lorenza Calcaterra, Sainsbury Wellcome Centre (UCL, London)
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Leta Tribble, Greenwood Genetic center
Monika Tucker, San Diego Children's Discovery Museum
Bruce Waller, Institute for Advanced Learning and Research
Sarah Weisberg, BioBus, Inc.
Daniel Wheeler, Morehead Planetarium and Science Center
Joe Wilkerson, MdBio Foundation, Inc.

"Yes, And..." The Power of Improv to Improve your Teaching

Friday, July 27, 9:15 – 10:15am

Presenter: **Pj Jacokes**, *Producer and Co-Owner, Go Comedy!*
Reporters: **Hannah Crawford**, *Greenwood Genetic Center*
Dillon Gary, *Greenwood Genetic Center*

Session Description

This session focuses on the use of Improv techniques to be a more effective communicator, listener, teacher, and leader. There are a few exercises that can be used to introduce active listening and learning in the moment more effectively.

Activity 1

To start the session, everyone in the room got in groups of two and played a game of rock-paper-scissors

- The partner that won then grouped up with another winning person and played again and kept going until one person won overall
- The partner that lost the match followed their partner around and encouraged them for the next "match" of rock-paper-scissors and then did the same for the winning person after that
- When there were only two people left playing, one whole side of the room was "rooting" for one person and the other side of the room was "rooting" for the other
- The takeaway from the game of rock-paper-scissors was that everyone should feel supported and should in return also support others, which is especially important on a mobile lab because sometimes you only have the other people on the lab to support you

Activity 2

Next was a listening activity that required the room to get in groups of two and say the alphabet back and forth to each other (for example I would say A and then my partner would say B...)

- Then, we had to do the same thing but instead say the alphabet backwards
- The final part of the exercise involved you and your partner having a conversation only by spelling out the words in the sentence (for example I had to spell out H-E-L-L-O...)

- This exercise was to force the participants to be active listeners. Saying the alphabet is easy, saying the alphabet backwards took more focus but spelling your conversation forced the individuals to actively listen so that they could understand one another.
- In improv, the instructor sets up the activity and gets out of the way so that the participants can learn and grow through experience. The same idea can be used as instructors in our mobile programs: set up your activity and get out of the way so your students can learn from experiences.

Activity 3

We again got into groups of two and had to count back and forth from 1 to 3 and then repeat the process (for example I would say 1 and my partner would say 2...)

- If either partner made a mistake, we would both have to loudly shout "TA-DA" to the entire room
- We then replaced saying number 2 with a clap (for example I would say 1 and then my partner would clap and then I would say 3...) Again, if either of us messed up, we had to shout "TA-DA" to the rest of the group
- We added a stomp to replace saying number three and went back and forth with our partner (for example I would say 1, my partner would clap, and I would stomp, and the process would repeat) Again, if either of us messed up, we had to shout "TA-DA" to the rest of the group
- The takeaway from this exercise was to be ok with making mistakes/failures and to celebrate them

Activity 4

"Yes And... Activity" For this exercise we got in groups of 5-6 and were instructed to create a piece of artwork by only drawing one line at a time

- After you were done adding your line to the artwork, you had to stand near the artwork with the marker held up and wait for the next person to come and grab it from you
- You could not talk to each other during the creation
- The takeaway from this exercise was to work as a group to create a piece of artwork that had to build off of the previous person's line. It shows you that there isn't only one way to get to a solution and to put your minds together

Activity 5

"Dr. Know it All" Five volunteers stood in the front of the room and played the role of Dr. Know it All and answered questions by each saying one word

- The question "What do you think the next great science invention will be?" was asked to Dr. Know it All and the group had to answer the question by saying one word at a time and the next person in line had to build off of the previous person's word
- The group answered: "Hamsters...and... sparkly...crumpets...being...used...for... an...energy...source"
- The takeaway from this exercise was again to engage in active listening and to work as a group to get to a solution

Session Takeaways

- Improv is all about team support, empathy, acceptance, active listening, learning to be ok with failures, and to create a safe space for people to feel comfortable in
- Improv can be used to learn in the moment more effectively
- These exercises can be used to become a better teacher, employee, employer, leader, friend, and can be used in your everyday life
- You can also use one or some of these activities as an ice breaker to get students more involved/interactive

Participants

Lorenza Calcaterra, Sainsbury Wellcome Centre (UCL, London)
Becky Carter, Seattle Children's Research Institute
Alex Chang, Seattle Children's Research Institute
Chris Chung, Sustain-ED
Corey Coombs, Seattle Children's Research Institute
Kimberly Cox-York, Colorado State University
Hannah Crawford, Greenwood Genetic Center
Michele Dahlberg, Scientopia
Natasha Deleon, Puerto Rico Vector Control Unit
Don DeRosa, Boston University CityLab
Tammy Diedrich, Anne Arundel County Public Schools
Madison Dodds, Salk Institute
Ben Dubin-Thaler, BioBus Inc.
Patrick Flanagan, Ocean Learning Lab and Immersive Experiences (OLLIE)
Emily Freeland, MdBio Foundation, Inc.
David Garbe, Pennsylvania Society for Biomedical Research (PSBR)
Dillon Gary, Greenwood Genetic Center
Lori Harvey, Hitachi High Technologies America, Inc.
Patricia Irizarry, Rutgers University
Amanda Jones, Seattle Children's Research Institute
Yosuke Kawamura, Nagoya Institute of Technology
Dimitri Klebe, National Space Science & Technology Institute
Harry Kurtz, Triune Specialty Trailers
Alexandra Main, MdBio Foundation, Inc.
Kara Mann, Liberty Science Center
Dona Mapston, Salk Institute
Colleen McCarty, Seattle Children's Research Institute
Amelia Miller, Utah State University
Benedetta Naglieri, MdBio Foundation, Inc.
Xavier Ocasio, Puerto Rico Vector Control Unit
Sherry Painter, LeMoyne-Owen College
Janeé Pelletier, MdBio Foundation, Inc.
Billy Roden, Seattle Children's Research Institute
Carla Romney, Boston University/Fordham University
Shiloh Slomsky, Little Traverse Bay Band of Odawa Indians
JaCinda Sumara, Oakland Schools
Leta Tribble, Greenwood Genetic Center
Monika Tucker, San Diego Children's Discovery Museum
Sarah Weisberg, BioBus, Inc.
Daniel Wheeler, Morehead Planetarium and Science Center
Joe Wilkerson, MdBio Foundation, Inc.

WORKSHOP SESSIONS

Design and Build a Mobile Lab Workshop

Wednesday, July 25, 2:30 – 4:00pm

Presenters: **Jennifer Colvin**, *Vice President of Education, MdBio Foundation, Inc.*
Steve Creech, *Director, Wyland Foundation*
Rebecca Dowd, *Curiosity Cube Coordinator, Corporate Responsibility, MilliporeSigma*
Dr. Ben Dubin-Thaler, *Founder and Executive Director, BioBus, Inc.*

Reporters: **Kara Mann**, *Liberty Science Center*
Daniel Wheeler, *Morehead Planetarium and Science Center*

Session Description

Four speakers from four different companies came together to share battle-tested wisdom on designing a mobile laboratory that meets the needs of a developing program.

Summary of the Wisdom Shared by the Four Speakers

- Research "How can I get a mobile lab to schools" and is a mobile lab what you really need?
- Assess your needs and goals first (capacity, attendance, 'reach', mobility...)
- Maximize your physical space
  - Consider extra doors, windows
  - You will likely have to go full custom-made
  - Use every inch and consider your outdoor space as well
  - Have a separate entrance and exit
  - Security system power needs to be available 24/7 when mobile lab is staying at a location overnight and be ADA compliant
  - Power and lighting
  - Laboratory reagent storage-freezer and refrigerator and sink for liquid disposal
- Have a HVAC system with vents in at least two places to ensure adequate heating and cooling
- Think about acoustics
- Plan, plan, plan (first and upfront)
- How much "wow factor" do you want/can afford
- Diversify your funding
- Start small (literally or figuratively), but start
- Think about staffing: Fulltime? Interns? Volunteers? Grad students?
- Marketing cannot be underestimated
- Should your program have contingencies for going inside a school?
- Think about maintenance for your wacky custom vehicle

First Speaker

Rebecca Dowd, Curiosity Cube Coordinator, Corporate Responsibility, MilliporeSigma

- 145 Curiosity Cube - a mobile lab outreach program that goes all around the country
- Requirements
  - Built a unique space for hands-on science to reach 200+ students daily
  - Easily transportable to reach many students at different schools every day
  - Engage local employees to facilitate and teach
- Shipping container design
  - Fun and unique environment and relatively cheap and extremely durable
  - Even with shipping containers there are things to consider—size, cost
  - Landed on 20ft shipping container
    - Can be pulled by regular pickup truck on a flatbed trailer

        - Has 4 stabilizers that come down and the trailer pulls out
        - Only takes 15-20 minutes to drop off and setup
    - Use every square inch of the space to move 200+ kids through per day
        - Cut windows and doors and use wall space
        - Built custom furniture to maximize use of space—curved tables
    - Storage
        - Design in custom storage to make sure all supplies are on board
        - Add storage cabinet on the outside
    - Volunteer led programs
        - Designed space to make them comfortable to teach the experiments because a different group of volunteers is teaching every day
    - Life science programs, but wanted to bring in more technology and do things teachers can't do in the classroom
        - Use VR, digital microscope, and use ozobots/robotics/coding
    - Use large screen with PowerPoint for volunteer to relay the information about science
    - Also designed an outdoor space to accommodate 1/2 the class while the other half is inside
        - Custom awning and rain walls that makes a protected space
        - Or bring the outdoor portion into the school classrooms if the weather is bad
    - Tables are designed to make a clear flow for how the students are supposed to move through the stations
        - Leaves space for volunteers to check in on how the students are doing as well
- What was learned, big takeaway lessons, changes and edits, things wished were done better
    - 2 doors were critical, having a separate entrance and exit was possibly the most important thing done
    - Space - customized furniture and storage to make a natural flow
    - Heating/Air Conditioning
        - A new system with vents all the way around pushing the air down
    - Sound proofing
        - Volunteers' voices overlap each other and can make it hard to hear
        - Wish they had added more sound-absorbent surfaces

Second Speaker

Steve Creech, Director, Wyland Foundation

- Wyland foundation started by well-known environmental artist Wyland
    - Goal is to create informed stewards of the oceans and waterways
    - Over the years have done outreach through artwork and tours through impromptu programs with artists and environmental biologists
- Two Components
    - A 40-person theater
        - 4D theater with foggers and wind blowing, etc.
        - They start off as water droplets and go through the water cycle
    - Waterway exhibit learning about estuaries
        - Learn all about waterways
        - New eutrophication exhibit as well
- Learned a lot, made a lot of mistakes
    - Thought it would be very simple to get it started, but realized not so much
    - Started with a trailer then found Triune and worked with them
    - Total cost about $600,000
    - Didn't have a lot of goals starting out except to save the oceans
        - Now have a lot of evaluations and everything else in place
    - Big lesson: PLAN AHEAD
- Upsides and downsides
    - Very large vehicle comes with restraints on where it can go, but it does have impact, it's very memorable, and you can do a lot with it
    - Closed streets to provide access to the vehicle

- Allows accommodation of large groups to share the vision and message
- Looking forward to evaluation and data collection to make sure the impact is what it appears
- Think of your goals: What do you want to achieve?
  - This can help determine what kind of vehicle you will want to use
- Secured funding and support from many different sources
- Uses docents/volunteers for the teaching

Third Speaker

Dr. Ben Dubin-Thaler, Founder and Executive Director, BioBus, Inc.

- Two buses that are very different from each other in style and age and how they came to be
- Why are we doing this?
  - Kids are not doing well in science by 12th grade and students of color are doing worse
  - Understand how powerful hands on research is and can be to get people excited about science
  - Gives students a chance to use microscopes
- Currently have 14 full time BioBus scientists
  - These are "real" scientists that have peer-reviewed research journal articles out there
- 10 years ago, started with a 1970s transit bus—total cost about 150k; the other bus cost 800k
  - It's ok to start small with whatever you can get your hands on right now
- Use almost exclusively microscopes on the mobile lab to have a fast, engaging experience
- BioBase facilities where more programs can happen with students recruited from BioBus
- High school students can do paid internships—teach, R&D, curriculum
- Evaluation is a critical piece
- Important considerations
  - Program and curriculum design
    - Before you know what it will look like, you have to know what you want it to DO
  - Equipment acquisition, training, deployment, maintenance
    - Mobile science stations on wheels that can be employed in schools
    - Do a needs assessment: How many people need to fit? How much equipment?
    - Begin designing how it will look inside
    - HVAC is going to be one of the most complicated considerations for the mobile lab
    - Do you want to divide the space? If so, noise isolation! Sliding door wall
    - 200k budget to gut and renovate BioBus 1, not including equipment
  - Program marketing, coordination, evaluation
  - Fundraising and income generation
- Advice: Seek advice of the community
  - Write consulting time into grants so you can talk to the folks that have been through this
  - Let them help you avoid some of the pitfalls that others have already fallen into
    - Make sure you don't get the wrong HVAC system, or slide out, etc.

Fourth Speaker

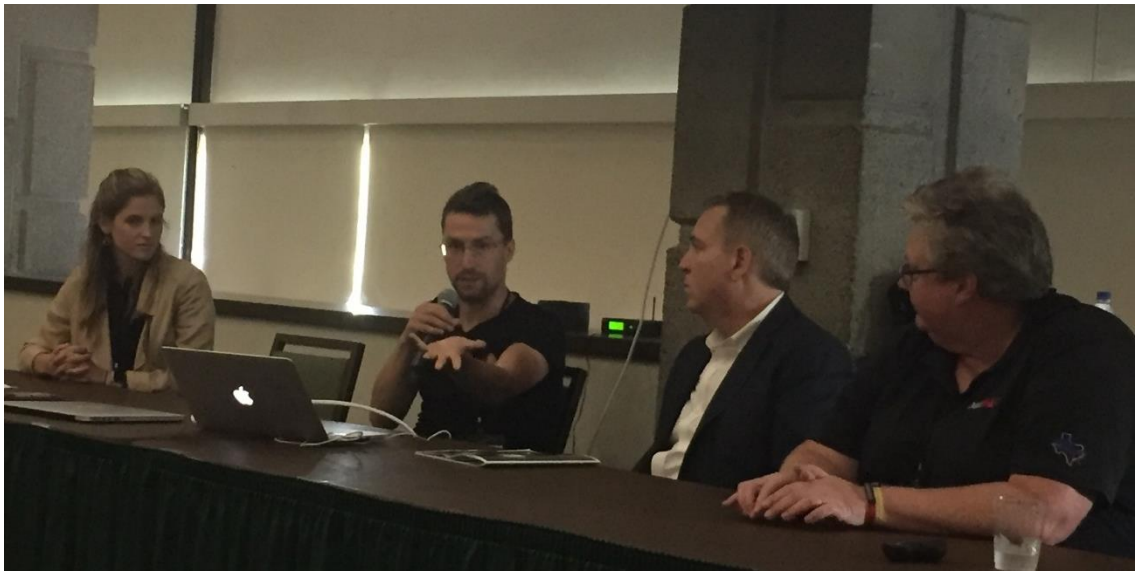
Jennifer Colvin, Vice President of Education, MdBio Foundation, Inc.

- Has helped build and design 4 vehicles: currently MdBio has 2 trailers and 1 bus
- Needs assessment
  - Goal? Weather? What students/community do you want to serve? How are you going to staff it?

- Vehicle Considerations
  - Bus vs. trailer vs. container and service options
  - More $ does not mean better/more effective
  - Be involved in the planning and building so you know what is under the hood
- Original MdBio Lab
  - Wanted it to look like a lab that real scientists use—captures look and feel of a wet lab
  - ADA compliance
  - Drawbacks
    - The cabinets and countertops weren't built for this, and didn't work well, they broke
    - Rooftop AC units are loud and too much plumbing
    - Small screens and small space
    - Students have backs to you (no camera, no show)
- MXLab
  - Designed to be a hybrid space for classes and events
  - REALLY big, weren't quite ready for that, has logistical challenges, but super impressive and you can do almost anything in there
  - Written into our RFP that the vehicle should last for 10 years
  - Send RFP to a variety of builders-selected based on budget, type of vehicle, etc.
  - Site visits with potential builders
- Pros and Cons of MXLab
  - Pros
    - Versatile and can accommodate large MD classes and events
    - Technology integration
    - Powerful HVAC system with really good air circulation and good lighting
  - Cons
    - It feels like a classroom, loss of a wow factor
    - Portrait TV screens vs. Landscape
      - All but one was portrait, so it was hard to get all screens looking good
    - Size: difficult for quick turnaround events, lost 6 schools
    - Takes about an hour to pack up and get moving
- Verizon Explorer Lab: Key Design Elements
  - Immersive experience visiting Mars
  - Artist designed interior and use of game-based learning combining tech and art
  - Has a major WOW factor because they virtually go to Mars
    - Has the feel of a Disney experience with subwoofers in the seats
  - But it does have drawbacks
    - Verizon tells you what you're teaching and where you're going
    - Fiberglass covering HVAC units prevents sufficient cooling
    - Built on existing vehicle with existing wear and tear
    - Entirely tech-based program can create limitations
    - Pilot program, not commercial program
    - Designers are used to building short-term programs

Questions for all Panelists and Final Comments

- Charge?
  - MilliporeSigma doesn't charge, but the cost is valued at about $1500
  - Wyland General operating cost is about $3000/day but only charge about $1500
    - Do save funding for free programming
  - MdBio operating cost is 11-15k per week and all programs delivered free
  - BioBus operating cost is $2500 per day
    - Private school pays $2500, 90% free and reduced lunch pays $150
- Things to think about security-wise
  - If you want to be able to leave the lab overnight, trailer is much more securable, and security systems. If not, a bus is a good option
  - Can also put in budget for hiring security staff



- For fundraising - 1 big fish? Or many little fish?
  - BioBus fundraising wanted $5 million for new facilities and 3-year operating costs
    - Got initial $2 million donation, leveraged against getting other large or matching donations
    - Then fill in the rest with smaller donations
  - Getting initial seed money helps get more money from additional funders, but can be hard to get that initial funding
  - MdBio is entirely externally funded with mostly corporate funders, and a few private
- How do you form relationships with companies to donate equipment?
  - Gateway events inviting corporations to see what you're doing and then slowly build the relationship from there
  - Introductory sponsor events
  - Asking people for stuff tends to be easier than getting money
    - Talk to the marketing people, not the sales people
    - If you need stuff, just ask for it, write a flattering letter, make a phone call
    - Can also use equipment donations as the gateway to monetary donations
  - Impact data, something to show that what you're doing isn't just a cool story, is important

Participants

Rick Armstrong, Farber Specialty Vehicles
Lorenza Calcaterra, Sainsbury Wellcome Centre (UCL, London)
Jennifer Colvin, MdBio Foundation, Inc.
Oscar Contreras Villaroel, Ecoscience Foundation
Kimberly Cox-York, Colorado State University
Steve Creech, Wyland Foundation
Michele Dahlberg, Scientopia
Nancy DeJarnette, University of Bridgeport
Natasha Deleon, Puerto Rico Vector Control Unit
Tammy Diedrich, Anne Arundel County Public Schools
Madison Dodds, Salk Institute
Ben Dubin-Thaler, BioBus Inc.
Patrick Flanagan, Ocean Learning Lab and Immersive Experiences (OLLIE)
Jeff Flath, eNOW
David Garbe, Pennsylvania Society for Biomedical Research (PSBR)
Mary Hall, Georgia State University/Bio-Bus Program
Daniel Hall, Winnebago Ind.
Yosuke Kawamura, Nagoya Institute of Technology
Chuck Keeler, Utah STEM Action Center
Dimitri Klebe, National Space Science & Technology Institute
Kara Mann, Liberty Science Center
Amelia Miller, Utah State University
Xavier Ocasio, Puerto Rico Vector Control Unit
Sally Partridge, Region 13 Education Service Center
Paul Seifert, Conservancy of Southwest Florida
JaCinda Sumara, Oakland Schools
Monika Tucker, San Diego Children's Discovery Museum
Daniel Wheeler, Morehead Planetarium and Science Center
Joe Wilkerson, MdBio Foundation, Inc.

Active Attacker: Emergency Preparedness for Active Shooter Situations

Wednesday, July 25, 2:30 – 4:00pm

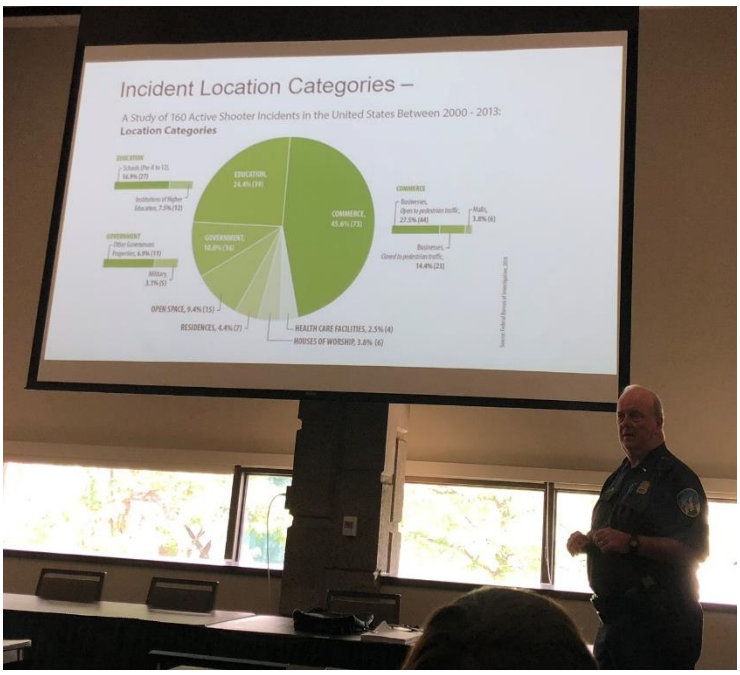
Presenter: **Lieutenant Dave Scott**, *Crime Prevention Section, Wayne State University*
Reporters: **Hannah Crawford**, *Greenwood Genetic Center*
Dillon Gary, *Greenwood Genetic Center*

Session Description

This session focused on making a plan in the event of an active shooter either onboard a mobile lab or in a classroom setting. It provides resources as to what to do in the event of an active shooter and what to do when law enforcement arrives.

Topics Covered

- Active shooter/sniper situations
- What to do when law enforcement arrives



Background

- Program was created as an online program in '07 by Wayne State University as a response to the attack on the Virginia Tech campus
- Turned into a live presentation approximately three years ago to make it more interactive
- Actual program starts with the question, "Are you a VIP?" Goal is for everyone to understand that although you may not think you are a VIP, someone in your life considers you very important

Active Shooter/Sniper Situations

- What is an active shooter?
  - Active shooter or active killer names the perpetrator of a type of mass murder marked by rapidity, scale, randomness, and often suicide. The United States Department of Homeland Security defines an active shooter as "an individual actively engaged in killing or attempting to kill people in a confined and populated area; in most cases, active shooters use firearms and there is no pattern or method to their selection of victims."
- The FBI studied active shooter incidents from 2000-2013 and found no pattern of who was targeted and that in most cases the perpetrators used firearms (a few incidents of individuals using other weapons such as knives)
  - The study found that there had been 160 total incidents from 2000-2013
  - In the first 7 years of the study there were 6.4 incidents per year while in the last 7 years of the study there were 16.4 incidents per year.
  - From 2014 – 2016 the number of incidents per year increased to 20 and in 2017 there were 30 total incidents
  - 158 of 160 incidents were single shooter incidents
- Active shooter incidents occur in many different types of environments with educational locations being the second most common location
- In 2017 you were more likely to be injured in an active shooter incident than by being struck by lightening

Actions to Increase Survival

- Due to the frequency of such events it is critical to be prepared, during these situations things occur quickly and chaotically meaning there is no time to think during these events, just time to react!
- Have a plan before you need it
- Be aware of your surroundings

- Stay calm and think clearly
- The best option is to run if you can find a clear and safe way to escape, stay low and out of sight, use cover and plan your movements, use any means to escape, any route possible
- The second-best option is to hide, get in an enclosed space and lock the door, block the exits and cut out the lights, cover the windows and stay out of sight, be silent. Most events over in 15 minutes, stay hidden and wait for the authorities (when the authorities arrive be sure they are the police; call 911 to ensure they are truly officers before leaving cover)
- The final option is to fight, disrupt the shooter's ability to see, breathe, or control their weapon. Be prepared to use any means necessary to stop the shooter. They will harm you if you give them a chance. Use anything you can possibly think of to defend yourself: knives, belts, broom stick, fire extinguisher, etc.

Remember these Points

- Get out
- Stay calm
- Make yourself harder to see and find
- Use cover (something in the room such as a desk)
- Conceal yourself
- Look for emergency exits
- Help others if it does not put you in harm's way
- Get to a room and lock it down and secure your location
- Secure the door
- Defend yourself
- Look for anything that could be used as a weapon
- Work with law enforcement
- Silence your cell phone
- Spread out and don't cluster together in a group
- ALWAYS have your cell phone on your person

Situational Awareness

- Cooper's Color Codes
  - White: when you are in a complete relaxed state (only achieved when you are asleep)
  - Yellow: when you are relaxed, but aware of your surroundings
  - Orange: when you have identified someone or something of interest, but it may not be a threat to you
  - Red: when you change your focus to a target that is a threat to you, but this lessens your ability to maintain some degree of 360-degree awareness
  - Black: when you are totally immobilized with panic and you have no idea how to respond

Resources

- Activeshooter.lasd.org
- Ohio State University keyword search – active shooter
- Los Angeles County Sheriff's Department
- Last Resort Active Shooter

Participants

Gary Barnett, Region 13 Education Service Center
Michelle Blodgett, Michigan Farm Bureau
Becky Carter, Seattle Children's Research Institute
Alex Chang, Seattle Children's Research Institute
Chris Chung, Sustain-ED
Corey Coombs, Seattle Children's Research Institute
Hannah Crawford, Greenwood Genetic Center
Don DeRosa, Boston University CityLab
Rich Elsasser, Region 13 Education Service Center
Emily Freeland, MdBio Foundation, Inc.
Dillon Gary, Greenwood Genetic Center
Patricia Irizarry, Rutgers University
Verdy Jocelyn, Georgia State University/Bio-Bus Program
Amanda Jones, Seattle Children's Research Institute
Alexandra Main, MdBio Foundation, Inc.
Dona Mapston, Salk Institute
Colleen McCarty, Seattle Children's Research Institute
Janeé Pelletier, MdBio Foundation, Inc.
Billy Roden, Seattle Children's Research Institute
Shelly Seifert, The Village School
Gianna Sullivan, National Space Science & Technology Institute
Leta Tribble, Greenwood Genetic center
Bruce Waller, Institute for Advanced Learning and Research
Sarah Weisberg, BioBus, Inc.

Engaging Diverse Learners with New Technology and Methods

Thursday, July 26, 9:00 – 9:50am

Presenters: **Dr. Patricia Irizarry**, *Assistant Teaching Professor and Program Director, Rutgers University*
Dr. Benedetta Naglieri, *Education Program Manager, MdBio Foundation, Inc.*
Lori Harvey, *Manager, STEM Educational Outreach and CSR Programs, Hitachi High Technologies*
Facilitator: **Dr. Patricia Irizarry**, *Rutgers University*
Reporters: **Roya Heydari**, *BioBus, Inc.*
Madison Dodds, *Salk Institute for Biological Studies*

Session Description

Three speakers from three different companies discussed how they engage diverse learning with new technology and methods.

Engaging Middle School Students from Underrepresented Minorities in STEM Disciplines

Patricia Irizarry, Ph.D., Rutgers University

Underrepresented in STEM

- Ethnic groups—African Americans, Pacific Islanders, Hispanics
- Other groups as well—women, low-income
- Underrepresented due to lack of enrollment in STEM, graduation, or staying in the workforce in STEM careers

Challenges

- Home—family culture, language barrier, lack of knowledge about careers, and lack of support (financial and emotional)
- School—overcrowding in schools, lack of resources, general perceptions, no positive STEM experiences

Strategies to Engage Students

- Targeting middle school because that is the drop off point or identify the needs of your specific target community
- Role models
- Career explorations and exposure
- Special needs of the community (bilingual programs)
- Foster an environment of inclusion

Rutgers University

- Rutgers Geology Museum
- Rutgers Science Explorer
- RSE Station
- Various spaces in the museum are used to provide math and science learning centers - this allows for additional schools to participate that would have been prevented due to logistical limitations (no parking spot for vehicle)

Rutgers Science Explorer

- Can accommodate 20 students at a time and stays at a school all day
- Curriculum is created by consulting grad students to create problem-based learning scenarios for students where they conduct 2-5 hands-on experiments and then analyze data (this is a challenge; they just want to focus on the hands-on aspect)
- Roughly 50,000 middle school students from NJ, most popular is DNA Detectives (due to the fact that it brings in equipment that teachers do not have)
- Current interest for students is in biological sciences and less about earth science and physics- though this could be related to the use of technology and equipment; teachers don't have access to these resources

- Activities
  - Research field, inquiry-based, experiments, analyzing data and reporting results, discussion
  - The reporting of the results very important
- Goals
  - Awareness of STEM timeline
  - Increase literacy
  - Increase interest in STEM careers
  - Support K-12 teachers

Partnering with Verizon Innovative Learning to Bring High End Technology to Mobile Education

Benedetta Naglieri, Ph.D., MdBio Foundation, Inc.

Collaboration with Verizon Innovative Learning Program

- Verizon partnerships help bring technology and skills to communities in need and work with many non-profits around the U.S
- Advantages of partnering with Verizon
  - High end technology and unique experiences
  - Exposure (attend national events, networking, increased publicity)
  - Ability to expand
- Challenges of partnering with Verizon
  - Balancing events with our education mission

Verizon Program - explorer lab

- Each school visit was 1-4 days; 16 students on a bus at a time is limiting factor; data is collected after visit via a post-lab activity
- Serious Gaming (from game-based learning)
  - Technology-enhance learning focuses on 21st century skills
  - "Personalized learning" – more on problem solving and adaptive learning based on each student's needs
- Pilot year program – Mars Discovery Program
  - Teacher professional development, participate in pre-lab hands-on activity as an intro to Engineering Design Process
  - explorer lab visit, optional post-lab activity
  - Tested in DC; wanted to align to NGSS

explorer lab Technology

- Immersive experience of light, sound, video, and gameplay
- Most unique aspect is the game affects the video playing in the bus— network the game with the video of their Mars Rover

explorer lab Experience

- Fly through the solar system and land on Mars and have to complete two missions
- Students are provided tasks where they test solutions
  - Requires resilience
  - Failure is a regular occurrence
  - Leads students to productive struggles
- For problems, there's no "best" answer
- Based on problem solving and students justify why they chose a specific solution
- Students must use the components of the Engineering Design Process to complete their missions

- Parts of game requires students to work together to go through the "communication" step of the Engineering Design Process

Advantages

- Wow factor
- Familiarity with games
- Does not feel like science
- Minimal language barrier
- Students reported they enjoyed process and increased confidence in Engineering Design Process

Challenges

- Fragileness
- Not easily replaceable; custom-built
- High end assistance; specialized A/V system
- Cost
- Limited adaptability

Next steps

- More consistent quantitative data (prelab and post lab survey)
- Improve content learning so it's more minds-on and curriculum that aligns well with national standards instead of changing it state to state.

The Scope of STEM and Diversity: Engaging Girls in STEM

Lori Harvey, Hitachi High Technologies

STEM Outreach Program

- Hitachi loans an electron microscope to educational programs for 3-6 months at no charge
- A one-page report is required to show how it's being used and for what purpose
- Resources are shared with participants (local role models if there's offices nearby or curriculum materials)

Goals of STEM Education Program

- Provide experiences that are outside a traditional setting
- Increase student interest in science globally
- Build strong relationships—partners, customers, local communities, etc.
- Contribute to the company's business activity
- Reduce fear of high-end technology for teachers and students
- Prepare students for the work force in these fields

Benefits

- Highly portable
- Encourages hands-on learning
- Program is scalable and sustainable
- Support to educators in STEM fields
- Helps people understand the diverse use of a microscope

Participants

Michelle Blodgett, Michigan Farm Bureau
Lorenza Calcaterra, Sainsbury Wellcome Centre (UCL, London)
Becky Carter, Seattle Children's Research Institute
Alex Chang, Seattle Children's Research Institute
Jennifer Colvin, MdBio Foundation, Inc.
Corey Coombs, Seattle Children's Research Institute
Michele Dahlberg, Scientopia
Madison Dodds, Salk Institute
Rebecca Dowd, Millipore Sigma
Ben Dubin-Thaler, BioBus Inc.
Patrick Flanagan, Ocean Learning Lab and Immersive Experiences (OLLIE)
Roya Heydari, Biobus, Inc.
Yosuke Kawamura, Nagoya Institute of Technology
Chuck Keeler, Utah STEM Action Center
Dimitri Klebe, National Space Science & Technology Institute
Seneca Lee, BioBus, Inc.
Kara Mann, Liberty Science Center
Colleen McCarty, Seattle Children's Research Institute
Amelia Miller, Utah State University
Xavier Ocasio, Puerto Rico Vector Control Unit
Shelly Seifert, The Village School
Leta Tribble, Greenwood Genetic Center
Monika Tucker, San Diego Children's Discovery Museum

Community Collaboration: Development of Successful Mobile Lab Programs

Thursday, July 26, 9:00 – 9:50am

Presenter: **Shiloh Slomsky**, *SEEDS Project Director, Little Traverse Bay Bands of Odawa Indians*
Reporters: **Chris Chung**, *Sustain-ED*
Dona Mapston, *Salk Institute for Biological Studies*
David Garbe, *Pennsylvania Society for Biomedical Research (PSBR)*

Session Description

This session was about how their program was started through collaboration between business/industry, community, and schools. From fundraising approach to tracking impact, this session provided an excellent overview of executing a plan and getting to a certain goal. Shiloh tried using poll to drive the conversation but there were technical difficulties. It would be great if you can look here and participate in her survey: pollev.com, shilohslomsk137. Their program SEEDS (Sustainable Employment and Economic Development Strategies), funded by ANA and operated by the Little Traverse Bay Bands of Odawa Indians, is a great example of community-based effort.

Program Information

- Mobile works in all areas
- Rural and urban, about 50/50
- 4 counties, 65 townships, 6 cities, 9 villages, 112k population

Program Development

Step One: Research

- Research was started by asking what local companies' needs were
- Looked for broad support: community, local government, colleges, businesses
  - Northern Michigan: there were no longer any CNC machinists and other unmet needs in workforce skills.
    - CNC Machine: Computerized Numeric Coding – from draft to production via computer driven machines.
  - Created MAT—Manufacturing Advisory Team—to change this gap in workforce development
    - Industry, education, community

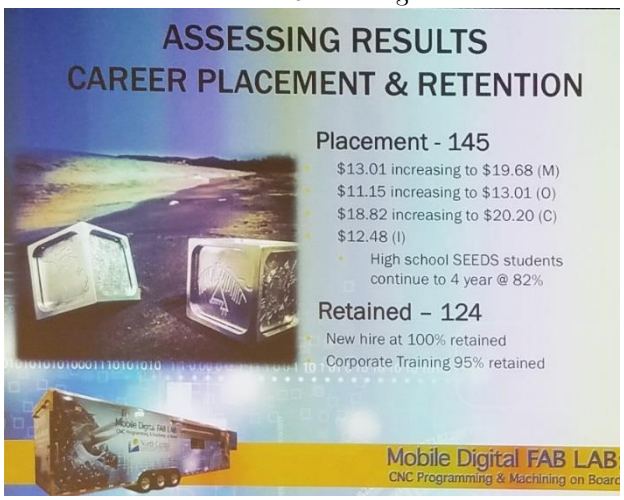
Step Two: Implementation

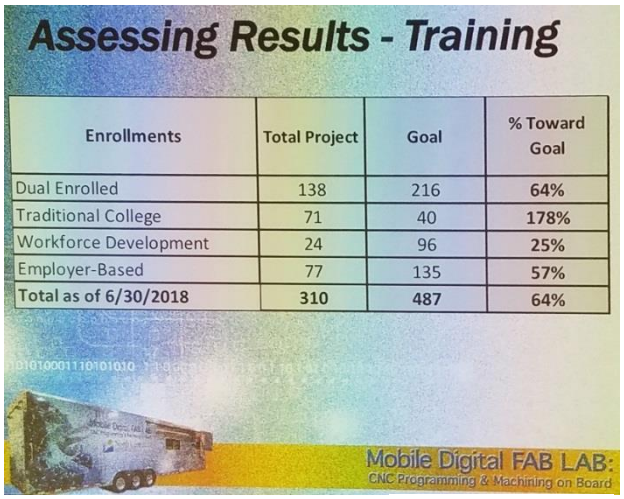
- Planning—secure funding
  - $350,000 Community Development Block Grant paid to build Mobile Digital FAB Lab
- Local Educational Agency visited program in Wisconsin with mobile lab and was able to use as working model
- Role of the lab
  - Training for high school students while earning college credit
  - Manufacturers could train locally
  - Unemployed/displaced workers could re-train
  - Marketing modern manufacturing to public
- SEEDS grant—federal grant provided for Odawa Indians
  - Grant objectives
    - Train 487 community members over 5 years – with 80% completion rate
    - Career placement up to 90%
    - Retention up to 80%

Results

- 145 trainees obtained placement in workforce
  - Within one year, the trainees have increased their wages after training program
- 124 trainees have been retained

- Assessment Results and Training Results:





M - Manufacturing
C – Corporate
O - Other

- Community and Economic Impact: 3 Year mark:
  - Over 70 new tech jobs
  - $2.2 million in economic gain
  - $2 million retained in companies
  - Increase in Robotics teams
  - Launched new college program
  - Broad community awareness [parents]
  - 300 community events
- Many trainees may not complete the program but often use this program as springboard into college programs, the military, or workforce.

Adapt to Better Serve

- Program: students are allowed a lot of freedom to create stuff. They are required to build a Stirling engine from scratch.
- No matter how successful the program, you always need to adapt to better serve your population.
  - Make necessary budget changes: adding tuition – was free before; equipment
  - Placement inclusions/expectations
    - Manufacturing vs other
    - Education, career, military
  - Advertising and marketing
    - Videos

Above and beyond

- Seek Associate's and Bachelor's degrees
- NIMS certification—federal recognition
- 100% free educational/career services

Participants

Gary Barnett, Region 13 Education Service Center
Chris Chung, Sustain-ED
Kimberly Cox-York, Colorado State University
Hannah Crawford, Greenwood Genetic Center
Natasha Deleon, Puerto Rico Vector Control Unit
Tammy Diedrich, Anne Arundel County Public Schools
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Dillon Gary, Greenwood Genetic Center
Mary Hall, Georgia State University/Bio-Bus Program
Verdy Jocelyn, Georgia State University/Bio-Bus Program
Harry Kurtz, Triune Specialty Trailers
Sarah Kurtz-McKinnon, Triune Specialty Trailers
Ji Sun (Sandy) Lee, Pasadena City College
Dona Mapston, Salk Institute
Sherry Painter, LeMoyne-Owen College
Billy Roden, Seattle Children's Research Institute
Paul Seifert, Conservancy of Southwest Florida
Gianna Sullivan, National Space Science & Technology Institute
JaCinda Sumara, Oakland Schools
Bruce Waller, Institute for Advanced Learning and Research
Sarah Weisberg, BioBus, Inc.
Daniel Wheeler, Morehead Planetarium and Science Center
Joe Wilkerson, MdBio Foundation, Inc.

Instructor Exchange Program: Lessons Learned from Doing Someone Else's Job

Thursday, July 26, 10:00 – 10:50am

Presenters: **David Garbe**, *Outreach Educator, Pennsylvania Society for Biomedical Research (PSBR)*
Corey Coombs, *Mobile Lab Scientist/Driver, Seattle Children's Research Institute*
Patrick Flanagan, *Director, Ocean Learning Lab and Immersive Experiences (OLLIE)*
Facilitator: **Amanda Jones**, *Seattle Children's Research Institute*
Reporters: **Madison Dodds**, *Salk Institute*
Roya Heydari, *BioBus, Inc.*
Kimberly Cox-York, *Colorado State University*

Session Description

The MLC Instructor Exchange Program is an excellent opportunity for instructors to travel to other established programs and learn from them. This workshop allowed for three of these participating instructors to report out on their experiences and what they took away from their visits.

What is the Instructor Exchange Program?

NIH funded program allowing instructors to visit other established programs.

- Competitive two-step application process
- Assistance for finding a relatable host program is available
- Provides travel stipends
  - Requiring instructor to present at following annual conference
- Priority given to new and emerging mobile labs to give them additional exposure
- During exchange, the visit includes
  - Visit to school or community event onboard the mobile lab
  - Observe how curriculum is delivered
  - Observe how classes are managed
  - Explains logistical information of program operation

David Garbe's Experience

- Creating own mobile lab program
- Science background and transitioned into informal science education field
- Outreach educator for a nonprofit biomedical outreach organization whose primary function is to educate the community about the importance of biomedical research and the use of animal models in this pursuit
- Visited Seattle Children's Research Institute
  - Science Adventure Lab
  - Attended school visits and office space
- Takeaways
  - Helped identify internal needs assessment: how many students? Sit or stand? Length of lesson? Budget? Geographic range? Type of vehicle? etc.
  - Wanted to learn about content and assessment
    - Observed three lessons in class period
    - Short activities that related to one larger topic
    - Use of clickers engaged students and provided instructors with rapid feedback.
  - Pre-visit activities were effective and built student interest
  - Planning out the logistics created a smooth school visit (prep work, parking, travel routes, registration, marketing)
  - Differences in scheduling (2-4 schools per week, or 1-2 schools per week)
- Noticeable challenges to consider
  - Program funding
  - Monotony of daily routine—consider how you can break things up to stay excited
  - Assessment of programs outcomes: measuring short- and long-term gains

- Travel logistics (parking, traffic, accessibility, etc.)

Corey Coombs' Experience

- Seattle Children's Hospital, Mobile Lab Scientist and Driver - established program
  - Current program mostly serves elementary and some middle school students
- Objectives/Goals
  - Difference in management with older students
  - Updated technology, vehicle, equipment
  - Program coordination among team members
  - Networking with an established program
- Visited MdBio Foundation, Inc.
  - Different target of students, but have similar missions
  - Visited two labs:
    - MXLab
      - 5th wheel, 1000 square feet, can hold 40 high school students
      - Activity is DNA fingerprinting
      - Students are provided with a worksheet and instructor supports at stations
    - explorer lab
      - 45 feet in length, can hold 20 middle school students, doesn't need to be dropped off
      - Mars Discovery Program – focuses on engineering, geology, and space science
      - Instructor provides background and students transition to game-based learning on tablets which focuses students' experiences in the engineering design process
- Takeaways
  - Importance of Instructor Exchange program
  - Difference in management – balance between lecture and student worktime kept students engaged
  - Experienced a new and immersive teaching approach onboard the explorer lab with technology
  - Modern vehicle updates for consideration (i.e. hydraulic slide-outs and multipurpose monitors)
  - Social media engagement allowed high school students to stay connected and is a source of advertisement
  - Clear communication strategies for a rapidly expanding program where team members don't come back to an "office" on a regular basis
- Similar issues that appeared
  - Parking and accessibility for the mobile labs
  - Tardiness of the students, tough to schedule with high school schedules

- Value of in-person experience
  - Experiencing the actual curriculum
  - Too short – like to see more than one lesson
  - Appreciated job on a mobile lab more

Patrick Flanagan's Experience

- Creating immersive oceanic mobile program, OLLIE
  - Current program goal is to provide a digital field trip to explore oceanic and climate change
- Visited BioBus in New York City
  - Similar start and background
  - Attended school visits
- Takeaways
  - Get the money
    - Takes time with a lot of sweat equity
    - Sliding scale (BioBus example of $150/day or $2500/day depending on income levels of students)
    - Donations and grants require building relationships
    - Keep communication open and make sure their interests align with the program's mission
    - Many research scientists have experience writing grants
    - Diversify funding to ensure stability if circumstances change over the years and get help with fundraising
  - Use the right tools
    - Take advantage of digital resources for developing a program
    - BioBus started with Google sheet and transitioned to Sales-Force - use the right tool that works for your organization
    - Other digital tools – AirTable; BioBus has one company account for zip car rather than individual vehicles since they operate in New York City
  - Know yourself
    - What do you want to evaluate? Have specific, measurable goals
    - Clear internal goals and communication is key
    - Ask the right questions to ensure funders have valuable data
      - Know the tools you need to use to evaluate your outcomes and goals
    - Knowing your strengths and weaknesses as an organization
    - Take care of yourself and know that there are limits
  - BioBus model: "Discover (events, career exposure), Explore (add variety, meet professionals), Pursue (internship)"

Closing Remarks

Link on how to apply: http://www.mobilelabcoalition.com/wp/about-the-mlc/instructor-exchange-program/
Contact: Amanda,Jones@seattlechildrens.org

Participants

Michelle Blodgett, Michigan Farm Bureau
Lorenza Calcaterra, Sainsbury Wellcome Centre (UCL, London)
Alex Chang, Seattle Children's Research Institute
Oscar Contreras Villaroel, Ecoscience Foundation
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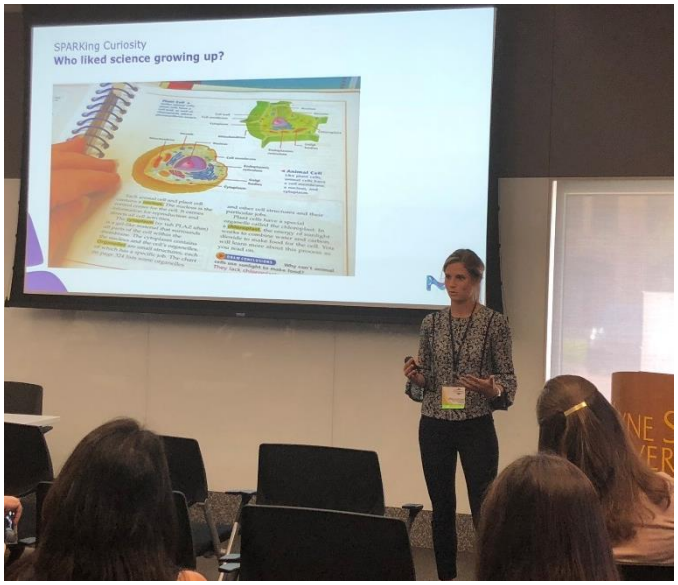
The Curiosity Cube: Engaging Employees and Communities using a Retrofitted Shipping Container

Thursday, July 26, 10:00 – 10:50am

Presenter: **Rebecca Dowd**, *Curiosity Cube Coordinator, Millipore Sigma*
Reporters: **Joe Wilkerson**, *MdBio Foundation, Inc.*
Amelia Miller, *Utah State University*

Session Description

This session is about the Curiosity Cube and how they spark curiosity with a shipping container. Millipore Sigma is a life science company. Curiosity Cube Program is part of the Corporate Responsibility division that is funded directly through Millipore Sigma.



Program Goals

- Spark curiosity with hands-on experiences
- Engage employees
- Increase brand awareness and reputation

Program Development

- 2013 launched curiosity labs
  - Scientists would go into a classroom with a tote of supplies to conduct hands-on experiments
  - Realized something was missing; classrooms aren't all designed for hands-on experiments
- Brought new employee on to develop a creative space to take to schools to bring students in for more creative, attention grabbing experiences

The Cube

- Bought a 20' x 10' shipping container (cheap, trendy, self-contained, can be placed anywhere)
- Designed shipping container
  - Customized with ergonomic tables to help indicate flow of students through the lab and created standing room
  - Has an outdoor space with rain walls to gain extra space
  - Specific places for teachers to stand at each station
  - Uses bright colors, creates an engaging environment
  - Required strategic use of space
  - External storage for supplies/generator housing

Content Development

- Subcontracted a teacher to develop curriculum using Next Generation Science Standards
- Content guidelines
  - Strong learning objective
    - Relatable to all students/grade levels
    - Incorporates multiple learning tools
    - Technology integrated; additional technology and resources teachers don't have
    - Life science based
  - Volunteer led
    - Relatable topics for volunteers and flexible for volunteers to learn
    - Quick, hands-on experiments (activities are 15 minutes for class, events are 5 minutes)
- Content is focused on cells, how humans are all made of cells, etc.
  - Students extract own DNA from cheek cells
  - Integrating technology
    - Virtual reality in the outdoor space

        - Explore the inside of a cell
        - Currently using a Google Expedition VR experience
      - Interactive microscopes
        - Students build their own slides
        - Figuring out which slides belong to different parts of the human body
      - Robotics and coding
        - Talking about cell pathways and communication
        - Code robots to move throughout the body
        - Learning about chemical and electrical signals in the body, but hardly realize the complexity of what they are learning
- Curious Questions
  - All students complete a curious question card and stick it on the cube
  - Then, Millipore Sigma staff send every school's questions back to the teachers with responses from the professional scientists
  - Post some questions and responses to social media or encourage students to interact with curious questions via social media

Implementation

- Five events/week
  - 4 schools per week
    - 90% Title I Schools
    - Ages 8-14, on average, grades 3-8
  - 1 public event
    - City centers, parks, science museums, etc.
    - Ways to reach students and parents that don't get the cube school visit
- Schedule is somewhat based on weather and large events too, (example: USA STEM Festival, San Diego STEM Festival)
- Created a flyer with information on cube dimensions and logistics for drop off and set up
- Staff lab with volunteers from Millipore Sigma staff, so this helps corporate community engagement and helps the program staff be very relatable to the community
  - Sustainable, make the connection to the real world
  - Internal volunteer website: events go up on this site and employees can search by local zip code
  - Training before this volunteer includes
    - 30-minute conference call
    - Emailed documentation of training materials and list of what to expect
    - On-site training day of the event
- Curiosity Cube can be a media magnet
  - Helped to build brand of the company due to positive visibility

Reach and Impact

- Travel anywhere there is a Millipore Sigma site in the U.S. and Toronto
- In 15 months reached 68,000 students
- 100% of schools have requested return visits
- 81% teachers indicated continued integration of lessons learned from Curiosity Cube into classroom discussion
- 77% students are more interested in a science career following visit to the Curiosity Cube
- Assessment is post for now, working on adding pre-assessment

Growth

- Goal: By end of the year: serve 90,000 students, 2,500 employee volunteers
- In the process of building a cube for Europe, hoping to add a cube to India soon (awaiting funds)

Participants

Gary Barnett, Region 13 Education Service Center
Becky Carter, Seattle Children's Research Institute
Chris Chung, Sustain-ED
Michele Dahlberg, Scientopia
Nancy DeJarnette, University of Bridgeport
Natasha Deleon, Puerto Rico Vector Control Unit
Jeanette Diaz, Pasadena City College
Rich Elsasser, Region 13 Education Service Center
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Gianna Sullivan, National Space Science & Technology Institute
Leta Tribble, Greenwood Genetic center
Bruce Waller, Institute for Advanced Learning and Research

Evaluating Program Impact

Thursday, July 26, 11:00 – 11:50am

Presenters: **Roya Heydari**, *Director of Program Evaluation, BioBus, Inc.*
Dona Mapston, *Director, Education Outreach, Salk Institute for Biological Studies*
Joseph Wilkerson, *Mobile Laboratory Manager* and **Emily Freeland**, *Education Outreach Instructor, MdBio Foundation, Inc.*
Facilitator: **Joseph Wilkerson,** *MdBio Foundation, Inc.*
Reporters: **Nancy DeJarnette**, *University of Bridgeport*
Seneca Lee, *BioBus, Inc.*
Patrick Flanagan, *Ocean Learning Lab and Immersive Experiences (OLLIE)*

Session Description

This session was about program evaluation of informal science settings and discussing the foundational core of doing evaluations. If we don't take time to review the foundational parts, the framework, evaluating will be extremely difficult. Three different speakers spoke in this micro-learning workshop.

Program Evaluation of Informal Science Settings

Speaker One: Roya Heydari, BioBus, Inc.

Foundational Core Processes of Evaluation

- Measurement vs evaluation
  - Measurement:
    - Cause and effect; more immediate results
    - Assessing and expressing program goals
    - Measuring program impacts
    - Improve program design and implementation
  - Evaluation:
    - Should not be done quickly, data will not benefit from this
    - Should relate back to your program goals and theory
    - Unique to your intervention
    - Needs to be done carefully and with intention to understand your program's effectiveness
- Measurement without analysis is not evaluation
- Next step beyond evaluation is research
  - Research is different than program evaluation
  - Research is about adding something new to the literature and expanding the field, but it's different from evaluation of a program
  - Mechanism behind the cause and effect

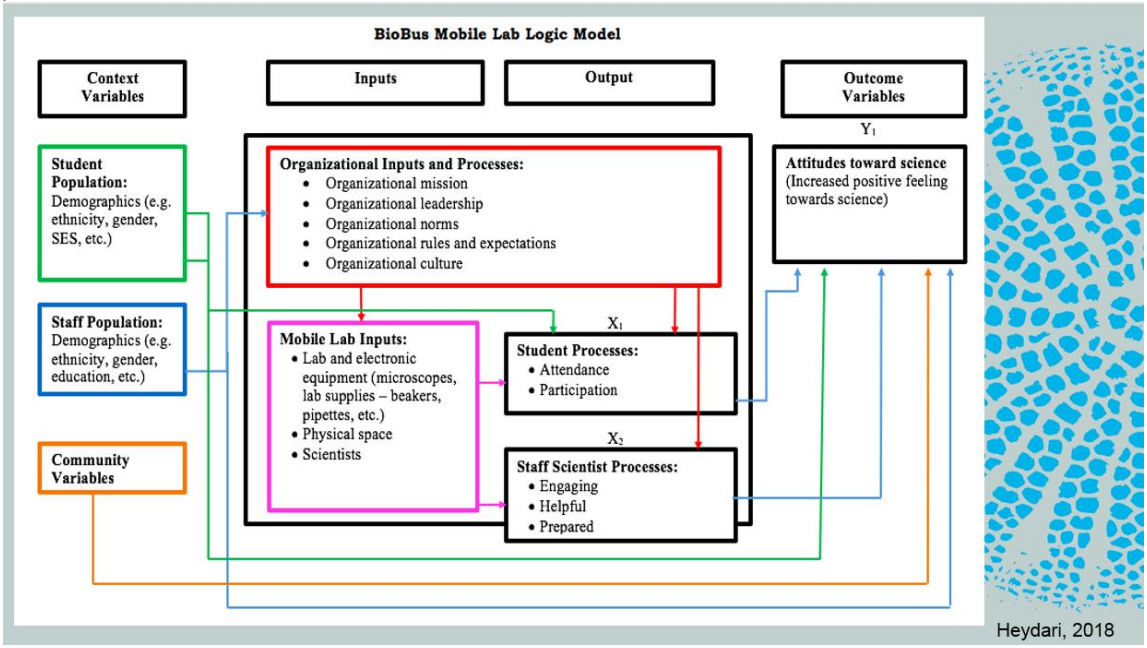
Logic Model

- A conceptual diagram showing the "theory" underlying a phenomenon or intervention

- Depicts how relevant variables are connected to each other and how they are expected to influence the desired outcome in the target population (Patton, 2011)
- If you don't know your variables, you won't know the strength of your causal relationship and you're trying to hit a moving target
- Logic model diagram
  - Purpose or Mission of your program
  - Inputs or resources; constraints or barriers
  - Activities – what the program does or use of resources
  - Outputs – direct evidence of having performed the activities
  - Short- and long-term outcomes

BioBus Mobile Lab Logic Model

The benefit of creating a logic model reveals elements that you may not have considered, and you have variables where you know where to look



Logic Model Development Template

- Filling out logic model in relation to your own program
  - Resources
    - Ask and answer: In order to accomplish our set of activities we will need the following
  - Activities
    - Ask and answer: In order to address our problem or asset we will accomplish the following activities
    - Observations, surveys, interviews, focus groups, rubrics
  - Outputs
    - Ask and answer: We expect that once accomplished these activities will produce the following evidence or service delivery
    - Are things that people will come away with having done something
  - Short & long-term outcomes
    - Ask and answer: We expect that if accomplished these activities will lead to the following changes in 1-3 then 4-6 years

        - Don't always have to be student-facing; could be organizational-facing, community-facing, etc.
    - Impact
        - Ask and answer: We expect that if accomplished these activities will lead to the following changes in 7-10 years

Three Phase Evaluation to Measure Success of Impact of Salk Mobile Science Lab on Students and Teachers

Speaker Two: Dona Mapston, Salk Mobile Science Lab – Salk Education Outreach

Case Study of Evaluation

Background

- Salk Institute is a basic Biologic Research Institute (lots of studies in mice) in San Diego– 3rd in the US
- Education was not part of the mission
- Salk mobile lab began in 1996 – 3-day curriculum "Discovering DNA"
    - Classroom based—bringing things into the classroom and community events also
    - Day 1 – Mutant Flies
    - Day 2 – DNA Extraction
    - Day 3 – Agarose Gels
- 20 Middle Schools/yr.; 2300 students per year
- All equipment provided
- Taught by scientist volunteers

Evaluation

- Three-year process from 2008-2011
- Hired a team from Insight Strategic Education Evaluation, Inc. to be able to articulate goals to stakeholders, identify areas for improvement, and find strategies on how to measure data
- Three-phase process
    - Year 1: Articulating goals (what do we think we're doing?)
    - Year 2: Develop and pilot evaluation tools (how do we measure?)
    - Year 3: Large scale sample and longitudinal study
- Results were positive and helped gather data for some bigger grants

Challenges

- Funding - $75K
- Classrooms are all different and introduces many variables
- San Diego is BIG and very diverse so choosing the right school to evaluate was challenging

Phase I – Year 1

- Interview stake holders to articulate goals – Principals, teachers, students, community members
- Identify areas for improvement
- Develop strategy to measure effectiveness of programs on community
    - Used Survey Monkey, but not all parents/students had online access
    - Pre- and post-test were data

Phase 2 -Year 2

- Building and piloting customized surveys
    - Teacher surveys
    - Pre- & post-surveys
    - Online surveys
- Student Surveys (Mixed method Quasi Experimental)
    - Ask the same question a lot of different ways
    - Participants and comparison group
- Surveys administered in class by skilled evaluators to lessen variables
- Surveys/questions were validated

Phase 3 – Year 3

- Survey revision, expanded data collection

- Longitudinal indicators (high school students)
- Focus groups of former participants (17 students)
- Science transcript analysis of participants vs controls

Lessons Learned

- Hire professionals
- Define, define, define,
  - Program goals
    - Know what you do and why you do it
    - Know what your clients think
  - Evaluation has to match your goals
- Working relationship with school, teachers, admin, and parents
- Be flexible
- Be willing to implement recommendations

Evaluation Onboard the MXLab: Strategies and Lessons Learned

Speaker Three: Joseph Wilkerson and Emily Freeland, MdBio Foundation, Inc.

Background

- 53' Trailer – seats 42 students
- Six touch screen monitors
- Visits different high schools in Maryland for one week
- Teachers select activities for each class
- Short-term outcomes--increase STEM: content knowledge, confidence, and career seekers
- Software and equipment—iClickers and iPads/phones

Methods

- Pre and post in urban, suburban, and rural
- Data collected by staff, analyzed by Kathy Dowell from The Evaluation Group

Goals

- Survey to compare impact in different communities across the state (urban, suburban, rural)
- Measure program quality and impact

Wildlife Forensics Activity

- After the lab, most students reported that they were more aware of different science careers and had a better understanding of what it means to have a science career.
- Just over half of students were more interested in a science career, while less than half had a stronger belief that they could be successful in a science career

Questions Asked on the Survey

- I believe there are many different career choices in science – 65% more or much more after visiting lab
- There are many careers in science, tech and engineering in MD – 65%
- I understand what it means to have a science career – 65%
- I believe I can be successful in a science career – 53%
- I am interested in pursuing a science career – 44%

Strengths

- Students responded to the clickers
- Software worked smoothly
- Increase in content knowledge

- Pre-surveys were easy for teachers to administer
- We're in control of data collection

Challenges

- Time: lab activities took priority to evaluation
- Length of survey – students lost focus
- Post only survey results – hard to evaluate
- Phrasing and order of wording/questions has an effect
- No control groups
- Communicate between evaluator and lab staff

Next Steps

- Re-evaluate survey questions
- Integrate evaluation questions into MXLab experience
- Increase STEM career content via career profiles
- Currently analyzing pre-survey data
- Focus groups – implement

Participants

Gary Barnett, Region 13 Education Service Center
Michelle Blodgett, Michigan Farm Bureau
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Bruce Waller, Institute for Advanced Learning and Research
Daniel Wheeler, Morehead Planetarium and Science Center

Solar Circuits with Science on Wheels

Thursday, July 26, 11:00 – 11:50am

Presenter: **Sherry Painter**, *Associate Professor of Chemistry, LeMoyne-Owen College*
Reporters: **Corey Coombs**, *Seattle Children's Research Institute*
Benedetta Naglieri, *MdBio Foundation, Inc.*

Session Description

Inspired by existing mobile labs, Sherry Painter began her journey of creating her very own, Science on Wheels. Her mission has been to spark interest in science for the students, while they also see that science is fun and something they can do. "Solar Circuits", which is one of the more popular activities, was available to try out.

Mobile Lab

NIH funded program allowing instructors to visit other established programs.

- Inspiration came from many existing mobile labs
  - Genome Mobile Lab
  - BioBus, Inc.
  - St. Cloud Science Express
  - Science Adventure Lab
- Leased a used city bus for $1 for the first 5 years

- Gutted and renovated
- Funded by donations from local organizations
- Implemented 4 solar panels
  - Adjustable
  - On roof of bus
  - 8 12v AMG batteries, 800amp hours
  - Powered inside lights and lab equipment
- Based out of Memphis, Tennessee

Activity

- Lessons are meant to be educational and fun
- Many activities offered for the schools to choose from
- Solar Circuits is one of the most popular activities (kits were donated to Science on Wheels)
  - Students are introduced to a solar panel
  - Provided worksheet that describes in series vs. parallel
  - Given instructions to follow to create result
    - Examples: light up a lightbulb, cause a fan to rotate, sound an alarm
- Targeted audience is 4th and 5th grade
- Enrichment activities for students who finish early—Battle Bugs

Closing Remarks

- Studies show students gain or lose interest in science by 5th grade
- Science on Wheels is there to encourage students that they can do science
- Spark interest in STEM careers

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Benedetta Naglieri, MdBio Foundation, Inc.
Billy Roden, Seattle Children's Research Institute
Paul Seifert, Conservancy of Southwest Florida

Mobile Learning for Mobile Labs

Thursday, July 26, 1:15 – 2:15pm

Presenters: **Dr. Carla Romney**, *Director of Research, Boston University*
Dr. Donald DeRosa, *Director, Boston University CityLab*
Reporters: **Chris Chung**, *Sustain-ED*
Dr. Carla Romney, *Fordham University and Boston University*

Session Description

In this session, attendees shared their experiences with a variety of mobile apps for teaching on mobile laboratories. The group had used or was interested in apps for assessment/evaluation, collaborative group work, sharing presentations with students' devices, using students' devices as data acquisition tools, creating game-like quizzes/scavenger hunts, and augmented reality/virtual reality for understanding the world and simulating lab experiences.

Overview of Apps recommended by Dr. Romney

- Slack [https://slack.com] – collaborative workspace -like Google docs.
  - Feedback: good on a phone or tablet on the students' own devices
  - Advantage Portability
- Nearpod [https://nearpod.com]
  - Feedback: PowerPoint on steroids

    - Input existing ppt and makes them shareable on students' devices and bi-directional
    - Use of Clickers – poll and assessment options are good with Nearpod
    - You can also find Nearpod publications via search [huge library]
- Quizizz [https://quizizz.com]
    - Make assessment type games – easy to use.
        - Scavenger hunts ...in the lab
- Labster [https://labster.com]
    - Virtualized laboratory setting
    - They simulate the lab – used in many universities
    - Ever-improving in quality of simulation
- Science Journal [https://sciencejournal.withgoogle.com/experiments]
    - Rock Star: uses sensor devices in your phone... for example, uses the light sensor on your phone to do spectrophotometry
    - Investigate the Kinetics of an Iodine Clock Reaction
    - Students can record their own observations....
    - Brings the science to the students' own devices... they can do this at home....
    - Q: Can you develop stuff for it? Yes.
    - Q: Does it only work with a phone? No, tablets too – any device with a dimming capacity...need a sensor that assesses ambient light...

Apps Suggested by Group

- www.withgoogle.com has other programs.
- OneNote & Google Classroom
    - Both are means of instructor work, disseminated, and collaboration of students with teachers.
    - GC has been revamped and works well in mobile setting.... worth another look.
    - Feedback: they have updated assessment support, you can also have discussions. They can also grab multimedia resources....
- Anne Arundel Public High School in Maryland
    - Has interns that look for tools and bring them back as recommendations.
- Socrative—good app for assessment
- Representative from Chile – lab4u.co
    - Similar to Science Journal
    - Pre-built labs that you can use
- Google exploration app
    - Need Google carboard headset and phone
    - There are a number of expeditions available for free
    - vr.google.com

Overview of Apps recommended by Dr. DeRosa

- Thinglink: Augmented Content – annotate video, 360, images
- NASA: mynasadata – good resources
- Ocean observations
    - earth.nullschool.net
    - Ventusky.com
- Assessments
    - Polls in google slides
    - Kahoot

Group Discussion

- The Farm Science lab: 10 ICAD stations- offer 8 lessons – setup in Nearpod – Agri based program, Video links, Experiment, polls, Quiz, labsheets
- Prezi requires 13 years or older
- For coding - Hour of Code resources
- CS-first.com is a Google product – storytelling – with coding
- Ozzo box & Scratch

- Beebots for younger kids
- Lego Education is good and also for younger kids
- Classcraft – way to "game-ify" lessons – works better for kids you see more long-term
- From Chile: Google Classroom – used to share resources after the lab experience
  - Free to NGOs
- Wi-Fi connectivity hit or miss in parts of Michigan.... Big question.
  - Add router with USB port so you can add devices and share any content to devices
  - Verizon has a new unlimited plan
  - AT&T works better in upper part of MI
  - Look at long distance Wi-Fi router – may be challenged with school politics
  - Look at RV internet company—satellite is expensive
- Breakout box – like a mobile escape room with multiple lock, clues related to curriculum www.breakoutedu.com

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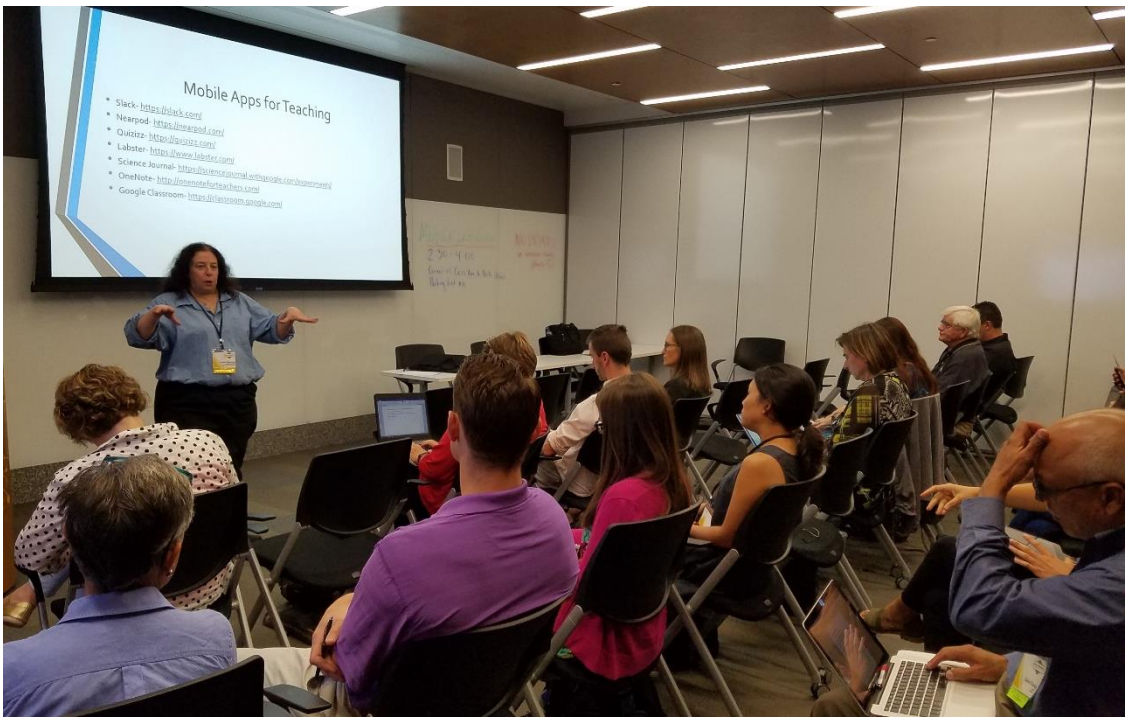

Is Your Science Diverse? Promoting Equity of Access in Your Mobile Lab Program

Thursday, July 26, 1:15 – 2:05pm

Presenter: **Daniel Wheeler**, *Science Programs Outreach Educator, Morehead Planetarium and Science Center*

Reporters: **David Garbe**, *Pennsylvania Society for Biomedical Research (PSBR)*
Seneca Lee, *BioBus, Inc.*

Session Description

This session describes methods for evaluating and increasing program diversity, as well as training about diversity in the classroom and providing access and equality on mobile labs. Mr. Wheeler discussed how to be an ally; the idea that anyone can be an ally to anyone else no matter your identification.

Introductions

- Daniel has been involved in training for LGBTQA communities, trained in how to be an ally for victims of abuse, and has participated in the diversity and inclusion training
- Morehead Science Center has two mobile vehicles and the buses visit any county in North Carolina
- 69 total visits; 3523 students served
- Primary modules are based on biology and chemistry

"Be an Ally" Strategy

- Be visible
  - How do you and your organization represent itself?
  - Be yourself and try to show your audience that you are inclusive
  - Ability to make someone more comfortable or uncomfortable (with regards to straying away from the norm)
- Educate yourself—try to be aware of your culture
- Make resources readily available—a dedicated marketing department helps
- Use inclusive language
  - Use culturally diverse names in your content
  - Demonstrate diverse images
- Avoid making assumptions
  - Behavior
  - Prior knowledge
- Speak up
  - Your mobile lab is your space—you make the rules
  - If you notice challenges to diversity, make sure you bring it to others' attention
  - If you witness biased behavior or any exclusive language/ behaviors

Activity

- Audience members would step back or forward if they related to the statement being said aloud. Statement topics were often about self, society, and how one affects the other
- Working agreements for the activity
  - Assume best intentions
  - Respect others and self
  - Ask questions
  - Speak from your own experience
  - Confidentiality

Program Specific Strategies

- Demographic tracking
- Hiring practices—who are the faces of your organization
- Target underserved audiences that don't often get STEM exposure
  - Pediatric patients, juvenile detention centers, etc.
- Scholarships and grants
- Tailored outreach
- Multilingual programs
- STEM career showcases
- Sign Language
- Low-sensory days
- Inclusion task force
  - Show kids different kinds of science
  - Lab work vs field work; presenting both
  - Opening students' minds to what STEM can be
  - Conscious of the way we present science
- Professional and/vs citizen science ("science is a hobby and one doesn't have to be a professional to like science")

Participants

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Alex Chang, Seattle Children's Research Institute
Corey Coombs, Seattle Children's Research Institute
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Billy Roden, Seattle Children's Research Institute
Sarah Weisberg, BioBus, Inc.

Thinking Outside the Box: New Ways to use Mobile Labs

Friday, July 27, 10:45 – 11:30am

Presenters: **Chris Chung,** *Founder*, *Sustain-Ed*
Dr. Donald DeRosa, *Director*, *Boston University*
Emily Freeland, *Education Outreach Instructor*, **Joseph Wilkerson,** *Mobile Laboratory Manager,* and **Jennifer Colvin**, *Vice President of Education, MdBio Foundation, Inc.*
Facilitator: **Dr. Donald DeRosa,** *Director*, *Boston University*
Reporters: **Kimberly Cox-York**, *Colorado State University*
Benedetta Naglieri, *MdBio Foundation, Inc.*

Session Description

Chris Chung discussed helping to create mobile labs with more green facilities with virtual reality, simulation, hands-on lab, and augmented reality. Emily Freeland discussed serving the community for disaster relief.

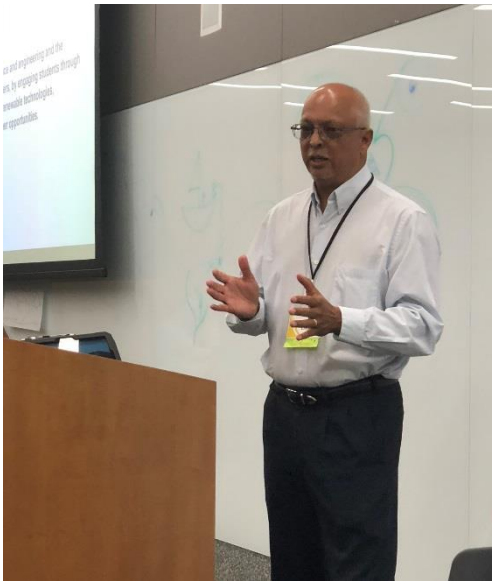
Incorporating Google Expedition in Curriculum

Chris Chung and Dr. Donald DeRosa

Virtual Reality

- Google Expeditions – take kids on virtual field trips, like to Grand Coulee Dam in Washington State.
  - Has teacher materials including arrows on the picture to describe what students are seeing and change the views
  - Need to be able to take 360 images and have the time/resources to go out and collect the images
  - Headsets are $10
  - Pop in different media

- Virtual wind power simulation - assemble turbine and simulate working
    - 3M product, but uses Flash (cumbersome)
    - Needs the use of a tablet/computer



Hands-On

After the simulation, they get a physical hands-on building set to make a wind turbine

Augmented Reality

- Thinglink – make your own AR
- BU video – Bio Convention on National Mall – Video wouldn't play
- iPhone new operating system will have AR real world with things that pop in that aren't really there.
- Can be expensive or cheaper if you build yourself

Mobile Education's Role in Disaster Relief: A Template for Innovation

Emily Freeland

Natural disasters are on the rise – how can mobile labs be used in disaster relief?

- Hurricane Harvey hit Texas on Aug 26th
    - Category 4
    - Very long and intensive damage
    - 964 schools were damaged with 52 schools totally damaged

MdBio helps Texas

- Phase 1
    - Raised operating costs for 2 weeks, including donated staff time
    - Served 3 schools in Houston and Port Aransas, TX
    - Goal was to find local funding once the two weeks were up
- Phase 2
    - Loaner Lab – schools staffed and rented the lab
        - School funded
        - Staff were trained on vehicle operation and curriculum
        - 50% of science must be done in a lab in Texas to meet standards
- Phase 3
    - Rebuild Texas – direct, private fund to use to rent the lab to meet state science standards
    - Refugio, TX for 3 months
    - Summer camp in Wharton, TX through August 2018
- MdBio bus will stay in south Texas through 2018
    - Looking for local partners to continue program
    - Big state with a big need for STEM activities in rural Texas

Food for thought Break-out Session

Think about ways to expand the use of the lab

- Mobile lab corridors
- Train teachers and lend equipment
- Rutgers science explorer provided assistance after Hurricane Sandy
- After-school "maker space" was used during the week to train teachers to use the equipment
- Work with community centers to have lab available
- Add solar to the top in case of emergency
- Get listed on FEMA list if you're a non-profit
- Set up "kid zone" in shelters (e.g. California fires)
- Train people to mobilize during disaster – IMPACTS train researchers to be science communicators
- Engage volunteers to supplement staff for after school or weekends

- More outreach to local centers – partner with community colleges to provide training
- Insurance issues – be aware of these
- Other considerations: may be requirements to work across state lines, register as a non-profit in the state, local insurance coverage

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Alex Chang, Seattle Children's Research Institute
Chris Chung, Sustain-ED
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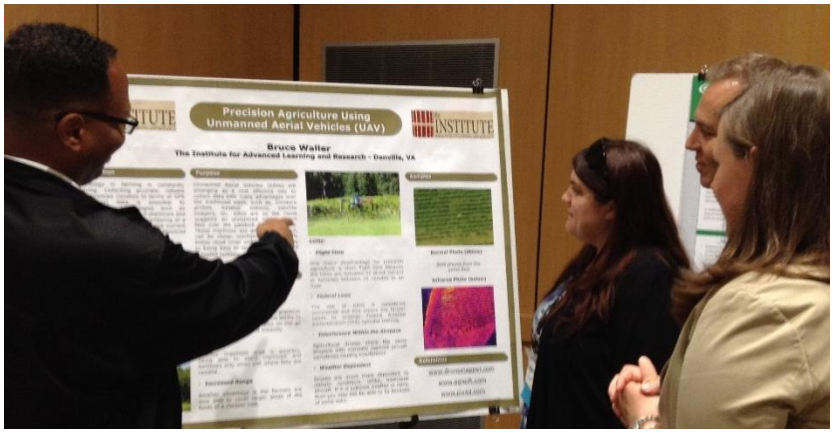
Carla Romney, Boston University/Fordham University
Shiloh Slomsky, Little Traverse Bay Band of Odawa Indians
JaCinda Sumara, Oakland Schools
Monika Tucker, San Diego Children's Discovery Museum
Daniel Wheeler, Morehead Planetarium and Science Center

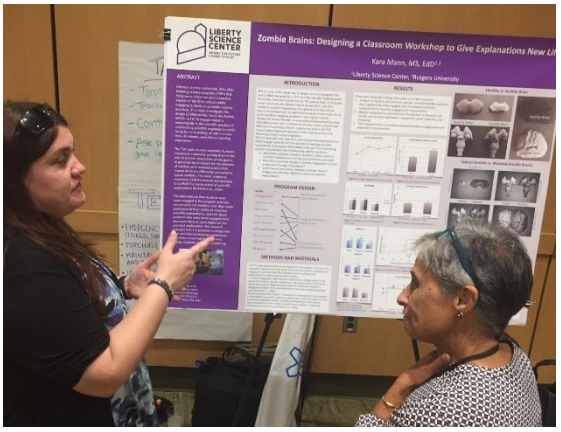



POSTER SESSION
WEDNESDAY, JULY 25

Poster Number	Project Name/Poster Title	Institution	Presenter(s)
1	Learning Undefeated: How Mobile Education Platforms Can Play a Vital Role in Disaster Recovery	MdBio Foundation, Inc.	Emily Freeland, Joe Wilkerson, and Jennifer Colvin
2	Salk Mobile Science Lab - Biotechnology Programs for Middle School	Salk Institute for Biological Studies - Education Outreach	Madison Dodds and Dona Mapston
3	Engaging Families to Enhance Science Learning and Interest in STEM Careers	Seattle Children's Research Institute	William Roden, Rebecca Carter, and Dr. Alex Chang
4	The Bio-Bus Program at Georgia State University: A Closer Look	Georgia State University/Bio-Bus Program	Mary Hall and Verdy Jocelyn
5	Active learning strategies in informal education environments to engage middle school students in STEM	Rutgers University	Patricia Irizarry and Jessica Johnson
6	UB - Discovery STEM on Wheels Initiative	University of Bridgeport	Nancy DeJarnette
7	Investigating Mobile Agricultural Classrooms for Agricultural Literacy Programming	Utah State University	Amelia Miller
8	Precision Agriculture Using Unmanned Aerial Vehicles.	Institute for Advanced Learning and Research	Bruce Waller
9	GENETIC OUTREACH EDUCATION: Seven years old and expanding the sphere of impact	Greenwood Genetic Center	Leta Tribble, Hannah Crawford, and Dillon Gary
10	Zombies Brains: Designing a Classroom Workshop to Give Explanations New Life	Liberty Science Center	Kara Mann
11	Tech Tools to Engage Remote Teams	MdBio Foundation, Inc.	Alexandra Main
12	Effectiveness of Mobile Laboratory	Nagoya Institute of Technology	Yosuke Kawamura
13	Going Mobile to Stationary	BioBus, Inc.	Seneca Lee
14	Use of the Mobile Earth & Space Observatory to reach underserved communities	National Space Science & Technology Institute	Dimitri Klebe, Gianna Sullivan, and Robert Sallee
15	Innovating a Mobile Lab curriculum with VR Technology	Ecoscience Foundation Chile	Oscar Contreras Villaroel
16	Mobile Makerspace: Robots on the Road	Sprocket, Inc.	Karen Baumann, Monika Bilak, Jimi Gwinn, and Katelinn Meyer

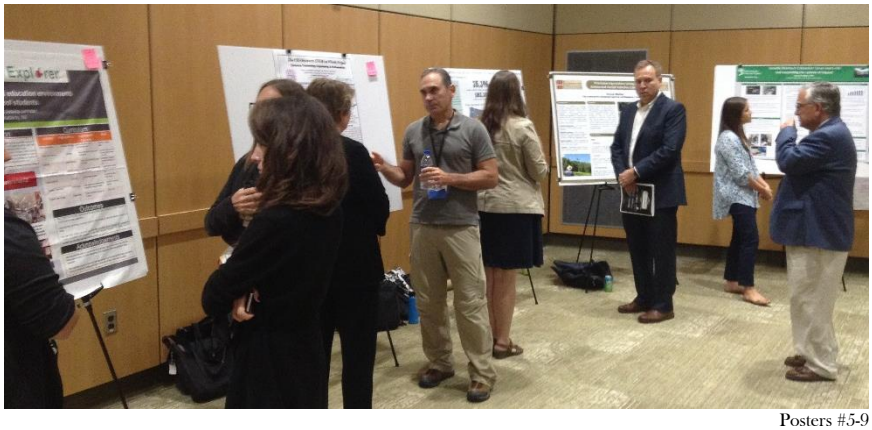


Poster #8



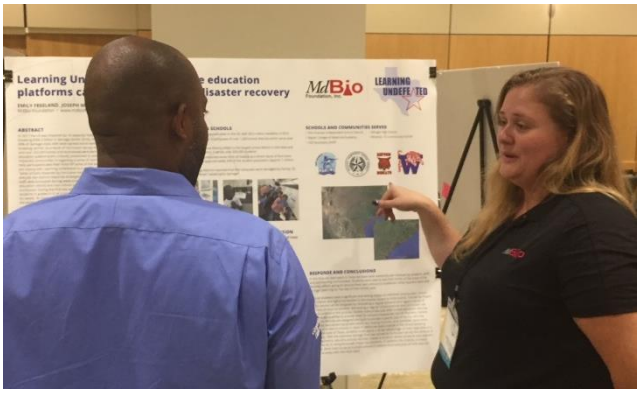
Poster #10

Poster #11

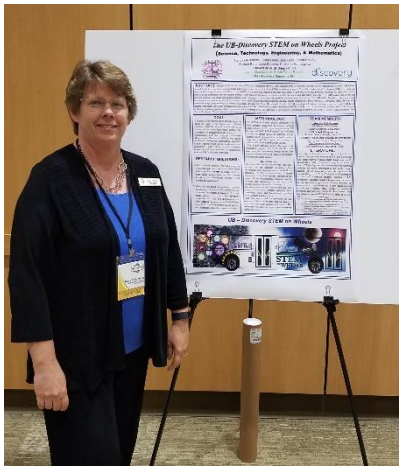


Posters #5-9

Poster #4



Poster #1



Poster #6

Poster #13

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