

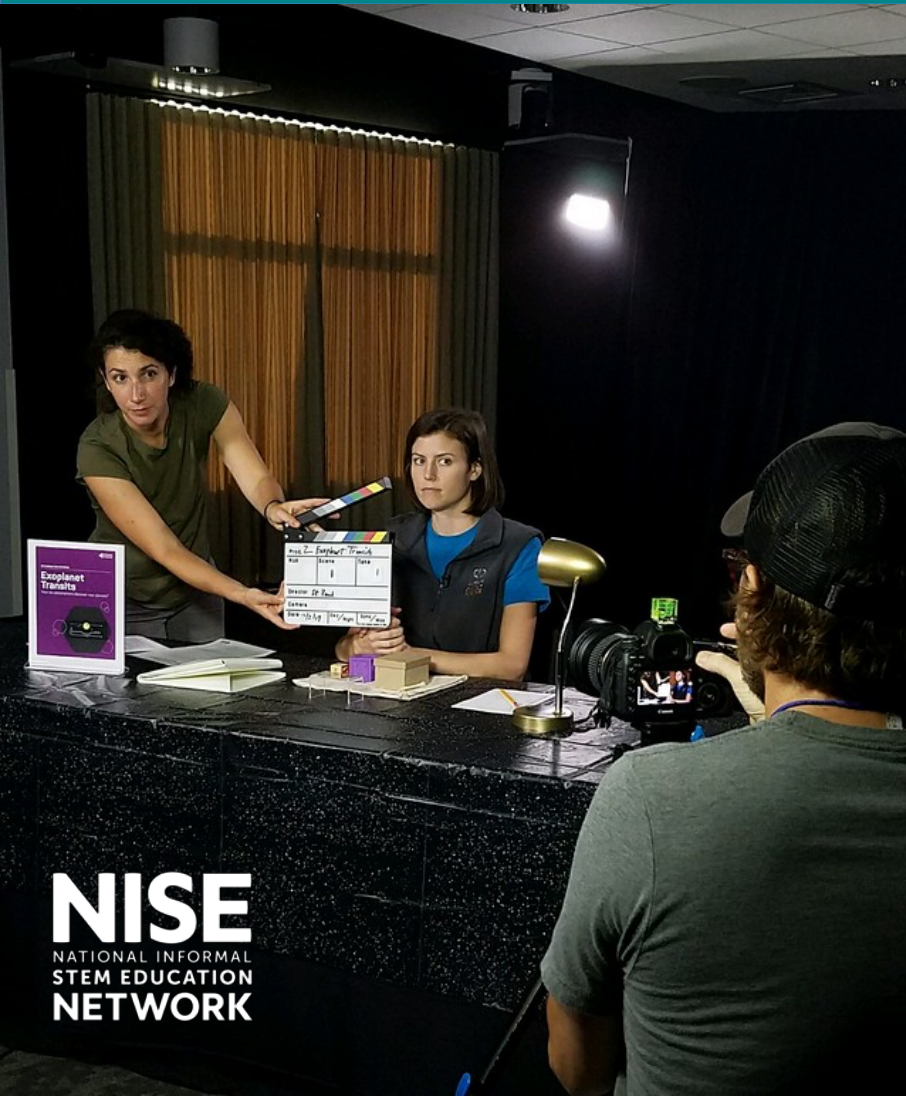
How to prepare and train event volunteers and staff



Presenters

- **Catherine McCarthy,**
Science Museum of Minnesota, Saint Paul, MN
- **Emily Belle,**
Sciencenter, Ithaca, NY
- **Alex Dour,**
Orpheum Children's Museum, Champaign, IL
- **Susan Heilman,**
Museum of Science, Boston, MA
- **Meghan Murray,**
Above & Beyond Children's Museum, Sheboygan, WI
- **Calvin Uzelmeier,**
Rochester Museum & Science Center, Rochester, NY

**Catherine McCarthy,
Science Museum of Minnesota
Saint Paul, MN**

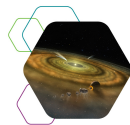


Catherine McCarthy
Project Leader
Science Museum of Minnesota
Saint Paul, Minnesota
cmccarthy@smm.org

NISE Network Partner Meeting
Tempe, Arizona February 2019

Hands-on Activities

Activity instructions



EXPLORING THE SOLAR SYSTEM Magnetic Fields

Try this!



Slowly move the rubber end of the pencil probe tool around the Earth globe. What do you notice?



Carefully watch how the small metal piece of the tool moves. Can you find the invisible magnetic field?



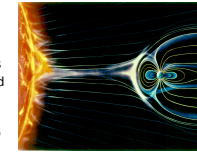
Sprinkle some small steel pieces onto the Earth globe. What happens?

Now, scoop the pieces off the Earth globe and try sprinkling them onto the larger Sun globe. What do you notice?

Tip: Remember to pull all the metal pieces off the Sun for the next group!

Scientists have observed active magnetic fields throughout the solar system.

Earth has a strong, protective magnetic field. In this activity the pencil probe tool and the small metal pieces allow you to observe the magnetic field of the Earth globe. Our planet's strong magnetic field is the result of hot, liquid metal surrounding its solid iron core. The swirling motion of this conductive liquid creates electrical currents, which develop into the magnetic field.



Earth's magnetic field protects the planet from charged particles from the Sun and cosmic rays from outside the solar system.

Scientists use a variety of tools to detect and study magnetic fields in the solar system. Here on Earth, a compass can detect our planet's magnetic field. An instrument called a *magnetometer*, which works a lot like the simple pencil tool, can be used to detect solar and planetary magnetic fields.

The Sun's magnetic field extends out into space and sends powerful bursts of magnetic energy into the solar system. In this activity, the small metal pieces on the surface of the Sun globe reveal some of the ways these magnetic fields interact. Sometimes the magnetic field lines are straight and simple; sometimes



Image of an aurora on Earth taken from the International Space Station.

the magnetic material inside the Sun stretches and twists, making the fields more complex.


A planet's magnetic field can protect it from most of the Sun's magnetic energy, but some particles coming from the Sun enter a planet's atmosphere to collide with and excite molecules. This interaction generates shimmering light displays called *auroras*. Also called "northern or southern lights" on Earth.

Hands-on Activities

Info sheets and worksheets


Our Active Star

Changes to the Sun's magnetic field can have a big impact on life on Earth.



A solar flare erupts off the Sun in 2012.

We live in the extended atmosphere orbit through a constant flow of solar magnetism streaming from the Sun to the Sun to learn more about our planet's sudden changes to the Sun's system.

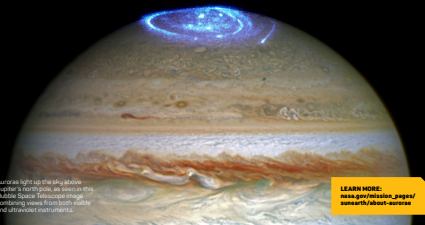


Coronal mass ejections can trigger power grids and cause widespread blackouts.

EXPLORING THE SOLAR SYSTEM: Magnetic Fields

Auroras on Other Planets

Earth isn't the only planet with northern and southern lights.



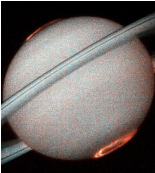
Auroras light up the sky above Jupiter's southern pole, as seen in this composite image showing the planet's colorful aurora and ultraviolet aurora.

LEARN MORE:
https://www.nasa.gov/mission_pages/cassini/ultraviolet-aurora/

EXPLORING THE SOLAR SYSTEM: Magnetic Fields

We've observed the colorful displays of light known as auroras on many different planets. On Earth, Jupiter, Saturn, Uranus, and Neptune, solar wind (charged particles flowing from the Sun) interacts with planetary magnetic fields to create auroras. On Mars and Venus, auroras come from solar wind interacting with the atmosphere.

The colors of an aurora depend on the gases in a planet's atmosphere, so auroras look different on different worlds. Scientists think some planets in other star systems might also display auroras. What do you think these light displays might look like?



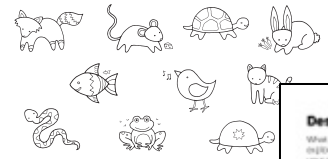
Saturn's powerful magnetic field helps produce auroras at both its north and south poles.

EXPLORING THE SOLAR SYSTEM: Magnetic Fields


EXPLORE SCIENCE

Cultures around the world tell many stories about what you see when you look up at the Moon.

In one Peruvian tale, Fox and Mole try to travel to the Moon using a grass rope to search for worms to eat. Mole falls back to Earth, but the birds still say that on a clear night they can see Fox in the full moon, looking down on Earth. Mole says he can't find him. Can you?




Use these binoculars to find Fox and other animals hidden on the Moon. What do you see?



EXPLORE SCIENCE

Design your own Mars rover!

What kinds of scientific instruments would your rover need to explore the surface of Mars and collect information? How does your rover communicate back with Earth? Does it need special wheels to drive on the surface of this rocky, red planet?



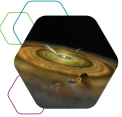
My rover's name is: _____

When you imagine the design of a Mars rover, you're doing a 3D model of science. People here on Earth carefully plan the Mars rover mission. Teams of scientists, engineers, artists, and many others work together to make rovers that can look for signs of life, study the planet's climate and geology, and prepare for human exploration.

Learn more about the new Mars 2020 rover: https://www.nasa.gov/mission_pages/mars2020/

Hands-on Activities

Facilitator Guides - Notes and tips



FACILITATOR GUIDE

Magnetic Fields

Learning objectives

- Scientists have observed active magnetic fields throughout the solar system.
- Earth has a strong, protective magnetic field.
- The Sun's magnetic field extends out into space and sends powerful bursts of magnetic energy into the solar system.

Materials

- Simple magnetometer pencil tool
- Earth model with magnetic core
- Sun model with magnetic fields and sun spots
- Small steel pieces and container (paperclips)
- Tray for Earth model
- Tray for Sun model
- Information sheets: *Auroras on Other Planets; Magnetic Fields; Solar Flares and Coronal Mass Ejections*
- Activity and facilitator guides


The Explore Science toolkit comes complete with all necessary materials for this activity. Materials The materials provided in the physical toolkit were custom made using TBD. You can substitute TBD. Graphic files can be downloaded from www.nisenet.org.

Safety

This activity should be monitored. It includes very small pieces of metal and magnets. Although they are not a choking hazard, the metal pieces should not be swallowed. If they come loose, the neodymium magnets do pose a serious safety choking hazard to children. Take precaution and conduct periodic safety checks to be sure they are secured within the Sun model.

Notes to the presenter

When first beginning the activity, set aside the cup of metal pieces and the Sun model. This will help the participants focus on finding Earth's invisible magnetic field using the pencil tool. Then try adding the metal pieces and invite visitors to try and connect the metal pieces between the north and south poles of the Earth model. This is a nice visual depicting the magnetic field lines covering the entire Earth.



Using positive responses with difficult concepts

What are misconceptions?

Throughout life we make observations and form patterns to try to understand the world around us. People often use mental shortcuts grounded in previous experiences to make sense of difficult

are incomplete or are too simple. Our intuitive range, even in the face of new information, ions.

that the closer you are to a hot stove, the misconception that warmer temperatures in the scientific explanation for seasons on Earth angle of Earth and the amount of light conceptions we may all have about Earth and

than just providing the correct scientific visitors think more scientifically about the try to build on previous knowledge and

open-ended questions. Use the activity or model to demonstrate

are saying. Try the "Yes, and..." approach, knowledge something you said that is helpful ou to consider some new evidence that will

D that's because it's so big that we can't tell that it's amine this scale model Earth experiment.

u get closer to something hot you get warmer, AND summer in the northern hemisphere, when it's s. Let's use this scale model of the Earth to chart during the year.

D another type actually blocks our view of the Sun. A on is between the Sun and Earth. This model allows casts a shadow onto Earth.

related to each activity, refer to the activity's

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Tips for leading hands-on activities

Greet your guests

Say "hello," make eye contact, and smile. People will come over if you look welcoming, available, and friendly. As much as possible, let your guests do the hands-on parts of the activity, and let them discover what happens. (If your activity has a surprise, don't give it away!)

Encourage exploration

Provide positive feedback and assistance when people need it, but let them experiment and learn for themselves. Don't insist people do things the "right" way—sometimes learning how something doesn't work is just as valuable as learning how it does work.

Ask open-ended questions

Help people observe and think about the activity. Try to use questions that have more than one answer, such as: "What do you see happening?", "Why do you think that happened?", "What surprised you about what you saw?", and "Does this remind you of anything you've seen before?"

Be a good listener

Be interested in what your guests tell you, and let their curiosity and responses drive your conversation forward.

Share what you know

Use clear, simple language. Focus on one main idea—you don't need to explain everything at once! Start with very basic information, and then share more with interested learners.

Use examples from everyday life

Familiar examples can help explain abstract concepts. Be aware of different abilities, keeping in mind that children do not have the same skills or vocabulary as adults.

Offer positive responses

If people haven't quite grasped a concept, you might say, "That's a good guess!" or, "Very close, any other ideas?" Don't say, "No" or "Wrong." You can offer hints or suggestions for things to think about or watch carefully. (See the other side of this sheet for positive ways to deal with difficult concepts.)

Share accurate information

If you aren't sure about something, it's ok to say, "I don't know. That's a great question!" Suggest ways that people can learn more, either by trying another activity or looking up information at the library or online.

Remain positive

Maintain an inviting facial expression, positive tone, and open body language throughout the interaction.

Thank your guests

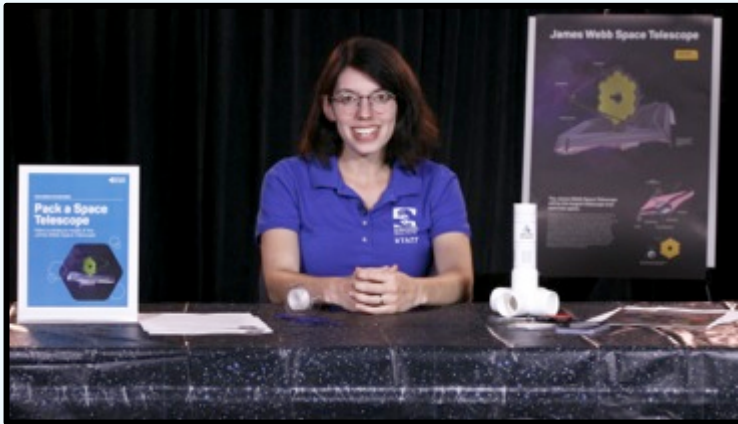
As your interaction ends, suggest other activities that you think your guests might enjoy.

Have fun!

A positive experience will encourage learning.

Activity Training Videos

How To Facilitate Activity



Activity Content



nisenet.org/About_Professional_Development

Facilitation Training Videos

Focus on facilitation skills

- **How to / how not to interact with visitors**
- **Edu-Cathalon**
- **Speed-ucate**
- **Misconceptions**
- **America's Next Top Presenter**



nisenet.org/About_Professional_Development

Orientation Slides

Customizable slides for training presentations



More Professional Development

Online Workshops

Upcoming:

nisenet.org/events

All workshops are

Recorded and posted to
nisenet.org



NISE
NETWORK

ONLINE
WORKSHOPS

More Professional Development

Professional Development Guides



nisenet.org/About_Professional_Development

More Professional Development

Improv Activities

to facilitate positive,
learning conversations
with visitors



nisenet.org/About_Professional_Development

More Professional Development

For Scientists

Science Communication Tools

- Mastering Public Presentations
- Making the Most of Broadcast Media
- Stunning Scientific Posters Sharing Science workshop materials

Workshop resources

- Sharing Science training materials
- Research Experiences for Undergraduates (REU) training materials
- Science writing workshop

Other examples

- Portal to the Public (Pop) Network



Where to find resources

The screenshot shows the NISE (National Informal STEM Education Network) website. At the top left is the NISE logo. To its right is a search bar. Further right is a 'SUBSCRIBE TO OUR NEWSLETTER' button and social media icons for Facebook, LinkedIn, and Twitter. Below this is a dark teal navigation bar with the following items: 'Programs and Activities', 'Exhibits', 'Media', 'Professional Development', 'Evaluation and Research', 'Kits', and 'About'. The 'Professional Development' menu is open, showing a list of options: 'For Educators', 'For Scientists', 'Online Workshops', 'Intro to Nano', and 'About Professional Development'. A purple arrow points to the 'About Professional Development' option. To the right of the menu, there are two light blue buttons: 'Browse by Kit' and 'Browse by Topic'. Below the navigation bar is a featured content area with a carousel of images and text, including 'EXPLORING Earth', 'Digital 2017 and 2018 t...', 'Digital 2019 tool...', and 'Download the Digital Kits!'. At the bottom, there are sections for 'FEATURED NEWS' and 'FEATURED PRODUCTS'.

nisenet.org/About_Professional_Development

Thank You



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Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the view of the National Aeronautics and Space Administration (NASA).

**Emily Belle
Sciencenter
Ithaca, NY**

**Training special event volunteers
at the**



Sciencecenter

Ithaca, NY

Presented by Emily Belle, Education Program Coordinator

Mission: Cultivate a broad community of curious, confident, critical thinkers.

Vision: A world where people explore, connect, and create through science.



The Basics

- 40,000 square feet
- Built by the community
- Approximately 3,200 members;
100,000 guests each year
- ~250 exhibits, outdoor Science
Park, mini-golf

Events

On-site Special Events

- Member Nights
- Spooky Science
- Featured Showtimes!
- Head Start Family Events



Off-site Outreach Events

- **Family Science Nights**
- Community festivals
- Campus/school visits

Interactive Activity Training

- Improv Game
 - NISE Network Training Video
 - [SPEED-UCATE](#)
 - [How TO Interact with Visitors](#)
 - [How NOT to Interact with Visitors](#)
 - [Edu-Cathalon](#)
- OR skit and Bingo Game

Bingo Caller's Card

Greet guests	Offer positive responses	Be a good listener	Have fun yourself!
Share accurate information	Encourage exploration	Share what you know	Engage adults
Thank your guests	Ask open-ended questions	Use examples from everyday life	Remain positive
Use guests' names	Wear apron & name tag	"Yes, and..."	Let silliness happen



IFP Information

Your name: _____

Name of IFP: _____

Date: _____

Number of Visitors: _____

Visitor Comments: _____

Tips for Working with Visitors

- **Greet visitors** with a friendly “hello,” make eye contact and smile.
- **Ask questions** that require visitors to think or observe. Ask questions that have more than one answer like:
 - What do you see happening?*
 - Why do you think that happened?*
 - What surprised you about what you saw?*
- **Use a positive and encouraging response** like “that’s a good guess.”
- **Be accurate** with the information you share. If you aren’t sure it’s OK to say, “I don’t know. That’s a great question!”

HAVE FUN!

A positive experience will lead to learning.



Sciencenter
Ithaca, New York

Great Job

*You have stumped
the Educator!*

If you would like help finding out the answer
to your question, send an e-mail to:

info@sciencenter.org

Be accurate with the information you share



“Children taught one function of a toy played for less time and discovered fewer things to do with it” (Bonawitz, 2011)

Activity Exploration

- Introduce kits, let volunteers choose
- Develop a “hook” to invite guests to participate
- Practice facilitating with a partner

**Event-specific schedule,
logistics, questions, etc.**

Alex Dour
Orpheum Children's Museum
Champaign, IL



Training Volunteers for STEM Education at a Children's Museum

Alex Dour, Education Coordinator
Orpheum Children's Science Museum
Champaign, IL



History of the Orpheum Children's Science Museum

- Located in the historic “New Orpheum Theatre”
- New Orpheum Theatre featured vaudeville acts until 1939
- Transitioned to moving picture shows, eventually closing in 1986
- Purchased from the City of Champaign in 1992



New Orpheum Theatre 1914



RKO Orpheum 1967



Orpheum Theatre 1990



Orpheum Children's Science Museum 2018

Mission of the Orpheum Children's Science Museum

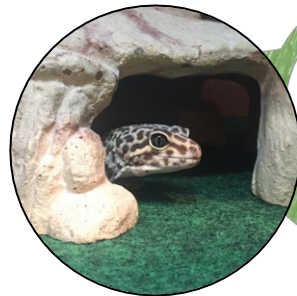
- Founded in 1991 in effort to save historic building
- Privately-funded 501(c)(3) non-profit
 - Funded via admissions and services (programs, rentals)
 - ~\$300,000 annual budget
- Member of ASTC and ACM

ASSOCIATION OF
**CHILDREN'S
MUSEUMS**



The museum is a significant resource in Champaign County, IL and beyond!

- 18 permanent STEAM exhibits (indoor and outdoor)
- 30,000+ total annual visitors
- 10-20 special events or programs annually
- 1,500+ *recorded* volunteer hours annually



Live Animals Exhibit



Astronomy
Summer Camp



Archaeology Field
Station Exhibit

Volunteers are recruited for Special Events and Programs

- **Special Events or Expos**

- Ex| Brain Awareness Day – *19th annual this year!*
- Ex| Robot Day – *1st annual this year!*
- Ex| National Astronomy Day – *2nd annual this year!*

- **Drop-in/Drop-off Programs**

- Ex| D.I.Y. Saturday
- Ex| Night at the Museum



Robot Day 2018



Brain Awareness
Day 2016

Volunteers may not be STEM educators, Volunteers are always leaders!

- Event/program description used to recruit volunteers
- Volunteers are trained the day of
 - Ex| Supplies
 - Ex| Written instructions
 - Ex| Example of finished product
 - Ex| Emergency procedures

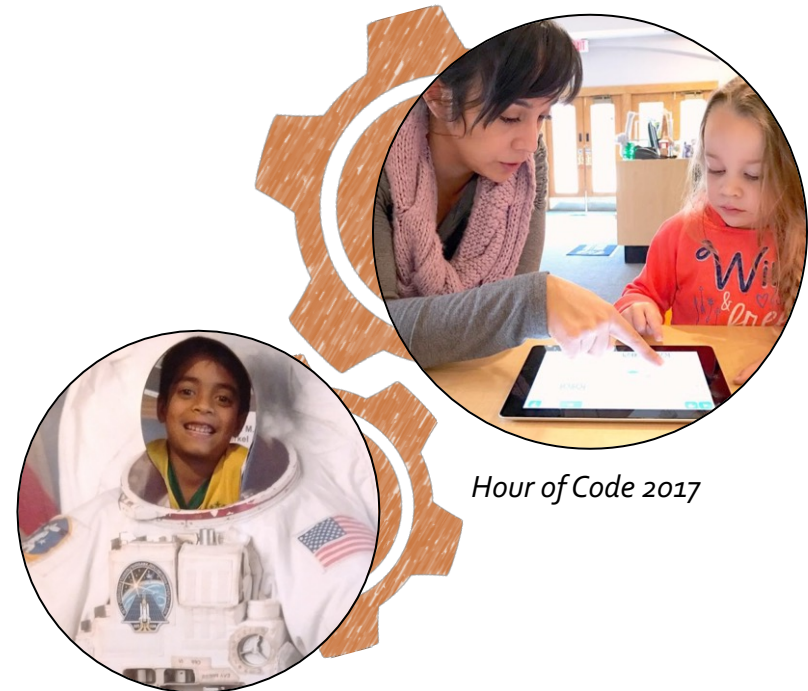


*Astronomy Day
2018*

*Astronomy Day
2018*

Active engagement relies on Effective Communication

- **Primary audience = 2- to 12-yo**
 - Secondary audience = adults
- **Word choice matters**
 - **Ex|** Avoid words like:
 - "HOWEVER"
 - "ALTHOUGH"
 - "WHICH"



Hour of Code 2017

*Astronomy
Summer Camp*

Bring it all home: Use simile to make STEM familiar

- STEM is more than just facts
- Accuracy > Precision
- Remember: youth education is foundational

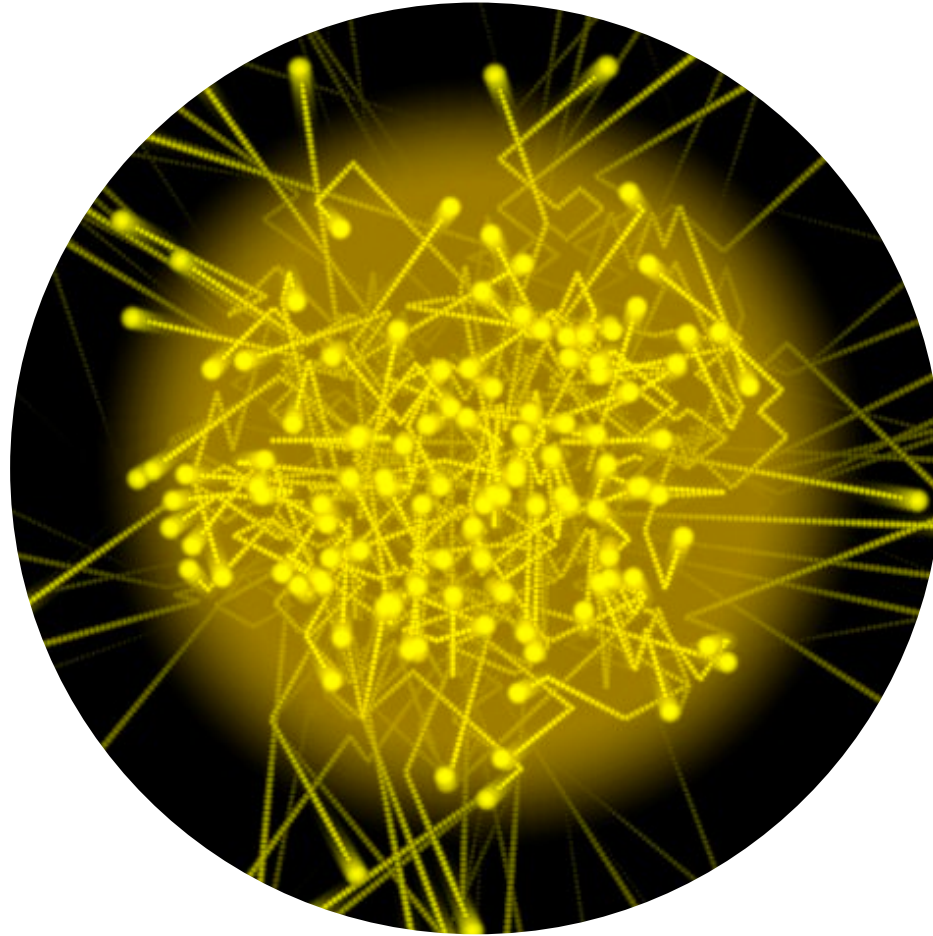


*Messy Science
Camp*



D.I.Y. Saturday

Example: Nuclear Fusion for Pre-schoolers



Before and after: Screen activities and debrief

- Test run the activity
- Review the talking points beforehand
- Monitor the activities in action
- Listen to volunteer input
- Document ways to improve



*Pollinator Week
2017*

Building Fair 2017

Thank you!

ORPHEUM CHILDREN'S SCIENCE MUSEUM

346 North Neil Street

Champaign, IL 61820

(217) 352-5895

education@orpheumkids.com

www.orpheumkids.com



Susan Heilman
Museum of Science
Boston, MA



Museum of Science

Museum of Science, Boston



Susan Heilman
Senior Educator
Current Science & Technology Program



Museum of Science

Museum of Science, Boston



Gilliland Observatory



Charles Hayden Planetarium



Museum of Science

Museum of Science, Boston



Earth & Space Activities
With Staff



Museum of Science

Museum of Science, Boston



Box Party!



Museum of Science

Museum of Science, Boston



Themed events



Exhibit Hall
Interpretation



Observatory



Summer courses

Meghan Murray

Above & Beyond Children's Museum

Sheboygan, WI

Above and Beyond Children's Museum

Meghan Murray; Educational Programming Manager



Brief History

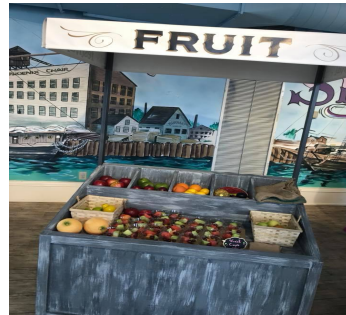
- Above & Beyond Children's Museum (ABCM) is a non-profit organization servicing children and families of Sheboygan County since 1999
- Located in downtown Sheboygan (WI)
 - Population: 50,000
- Began as a traveling road show featuring interactive children's exhibits, to an established community treasure offering service 6 days a week
- Currently ten paid staff members



Exhibits Unique to Sheboygan



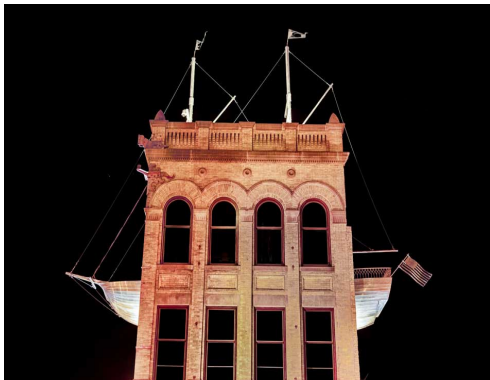
Fire Station



Farmer's Market



Music Garden/Gardens



USS Efroysman

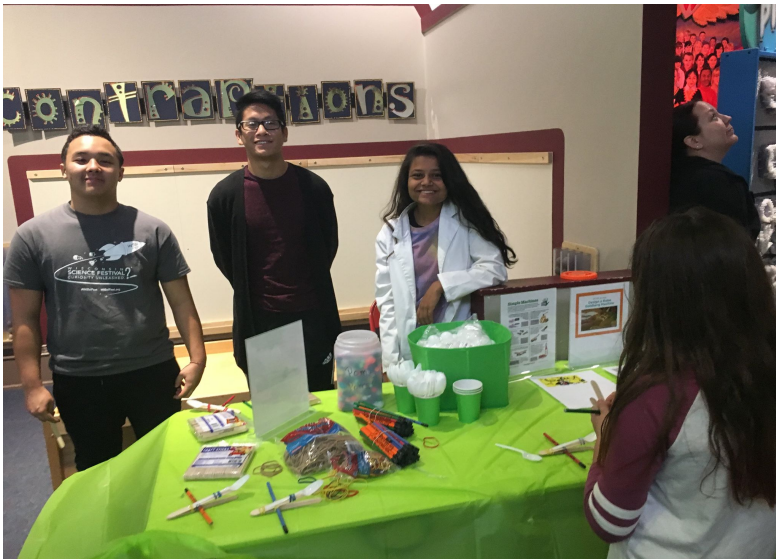


Toddler Barnyard



Volunteer Make-up

- NISE kit volunteers
 - Middle school and high school students
 - Limited content knowledge
 - Different comfort levels regarding educating/presenting



Response to Inquiry

- No answer? No problem!
 - Be honest and forthcoming
 - Ask the program coordinator or an adult nearby
 - Discuss where the student might find the answer to his/her question



The three “E”s

Volunteer Expectations for educational programs at ABCM

Be Engaged

Be Enthusiastic

Be Encouraging

**YOU DON'T BUILD A
BOND WITHOUT
BEING PRESENT.**

QUOTEHD.COM

James Earl Jones
American Actor

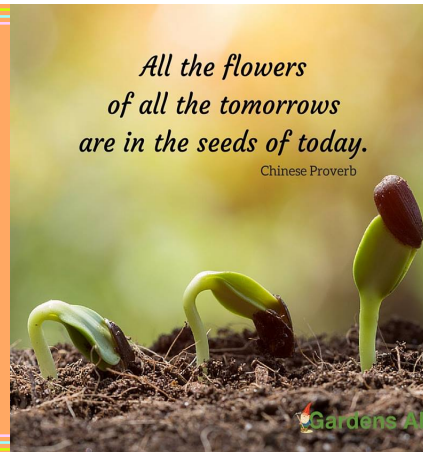
ENTHUSIASM
is the steam
that drives the
engine.

- Napoleon Hill

@OhSunnyMornings - www.OhSunnyMornings.com

*All the flowers
of all the tomorrows
are in the seeds of today.*

Chinese Proverb



Gardens All



Calvin Uzelmeier

Rochester Museum & Science Center

Rochester, NY



Calvin Uzelmeier



Science
Museum
+

Strasenburgh
Planetarium
+

Cumming
Nature Center
+

Who are we training?

- Knowledgeable researchers
- Enthusiastic teens
- Active teachers
- Retired professionals
- Anyone with a pulse?

What do they need to know?

- Who?

How do they fit in to the team and event?



What do they need to know?

- Who?
- What?

What will be happening?

What is their role?



What do they need to know?

- Who?
- What?
- When and Where?

When and where is the best time to train this group?



RMSC
Rochester Museum & Science Center

reward
your
curiosity.

Science
Museum
+

Strasenburgh
Planetarium
+

Cumming
Nature Center
+

What do they need to know?

- Who?
- What?
- When and Where?
- Why?



Why are we doing this?

The Age Old Question

What to say?

Or

How to say it?



RMSC
Rochester Museum & Science Center

reward
your
curiosity.

Science
Museum
+

Strasenburgh
Planetarium
+

Cumming
Nature Center
+

Helpful Tools

- NISEnet
- Portal to the Public
- Visual Thinking Strategies

What's going on in this picture?



RMSC
Rochester Museum & Science Center

reward
your
curiosity.

Science
Museum
+

Strasenburgh
Planetarium
+

Cumming
Nature Center
+

Questions and Discussion

Are there robots
the size of a freckle or hair?



.1mm

Thank You



This material is based upon work supported by NASA under cooperative agreement award numbers NNX16AC67A and 80NSSC18M0061.

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the view of the National Aeronautics and Space Administration (NASA).