

# Why is Informal Science important?

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# SCIENCE, TECHNOLOGY, ENGINEERING, MATHEMATICS

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- **All sound too scary!**
  - How do STEM disciplines impact my life?
- **Typical comments**
  - “I was never good at science (or math)”
  - “That stuff is for nerds and really smart people”
  - “None of that is needed for what I do in life”

# Science, Technology, Engineering and Mathematics

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- **STEM disciplines form the underpinnings of aspects of all of our lives**
  - What do election polls mean when the difference between candidates is 50% vs. 48% with a  $\pm 2\%$  uncertainty ?
  - What chemistry is responsible for making muffins and cakes rise in the oven?
  - Does evolution mean that we are part monkey?
  - If nuclear radiation is harmful, then why do some medical tests use radiation for diagnosis and eventually treatment?
  - What does an SPF 30 rating on sunscreen really mean?

# Role of Informal Science

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- Introduce people to the fact that they are capable of
  - **doing** and **understanding** science, technology, engineering and mathematics.
- The voters need to understand STEM to vote intelligently in a democracy
  - on science based issues

# Important Features of Informal Science

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## Must be

- **Accessible**
  - Both physically and cognitively to all
- **Inviting**
  - Acknowledge where people are in their understanding and move them further along in the continuum.
- **Overcome avoidance**
  - Immerse people in STEM experiences and then have them reflect on that experience.

# Who should we try to reach?

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- **Children are easy to engage**
  - Curious, want to try everything
    - ✦ Explain their new knowledge to others
- **Parents, Grandparents, Guardians, Babysitters**
  - Do science with kids
  - Learn as the children learn
- **Senior citizens**
  - Eager to think and have something new to contribute to conversations
- **Professionals**
  - Bring new insights to current discussions
- **Interested citizens**
  - Want to learn new ways for looking at and understanding the world

# Where do we do informal science?

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- **Areas of play, recreation and vacation**
  - Playgrounds
  - Parks (local, state and national)
  - Amusement parks
    - ✦ Disney World, etc.
  - Vacation locations
    - ✦ Visitor centers
      - Williamsburg, Ocean Boardwalks, Baseball Hall of Fame, etc.
  - Fast Food
    - ✦ Kiddie meal give always

# What is the structure of these activities?

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- **Start with where the people are in their understanding of everyday events**
  - Stretch that understanding to include the underpinnings of STEM
- **Involve people in experiencing the science**
  - Hands on
- **Provide access to future learning opportunities**
  - Websites, magazines
- **Review what has been experienced**
  - Provide time for people to reflect, summarize and explain what they have learned

# An example

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## Weather Flower

- Predict weather (whether there is enough water in the atmosphere for rain)
  - No rain (little water in atmosphere)
    - ✦ Flower BLUE
  - Rain likely ( a lot of water in atmosphere)
    - ✦ Flower PINK
- Science
  - $\text{CoCl}_2$  forms two different crystals depending on the amount of water available
    - ✦ One crystal has  $\text{Co}^{2+}$  and 2  $\text{Cl}^-$  ions
      - Shape reflects light and color appears BLUE
    - ✦ The other crystal is  $\text{Co}^{2+}$ , 2  $\text{Cl}^-$  ions and 6 water molecules
      - Different shape reflect light and color appears PINK

# Summary

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- **People (young and old) avoid science (and other STEM)**
  - Think they are not capable of understanding it
  - Think it doesn't impact their lives
- **Informal science's goals**
  - Help people EXPERIENCE science (and other STEM)
    - ✦ Realize they can understand it
    - ✦ Empower them to pursue further understanding of STEM disciplines

# Is funding for Informal Science well spent?

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- If we want people to operate intelligently in a democracy
  - YES
- If we want more young people to pursue the study of science and strengthen our country's leadership roles in science and technology
  - YES
- If we want people to understand that all the STEM fields were invented by people and thus anyone who wants to learn STEM, should be able to
  - YES