Effectively Engaging Youth in the Process of Science

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MSTA
March 2, 2018
Talk Outline

• Introductions
• Learning targets for today and beyond
• Observations, asking questions, investigations
• 4-H Science Process Model
• Science Process activity - getting your hands dirty
• Science Process Model to take home
• Questions, comments
Introductions

• Norm Lownds
  • Curator, 4-H Children’s Gardens
  • Professor, Department of Horticulture, MSU

• Tracy D’Augustino
  • MSU Extensions Science Education
    • Connecting Extension with the NGSS
    • Helping all learners recognize everyday science
  • Proud mom of three adult science Geeks
Introductions - a bit about you

- Your name
- Your email
- Grade(s) you teach
- Your primary subject area (topic)
- When was the last time YOU used science process?
Learning Targets for today and beyond

• Increase your ability to engage youth in the process of science
• Develop a deeper understanding of the process of science and how it connects with the Science and Engineering Practices
• Have Fun!!
Observations… leading to Questions

• https://www.youtube.com/watch?v=bKZQ6nJQ_gg
• Ladybugs 13:27
• Fisher Spider 3:30
• Water drop – physics 8:45
• Dry earth – 9:06
Observations… leading to Questions

• While watching this video
  • Write down at least three questions based on your observations
Your questions - share out
Select a question to investigate

- Discuss testable questions
- Modify and clarify as needed
- Write a Hypothesis
  - Possible answer to the question.
  - I predict....
Investigation

• Discuss how to investigate the question
• Discuss the data to be collected
  • What can be collected
  • What is relevant to try to answer the question
• Develop hypothetical graphs showing data that:
  • Supports the hypothesis
  • Refutes the hypothesis
  • Is inconclusive with regards to the hypothesis
Phenomenon - NGSS

You just engaged in the process of science using a real world phenomenon.
Engaging Youth in Science Process

- Recognize the science process we do every day
- Emphasize the science we do
- Get excited by the science we do
- Have fun with the science we do!
Science Process

Science is….

- “hard”
- “something I don’t do very well”
- “boring”
- “something we do in the science laboratory”
- “something that is not connected to what I usually do”
Science is…
Science Process is…

• “asking questions and discovering answers”

• Something we all do every day
Engaging Youth in Science Process

• So what does science look like?
• Can I touch, play with science?
• How does it connect to me?
• Why should I care?
Science Process Model

Process of Science

1. Ask a question
2. Research
3. Hypothesis
4. Experiment
5. Collect data
6. Explain data
7. Ask new questions

Illustration courtesy of Perick Bird
Science always starts with a question…
• “I wonder…”
• Review, think about what we already know
  • “I know, think…”
• Predict what you think will happen
  • “I predict…”
Experiment to try to answer your question…

“I try, test…”
- Observe, record, measure what happens, what you see
- “I observe, measure…”
• Make graphs, tables, calculate averages and tell others what you have found (discovered)
  • “I tell, explain…”
• Write down other questions that come up as you are doing your experiment.
  • “I wonder…”
Science Process Model
The Shape of Science

- Look at the first step and the last step
- This suggests a shape
- And that shape is…
The Shape of Science
Science Process Model

- Everyday example:
  - You have been busy doing things and your hands have gotten dirty.
1. Ask a Question

- How do I get my hands clean?
2. Research

- You don’t have to stop and do research, you have done it already.
- Your mom taught you long ago that when your hands are dirty you need to wash them.
- You have even probably used different soaps to wash your hands.
3. Hypothesis

- You don’t really stop to do this, but you do make a hypothesis:
  - “I think that if I use the bar of soap next to the sink it will clean my hands”
4. Experiment

• You won’t do a formal experiment, but you will:
  • Turn on the cold water, pick up the bar of soap, lather up your hands, rinse them off and dry them.
5. Collect Data

- You will look at the color of the soap suds
- You will look at how clean your hands are after you rinse them
- When you dry them on mom’s white towel, you will look at the color of the towel (mostly to see if you will get in trouble)
6. Explain Data

• Dark soap suds…
• Hands look pretty clean…
• White towel turns brown…

• The bar of soap with cold water did not clean my hands very well.
• I am probably in trouble with mom.
7. Ask New Questions

• What would happen if I used warm or hot water?
• What if I used Dawn dish liquid?
• What if I dried my hands on a different towel?
• How do I keep mom from being mad at me?
Everyday Science Process Examples

- Turn light on and nothing happens
- Dressing for the weather
- Playing a video game
Science Process Model

- Growing vine
- Living, growing, expanding
- Rooted in the past, grows into present and future
Looking more closely at Science Process

- Why does science spiral up?
- How long will science grow?
- What type of support does science need?
- What fertilizer does science need to keep growing?
- Do you need to prune science?
- What color is science?

- Science grows, it is alive!
Science and Engineering Practices

1. Asking questions and defining problems
2. Developing and using models
3. Obtaining, evaluating and communicating information
4. Planning and carrying out investigations
5. Analyzing and interpreting data
6. Using mathematics and computational thinking
7. Construct explanations and design solutions
8. Engage in argument from evidence
### Science Process Model - Science Practices

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<td>2. Research (I know, I think...)</td>
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Exploring Science Process

• Basil seeds + water

• What happened?
• How quickly did it happen?
• Why do you think that happened?
• Is there an advantage to this?
Taking this to your students

- Pair off, group up by grades
- Ideas on how to use this with your students
Growing your own Science Process Model

- Sweet Pea - climbing vine
  - Grow your vine
  - Report back on growth
    - measurements
    - comments
    - photos
- Examples of everyday science process
  - Post examples from your classroom
- Follow up from us
  - Approximately April 1 and May 1
Questions,
Comments,
Thoughts…
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