



Inquiry-Based Learning

Math/Science PD June 26th 2012

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What is inquiry-based learning?

- **Definition:** Inquiry based learning is a form of active learning, where progress is assessed by how well students develop experimental and analytical skills rather than how much knowledge they possess on a given topic.
- **Purpose:** to motivate students toward individual discovery to better internalize concepts

Characteristics of Inquiry

- Creating questions of their own
- Obtaining supporting evidence to answer the question(s)
- Explaining the evidence collected
- Connecting the explanation to the knowledge obtained from the investigative process
- Creating an argument and justification for the explanation

How independent is this process?

- Your level of involvement and scaffolding is up to you.
- In a **structured** inquiry, the question and procedure are still provided by the teacher; however, students generate an explanation supported by the evidence they have collected
- In a **guided** inquiry, the teacher provides students with only the research question, and students design the procedure to test their question and the resulting explanations

Supporting Inquiry

- To support student inquiry:
 - Teachers can design discovery based activities and tasks that will illicit higher order thinking
 - Teachers can also employ "focusing" questions to guide inquiry based discussion.

Math/Science Questioning to Support Inquiry

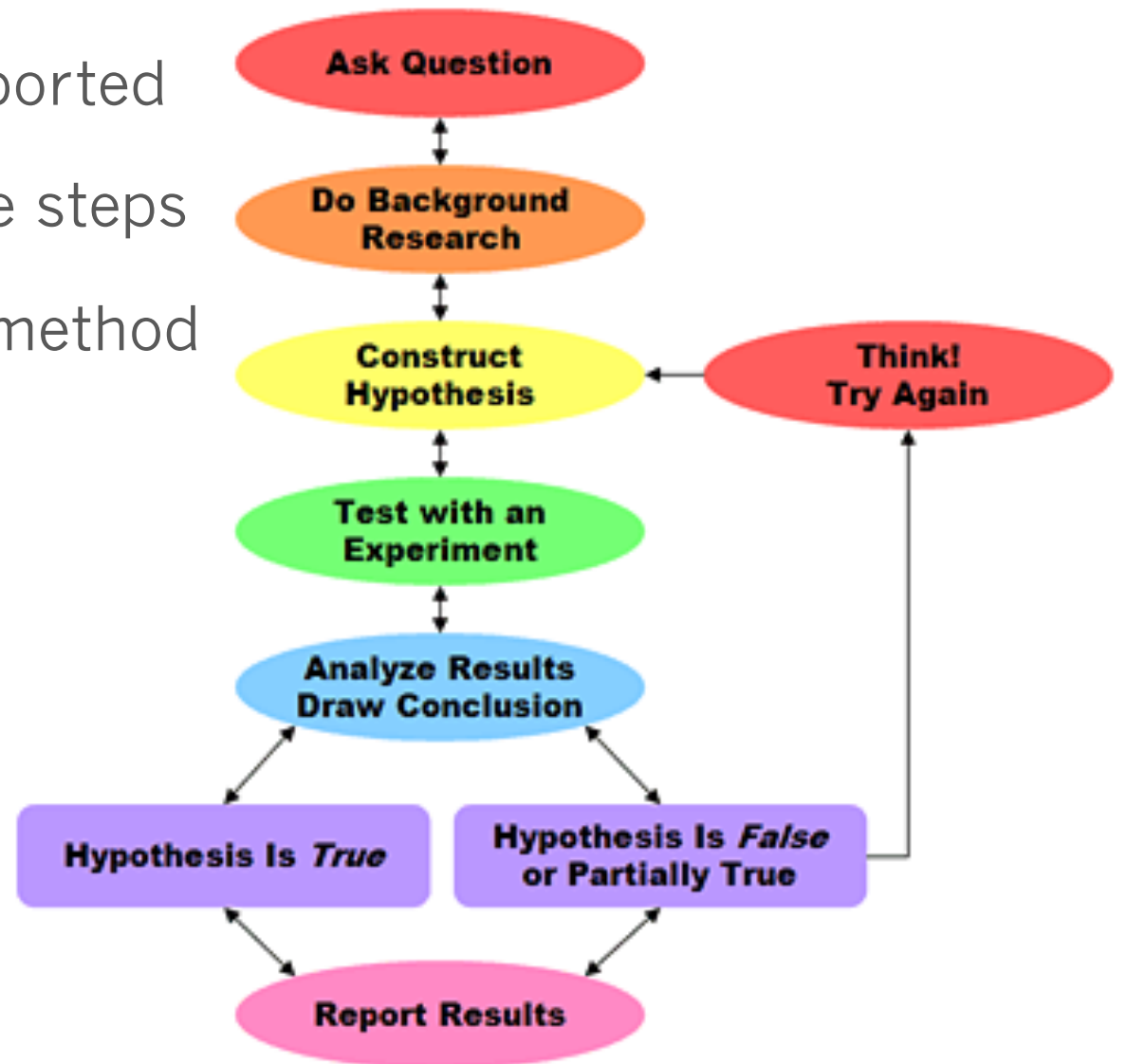
- Questions should:
 - Be worded to lend itself to student thinking and is aimed to draw out a student's conceptual understanding
 - Be open ended and allow for more than a one word response
 - Lead to a conclusion rather than an answer
 - Push the teacher to listen to students' responses for proper guidance
 - Incorporate the 5 productive Discourse Moves (revoicing, repeating, reasoning, adding on, and waiting)

Math/Science Tasks to Support Inquiry

- A task should...
 - Provide students the opportunity to explore and generate their own conclusions and ideas
 - Be open-ended and can be solved using a variety of approaches
 - Allow for students to argue that their work is right
 - Be able to be solved using divergent methods that lead to convergent endpoints
 - Promote students to think logically while searching for new learning
 - Rely on and make connections with prior knowledge

Inquiry and the Scientific Method

- Inquiry is supported through all of the steps of the scientific method



CMT Prep. and Problem Solving

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CMTs by Grade Level

- All grades are expected to take or prepare for the CMTs
 - K-2nd- the younger grades prepare for the CMTs by practicing problem solving skills and quiet test-taking environments during the CMTs
 - 3rd and 4th grade- complete the math section
 - 5th grade- complete math and science sections

How can we prepare?

- Daily Do Nows
- Center activity, utilize PPSF
- HW Menu option
- Question of the day/week

Problem Solving

- Students must learn to question and apply mathematical concepts to problem solving situations on a regular basis
- Promotes real-world connections to math
- As a math teacher you can...
 - Create a discourse-friendly classroom environment
 - Bridge gap between students' ordinary language and the formal language of mathematics
 - Focus on teaching strategies and conceptual understanding

Sharing Strategies

- Choose a few students to share the path they took to solve the problem
- Summarize and paraphrase as students share
- This is to clarify and illuminate ideas that students have presented as well as link every day language and mathematical terms to the process

Problem Solving Strategies

- Familiarize students with various question formats as you teach them problem solving skills
- Try to embed in your daily routine so it is a natural process to students
 - Ex; Review of Problem of the Day Do Now
 - Tell what the question is asking them to do
 - Underline key words that indicate operation to be performed
 - Delete extra or unnecessary information
 - Identify the steps needed to solve
 - Find the best route to solving and be able to explain in words
 - Describe another way the problem could be solved

Resources

- <https://sites.google.com/site/inquirymla2011/home>
- <http://teachingtoday.glencoe.com/howtoarticles/promoting-problem-solving-skills-in-elementary-mathematics>
- http://www.sciencebuddies.org/science-fair-projects/project_scientific_method.shtml