SUCCEEDING WITH INQUIRY WITH ALL STUDENTS

Mount Teacher Institute
June, 2015
Road Map

Your Lens

Why Inquiry?

Experience

Framework

Success?

Your Plan
Turn to Your Neighbor

How do you define inquiry-based instruction?
Self-Inventory

What do you perceive...value...believe?

Who Succeeds? Fails?

Strategies?

Success Maximized?

Does Perception Match Reality?
YOUR PERCEPTION, WHEN UNCHECKED, CAN LIMIT YOUR SUCCESS WITH STUDENTS.

So what is your perception based upon?
Is the Black Hole Growing?
Which end of the center bar is darker?
Front or Side View?
What do you see?
WHY INQUIRY?

1. Standards / Assessments
2. Student Success
3. Critical Thinking
4. Higher-Order Thinking Skills
5. 21st Century Learner
Which classroom would you rather emulate and why?

Current Standards are from SC, but these have been endorsed by Fordham and others among the best and most rigorous in nation.
So What?

**NGSS**: 94% high or mid level vs. **Current**: 18% high or mid level

Note: Levels are based on the Revised Bloom’s Taxonomy
Standards guide the curriculum, but…

What drives the bus?

Assessments drive the curriculum!
Explain what is occurring, and why do you suppose it is happening?
Was the strategy?

Lecture
NO!
Direct Instruction
NO!
Hands-On
NO!
Inquiry-Based Instruction
YES!!!
Before you say…great, but it won’t work with my kids?

The data hold true for:

• Honors/Average/Remedial
• Males/Females
• Majority/Minority
• Affluent/Poor
Design/Participants

• Quasi-experimental design (4 groups over 5 years)
• 11 middle schools in 5 districts
• 74 middle school teachers
• 9981 students from diverse, high minority populations.
Percentage Scoring Proficient on MAP vs. Intervention Year of Students’ Teachers

**Intervention Year**

- **MAP Composite**
  - Non-Partic.: 68
  - 1st Yr. Partic.: 66
  - 2nd Yr. Partic.: 73
  - 3rd Yr. Partic.: 76

- **MAP Sci. Concepts**
  - Non-Partic.: 71
  - 1st Yr. Partic.: 71
  - 2nd Yr. Partic.: 73
  - 3rd Yr. Partic.: 76

- **MAP Sci. Practices**
  - Non-Partic.: 68
  - 1st Yr. Partic.: 68
  - 2nd Yr. Partic.: 74
  - 3rd Yr. Partic.: 74

- **Percentage Scoring Proficient on MAP vs. Intervention Year of Students’ Teachers**

- **Intervention Year**
  - Non-Partic.: 68
  - 1st Yr. Partic.: 71
  - 2nd Yr. Partic.: 73
  - 3rd Yr. Partic.: 76

**Legend**
- MAP Composite
- MAP Sci. Concepts
- MAP Sci. Practices
MAP scores—RIT above VCG

3.16 avg. Content growth and 2.56 avg. Process growth for VCG

Basically, 3-6 months beyond expected!
Which of the following are:

living?
non-living?
not able to determine?
Instructional Paradigms

Typical Approach:

Review → Introduce → Model → Practice

Guided Inquiry Approach:

Engage → Explore → Explain → Extend

Role of student in each???
Engage

Motivate
Identify Misconceptions
Understand Prior Knowledge

**Target**: Establish starting benchmark—not resolve misconceptions or incorrect reasoning.
Characteristics of life

Looking at your list of living and non-living, compose the SMALLEST list of required characteristics for something to be living.

(Must all your characteristics be present?)
Explore

Predict
Design
Test
Collect

Target: wade in the muck and grapple with ideas.
Share and Critique

Share one critical characteristic of living things from list until all characteristics have been presented.

Then test various pictures against the list to see if all items belong.
Once the class list is determined, share several lists that scientists have compiled (they typically span from 3-10 characteristics).

- Composed of Cell(s)
- Use Energy
- Grow
- Reproduce
- Respond to the Environment
- Adapt to Environment

e.g., List of characteristics of living things:
Explain

Interpret
Communicate
Evidence/Justify

Target: time for sense making. Ideally, student and teacher explains.
Do you get it?

1. Justify whether the following items are or are not living. (Peach pit, bacteria, tennis shoe, and nucleus of cell)

2. A friend says that water is living. How do you respond and what evidence do you provide to support your claim?

3. List 5 living things and 5 non-living things (that have not been discussed).

4. Good opportunity to revisit original list to clear up misconceptions.
Overview of 4E x 2 Model

4E x 2 Instructional Model

Engage focuses on motivation, prior knowledge, misconceptions

Explore process of doing science, math, etc,

Explain sense making phase

Extend deepen conceptual understanding and practice

Reflective Practice each stage encourages intentional teaching that addresses student needs

Assessing at each stage emphasizes formative learning

www.clemson.edu/iim
Inquiry in Other Disciplines

- Mathematics (Alg., Geo., Trig., Calc.)
- English, Social Studies, Arts, Humanities
Critical Reminders for Guided-Inquiry

1. Build on Prior Knowledge
2. Explore Before Explain
3. Formative Throughout
4. Learning and Strategy Scaffolded
5. Activity ≠ Inquiry
Instruction

Describe the progression of the last lesson that you taught or observed.
The vast majority of curriculum with activities and investigations is written at a level 2.
Who Do You Recognize?

Venchenzo Nibali
Bill Clinton
Ardola McCammon
EXPLORE BEFORE EXPLAIN
Discourse

How do we talk and communicate in the classroom?

What is the best question that you asked in class this week? Why was it the best?
### V. Discourse Factors

<table>
<thead>
<tr>
<th>Construct Measured</th>
<th>Pre-Inquiry (Level 1)</th>
<th>Developing Inquiry (2)</th>
<th>Proficient Inquiry (3)</th>
<th>Exemplary Inquiry (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D1.</strong> Questioning Level</td>
<td>Questioning rarely challenged students above the remembering level.</td>
<td>Questioning rarely challenged students above the understanding level.</td>
<td>Questioning challenged students up to application or analysis levels.</td>
<td>Questioning challenged students at various levels, including at the analysis level or higher; level was varied to scaffold learning.</td>
</tr>
<tr>
<td><strong>D2.</strong> Complexity of Questions</td>
<td>Questions focused on one correct answer; typically short answer responses.</td>
<td>Questions focused mostly on one correct answer; some open response opportunities.</td>
<td>Questions challenged students to explain, reason, and/or justify.</td>
<td>Questions required students to explain, reason, and/or justify. Students were expected to critique others’ responses.</td>
</tr>
<tr>
<td><strong>D3.</strong> Questioning Ecology</td>
<td>Teacher lectured or engaged students in oral questioning that did not lead to discussion.</td>
<td>Teacher occasionally attempted to engage students in discussions or investigations but was not successful.</td>
<td>Teacher successfully engaged students in open-ended questions, discussions, and/or investigations.</td>
<td>Teacher consistently and effectively engaged students in open-ended questions, discussions, investigations, and/or reflections.</td>
</tr>
<tr>
<td><strong>D4.</strong> Communication Pattern</td>
<td>Communication was controlled and directed by teacher and followed a didactic pattern.</td>
<td>Communication was typically controlled and directed by teacher with occasional input from other students; mostly didactic pattern.</td>
<td>Communication was often conversational with some student questions guiding the discussion.</td>
<td>Communication was consistently conversational with student questions often guiding the discussion.</td>
</tr>
<tr>
<td><strong>D5.</strong> Classroom Interactions</td>
<td>Teacher accepted answers, correcting when necessary, but rarely followed-up with further probing.</td>
<td>Teacher or another student occasionally followed-up student response with further low-level probe.</td>
<td>Teacher or another student often followed-up response with engaging probe that required student to justify reasoning or evidence.</td>
<td>Teacher consistently and effectively facilitated rich classroom dialogue where evidence, assumptions, and reasoning were challenged by teacher or other students.</td>
</tr>
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</table>
What makes Bob bob, and will he keep bobbing forever? Explain.
Words Matter!
Questioning

Asking more how and why questions instead of what questions challenge students to think more deeply about their work.

How did…?
Why do you suppose…?
Assessment

How do you know if they are getting it, and who is getting it?
IS THIS THE ACTUAL TEST OR A PRACTICE TEST?

TEST TODAY

COULD BE THE POST TEST TO THE PRE-PRACTICE TEST SO THEY KNOW IF WE UNDERSTOOD THE FORM OF THE TEST.

I THINK IT'S THE PRE-TEST TO THE PRACTICE TEST

OR IS IT THE POST PRACTICE TEST BEFORE THE PRE-TEST TO THE ACTUAL TEST?
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<td><strong>A1.</strong> Prior Knowledge</td>
<td>Teacher did not assess student prior knowledge.</td>
<td>Teacher assessed student prior knowledge and partially modified instruction based on this knowledge.</td>
<td>Teacher assessed student prior knowledge and then modified instruction based on this knowledge.</td>
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<td><strong>A2.</strong> Prior Knowledge</td>
<td>Teacher encouraged by memorization and repetition.</td>
<td>Teacher encouraged process-focused learning strategies that involved student thinking in relation to new learning with other concepts.</td>
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<td><strong>A3.</strong> Student Reflection</td>
<td>Teacher did not explicitly encourage students to reflect on their own learning.</td>
<td>Teacher encouraged students to reflect on their understanding at multiple times throughout the lesson; encouraged students to think at higher levels.</td>
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<td><strong>A4.</strong> Assessment Type</td>
<td>Formal and informal assessments measured both discrete factual, discrete knowledge and information.</td>
<td>Formal and informal assessment methods consistently and effectively used authentic measures.</td>
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<td><strong>A5.</strong> Role of Assessing</td>
<td>Teacher solicited predetermined answers to question students requiring students to repeat explanation or justify response.</td>
<td>Teachers solicited explanations from students to assess understanding and then adjusted instruction accordingly; challenged evidence and claims made; encouraged curiosity and openness.</td>
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Josey needs help figuring out what Jack was doing. Which of the following position versus time graphs best shows how Jack moved (was walking) while he was eating his ice cream cone? Circle the letter of the best graph.

A

B

Josey and her little brother Jack are walking side by side, eating ice cream cones. Josey stops to talk to a friend. While she is talking, Jack’s ice cream cone starts to drip at a steady rate as Jack walks away. When Josey finishes talking to her friend and realizes that Jack is no longer next to her, she looks down and notices these drops of ice cream on the ground from Jack’s ice cream cone:

C

D

From: Uncovering Student Ideas in Physical Science

Explain your thinking. Describe how the graph you chose best matches Jack’s motion.
German Saying: "Das Schwein wird nicht fetter, wenn man es öfters wiegt."

Translation: The pig doesn't get any fatter just because you weigh it more often.

In Education this means we need fewer summative tests and more formative assessments.
Seek to Improve Four Areas

- Curriculum
- Instruction
- Discourse
- Assessment
Curriculum

What resources, standards, and supports guide your instruction?
4 Keys to Success

Learning increases when:

• Curriculum unites concepts and practices
• Instruction allows exploration before explanation
• Discourse requires students to explain and justify (not just state answer)
• Formative assessments are frequently used to gauge progress and inform instruction
Success

Can you achieve it AND consistently recreate it?

Image used with permission: Sarah Joann Photography (2013)
Critical Issues for Long-Term Success

What is the target?

How successful are you in reaching the target?

How can you improve tomorrow?
What is the Target? Examining the Inquiry Continuum

Teacher as Teller $\rightarrow$ Prescriptive $\rightarrow$ **Guided** $\rightarrow$ Open

Can you distinguish lessons that fit into each category?
Measure of Success: EQUIP

EQUIP—Electronic Quality of Inquiry Protocol

19 things teachers can control linked to student achievement!

Instruction
Discourse
Assessment
Curriculum
Tomorrow and Next Semester

- Create, Tweak, or Use Existing Lessons
- Select EQUIP items to Target
- Create Plan & work with Others
- Focus Inquiry on Major Concepts/Themes
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Citations

