INSIDE MY CLASSROOM

Ryan Kester
STEM Educator
Brookline, MA
Making Sense

Construct Arguments

Think in Systems

Make Connections

Look for Evidence

Engage in STEM

Natural Phenomena

Construct Meaning

Asking Questions & Seeking Solutions

Integrated Earth Systems Science

How

Why

Relevant

The Now

Future Facing

Modeling

Minds On

Hands On

Inquiry

Argument Driven Inquiry

Claims Evidence Reasoning (Rebuttal)
Our search to understand
Seeking explanations
Connect Past, Present and Future
The Universe and all matter and energy it contains.
STUDY NATURAL PHENOMENA

Begins with what we can observe.
What is outside our door or inside our bodies.
Integrates all sciences
Earth Science Systems Education
We want to know the “How” and the “Why”
Constructivist approach to searching for answers.
Answers lead to more questions lead to more answers lead to more questions
Learn science and engineering practices in tandem.
Science knowledge grows with innovation and discovery.
Engineering skills applied in the context of scientific understanding.
Study what is relevant to your students.
Keep the past alive but teach what is in “The Now.”
Face the future and study what is to come.
Your students’ future matters today.
Dynamic, balanced, thought provoking lessons
Balance of inquiry approaches
Contemporary Strategies
Hands-on
Minds-on
Students become scientifically literate when they build their own wisdom from the connections they make when engaged in STEM. Our job is to guide and facilitate. Help them with the enduring understandings.
AT THE CORE OF ALL NEW STANDARDS....

• reasoning with evidence
• building arguments & critiquing arguments of others
• participating in reasoning-oriented practices with others.
TEACHERS WILL NEED TO HELP ALL STUDENTS

• externalize their thinking
• listen carefully to one another and take one another seriously
• dig deeper into data and evidence
• work with the reasoning of others
Tools to help your students become critical thinkers.
Useful across academic disciplines.
Produces deeper thinking.
Systems thinking utilizes habits, tools and concepts…

to develop an understanding of the interdependent structures of dynamic systems.

When individuals have a better understanding of systems, ….

they are better able to identify the leverage points that lead to desired outcomes.
Argumentative Writing
Claims backed by evidence supported by reasoning.
Students are able to debate, articulate & educate.
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GETTING STARTED

• 2014-2015
• 8th Grade (three classes)
• Mid-year Unit
• Climate Change
NGSS STANDARDS

• MS-ESS3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

• MS-ESS3-5: Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

• SP4: Analyzing and Interpreting Data

• SP5: Using Mathematical and Computational Thinking

• SP6: Constructing Explanations
MAPPING THE UNIT

Key
- STAD
- Sim/Model/ERR
- Labs/Investigations
- Web/RCC
## Lesson Structures

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<tr>
<th>7E</th>
<th>P.E.O.E.</th>
<th>12 Point</th>
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<tbody>
<tr>
<td>Elicit</td>
<td>Predict</td>
<td>Comprehension</td>
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<tr>
<td>Engage</td>
<td>Explain</td>
<td>Visualization</td>
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<td>Explore</td>
<td>Observe</td>
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<td>Explain</td>
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<td>Exploration</td>
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<td>Elaborate</td>
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<td>Simulation</td>
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<td>Evaluate</td>
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<td>Calculation</td>
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<td>Extend</td>
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<td>Organization</td>
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### Additional Activities
- Reflection
- Illustration
- Evaluation
- Conclusion
- Extension
MY LESSONS

• http://betterlesson.com/my/unit/161014/understanding-our-changing-climate-systems-thinking-global-warming
https://www.youtube.com/watch?v=WLClnTqIvQo
RESOURCES
ONLINE

• Creative Learning Exchange
• Waters Foundation
• PBS Learning Media (SYSTEMS LITERACY)
“Teachers are indeed role models. We inspire. We teach by example. And we manifest for our students what it means to be a thinker and a learner. Working with our colleagues, we provide an intellectual life into which our students may grow.”

-Ron Ritchhart
THANK YOU
Making Sense

Construct Arguments

Natural Phenomena

Think in Systems

Core Ideas
1. Science Practices
2. Cross Cutting Concepts
3. Utilize Technology
4. Teamwork
5. Think Critically
6. Communicate
7. Reflection
8. Evaluation

Construct Meaning

Asking Questions & Seeking Solutions

Make Connections

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Engage in STEM
PRACTICES, CCC, CORE IDEAS
UTILIZE TECHNOLOGY

- Did the assignment build capacity for critical thinking on the web?
- Did the assignment develop new lines of inquiry?
- Are there opportunities for students to make their thinking visible?
- Are there opportunities to broaden the perspective of the conversation with authentic audiences from around the world?
- Is there an opportunity for students to create a contribution (purposeful work)?
- Does the assignment demo “best in the world” examples of content and skill?
WORK IN TEAMS
CRITICAL THINKING
Learning Process

- planning
- doing
- reflecting
<table>
<thead>
<tr>
<th>Formative</th>
<th>Summative</th>
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<td>Formative assessment, also called assessment for learning, takes place during instruction. It enables instructors to identify necessary adjustments while teaching and learning are in progress.</td>
<td>Summative assessment, also known as assessment of learning, takes place at the end of an instructional unit, quarter, semester or year. It is the culminating evaluation of a teaching and learning progression in which a student has had multiple opportunities to hone and build on knowledge, skills and assignments.</td>
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<tr>
<td>• Conferencing</td>
<td>• Projects</td>
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<td>• Discussions</td>
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<td>• Probes</td>
<td>• Blogs, Vlogs, Digital Stories, Podcasts</td>
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<td>• Rubrics</td>
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<td>• Questions</td>
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<td>• Individual White Boards</td>
<td>• District benchmark or interim assessments</td>
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<td>• Plickers*</td>
<td>• End-of-unit or chapter tests</td>
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<td>• Exit Slips</td>
<td>• End-of-term or semester exams</td>
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<td>• Four Corners</td>
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“You think that because you understand “one” that you must therefore understand “two” because one and one make two. But you forget that you must also understand “and.”

–Sufi teaching story