STEM Teaching Tools 101
Professional Learning Resources to Support the New Vision for K-12 Science Education

Goals for this Session:

● Obtain the ability to find STEM Teaching Tool documents

● Experience a snippet of the Session E Professional Development Session

● Identify STEM Tools Playlists

● Explore the STEM Teaching Tool website
Professional Learning Resources to Support NGSS Implementation

- Co-designed by practitioners & researchers
- Tested & refined over time
- Easily shareable—over social media, email, paper

STEMteachingtools.org (web)
@STEMteachtools (twitter)
pinterest.com/stemeducation (pinterest)
Professional Learning Resources to Support NGSS Implementation

The practice briefs in this collection...

• Focus on one specific problem of education practice that is broadly shared

• Highlight what people in different roles can do to work to address the problem

• Gather together our best knowledge from research and practice to understand the issue and give practical, actionable advice or strategies to educators

• Prompt reflection and discussion

• Resource further learning by linking off to relevant resources
STEM Teaching Tools on the Web
http://STEMteachingtools.org/

The STEM Teaching Tools site has tools that can help you teach science, technology, engineering and math (STEM). We are currently focused on supporting the teaching of the Next Generation Science Standards (NGSS). Each tool is focused on a specific issue and leverages the best knowledge from research and practice. Under the News section, you can learn a bit more about how you might use them. This article provides background on this effort. Review more resources in our Tools area and check out the online "short courses" shown below.

Current Highlight from the PD section

Practice Brief 56
Why it is crucial to make cultural diversity visible in STEM education

Tweets by @STEMTeachTools

Why insect populations are plummeting—and why it matters
nationalgeographic.com/animals/2019/0

Feb 16, 2019
PDF Collection in a Google Folder
http://STEMteachingtools.org/link/PDFcollection
STEM Teaching Tools on Twitter
http://twitter.com/STEMTeachTools
STEM Teaching Tools on Pinterest
http://www.pinterest.com/STEMeducation/

STEM Teaching Tools | Full Collection
Includes very short pieces that highlight ways of working on specific issues that come up during STEM teaching.

9 Pins • 89 Followers
To Access STEM Teaching Tools

Web Site

http://STEMteachingtools.org

Twitter

@STEMTeachTools

Pinterest

http://www.pinterest.com/STEMeducation

Easy Access to PDFs of All Tools

http://STEMteachingtools.org/link/PDFcollection

Email—to suggest new tools or give feedback

STEMteachingtools@uw.edu
STEM Teaching Tools on the Web
http://STEMteachingtools.org/

Teaching Tools for Science, Technology, Engineering and Math (STEM) Education

The STEM Teaching Tools site has tools that can help you teach science, technology, engineering and math (STEM). We are currently focused on supporting the teaching of the Next Generation Science Standards (NGSS). Each tool is focused on a specific issue and leverages the best knowledge from research and practice. Under the News section, you can learn a bit more about how you might use them. This article provides background on this effort. Review more resources in our Tools area and check out the online "short courses" shown below.

Current Highlight from the PD section

Practice Brief 56
Why it is crucial to make cultural diversity visible in STEM education
STEM Teaching Tools are now posting open educational resource (OER) versions of 5 different PD sessions you can facilitate with teachers. They include all of the resources that PD facilitators need to adapt and run the sessions—including slides, speaker notes, facilitator guide, and embedded resources.
PD Session Resources (developed through the ACESSE Project):

- Session A: Introduction to Formative Assessment to Support Equitable 3D Instruction
- Session B: How to Assess Three-Dimensional Learning in Your Classroom: Building Assessment Tasks that Work
- Session C: Making Science Instruction Compelling for All Students: Using Cultural Formative Assessment to Build on Learner Interest and Experience
- Session D: How to Craft 3D Classroom Science Assessments
- Session E: Selecting Anchoring Phenomena for Equitable 3D Teaching
Selecting Anchoring Phenomena for Equitable 3D Teaching and Assessment

William R. Penuel
University of Colorado Boulder

With contributions from Philip Bell, Becky Bundy, Lizette Burks, Ron Darbeau, Susan Holvcek, Cora James, Kris Kilibarda, Deb Morrison, Tiffany Neill, John Olson, Robbin Riedy, Mary Starr, and Gina Tesoriero.

August 2018 • Resource E

Advancing Coherent and Equitable Systems of Science Education (ACESSE)

This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 Unported License. Educators and others may use or adapt. If modified, please attribute and re-title. CC BY-SA license details are at https://creativecommons.org/licenses/by-sa/4.0/
Today’s session will prepare you to...

• Explain to a peer the role of phenomena and design challenges in science teaching—with a particular focus on equity and justice.

• Experience how phenomena can be introduced at the start of the unit, in order to launch a student driven series of questions.

• Generate working definitions of phenomena, design challenges, and disciplinary core ideas.

• Analyze a pair of performance expectations for each dimension.

• Brainstorm phenomena with potential to develop and elicit student understanding of particular performance expectations.
Overview of Workshop

Session 1

15 minutes  Introduction

25 minutes  Experiencing a phenomenon

60 minutes  Phenomenon game

25 minutes  Defining phenomena, design challenges, and Disciplinary Core Ideas

50 minutes  Analyzing performance expectations
Session 1: What are phenomena?
Initial Ideas, Experiences, and Questions

How have you heard “phenomena” described, especially in relation to science teaching?

What experiences inform your thinking about phenomena?

What questions do you have about phenomena we should answer together?
This is a photograph of the African Buffalo (*Syncerus caffer*), which is an animal that lives in the Serengeti National Park, in the country of Tanzania.
What patterns do you notice in the graph? With a partner, brainstorm some possible causes for the change in the Buffalo population you observed in the graph.
What knowledge and experiences have you had, that might help us as a class explain what’s happening to the buffalo?

What questions do we need to answer, to test your ideas about what’s happening with the buffalo?

What other questions do you have about what we’ve shown so far?
If we were to continue this activity

We might...

Take your questions and build a public record of them

Prioritize them

Decide on a first investigation to conduct
And as part of this unit, we might also...

Ask students to complete a design challenge that requires them to apply their understanding of the phenomenon to solve a problem that addresses a concrete human need in society.

Join a citizen science effort to help monitor animal counts on the Serengeti that helps evaluate efforts to preserve biodiversity.
Discussion

What is the phenomenon here?

What strikes you as similar to or different from how teachers have introduced science units in the past?
But wait, is this a phenomenon?

Your task is to work in pairs to sort these strips of paper into three piles, to identify which of these is:

- A phenomenon
- A design challenge
- A disciplinary core idea
This part of the session will prepare you to...

Generate working definitions of phenomena, design challenges, and disciplinary core ideas.
Discussion

Share one question and where you placed it. Share your reasoning.
Discussion

What are some criteria we can use to decide if something’s a phenomenon?

What are some criteria we can use to decide if something’s a design challenge?
What are phenomena?

Phenomena are observable events that occur in the universe and that we can use our science knowledge to explain or predict. The goal of building knowledge in science is to develop general ideas, based on evidence, that can explain and predict phenomena.

Definition from Achieve, Next Generation Science Storylines & STEM Teaching Tools
Different kinds of phenomena

Phenomena vary in how long they take students to explain or model.

- **Unit:** Anchoring phenomenon
- **Days:** Investigative phenomenon
- **Moments:** Everyday phenomenon
- **Assessment:** Scenario that presents a phenomenon

A phenomenon can be a “case” of something (e.g., *what happened to the aspens when wolves were introduced into the Yellowstone*).

A phenomenon doesn't have to be “phenomenal” but rather something that people can observe.

A phenomenon can be a puzzling observation of the everyday (e.g., *Rainwater isn’t salty, even when it is coming from the salt water in the ocean*).

Everyday phenomena can sometimes become investigative or even anchor phenomena.
Suggested STEM Teaching Tool Uses, or Playlists:

• Introducing the NGSS / NRC Framework Vision to Teachers (50-70 min session)
• Introducing the NGSS / NRC Framework Vision to School Principals (30-45 min session)
• Engaging Teachers with Equity in Science (50 min)
  Incorporating Scientific Argumentation into Your Classroom (105 min)
• Promoting Student Science Talk in Classroom (50 min)
To Access STEM Teaching Tools

Web Site
http://STEMteachingtools.org

Twitter
@STEMTeachTools

Pinterest
http://www.pinterest.com/STEMeducation

Easy Access to PDFs of All Tools
http://STEMteachingtools.org/link/PDFcollection

Email—to suggest new tools or give feedback
STEMteachingtools@uw.edu