Teach ME Outside

BEST PRACTICES

Maine Mathematics and Science Alliance

A Guide and Toolkit for Educators to Incorporate Best Practices in Science Teaching Into Their Environmental Learning Programs and Lessons

How to Use This Toolkit

This toolkit is designed to be a simple and time friendly guide to take the work you are already doing in your environmental learning programs and lessons and shift them from **students "learning about" content to "figuring out" content.** It places the learning and the students at the center, and **it is something the students do, not something done to them**. These are not radical shifts in your programming, but a way to support what is already being done well in so many formal, informal and non-formal, large and small, rural and urban learning environments.

Use this guide to:

- Learn about core research-based shifts in science education that have been proven to improve student outcomes
- Explore concrete examples of how minor changes in lessons can be incorporated to move students from "learning about" to "figuring out"
- Workshop your own lessons using a series of "Best Practice" tools
- Engage your colleagues in a discussion about how to adapt and improve your lessons

Acknowledgements

Teach ME Outside

This module was developed as a part of the Teach Me Outside project. Teach ME Outside builds on the collaborative work of many different organizations and individuals over the past decade and is led today by a partnership between the Maine Mathematics and Science Alliance (MMSA), the Maine Environmental Education Association, and the Nature-Based Education Consortium. This project is made possible with support from the Pisces Foundation, the Elmina B. Sewall Foundation, and the Onion Foundation.

MMSA Maine Mathematics and Science Alliance

Maine Environmental Education Association MEEA

NATURE BASED EDUCATION CONSORTIUM

1. Introduction - Why Should I Incorporate Best Practices Into My Work?

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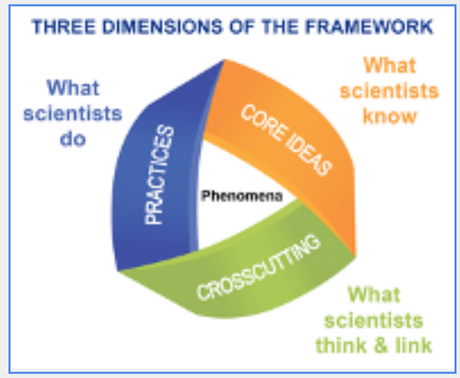
The single most coveted yet dwindling resource educators have – or don't have – is time. The impetus for this *Best Practices Module* is to help support what is already being done in so many formal, informal and non-formal, large and small, rural and urban learning environments. **Teaching Best Practices in Science Learning is nothing more than doing what we already know to be best, in our interest, and the students' interests**. It puts more teacher effort on the front end, allows for flexibility throughout, and prepares (with reasonable expectations) students in the end. Continue to do what you already do but elevate lessons using some of these new tools and strategies. Swap out, in, or alongside what is already happening in your learning space and understand pedagogically why you are making these changes.

These tools can be introduced gradually until you feel confident in their effectiveness. Not all lessons need to include all the best practices – some will. There is not a wrong way to do this, but there is no better way to improve learning. This sort of sensemaking means **shifting away from students "learning about" content to "figuring out" content.** It places the learning and the students at the center, and **it is something the students do, not something done to them**.

It seems that sometimes in education, the more we learn, the less we know, and for this reason alone, this module of best practice tools, lesson examples, and adaptation guidelines have been kept simple and time friendly.

This guide is organized to provide some background information and rationale for adapting curriculum, best practice tools and examples that you can use in your own work, and space for adaptation work and reflection on your own lessons. We hope you find and use this guide as a practical working space!

2. Defining Curriculum



When we think about curriculum, any curriculum, we should think about it in the context of 3- dimensional learning. That 3-dimensional context includes: Content Standard, Practice, and Cross-Cutting Concept. Teaching all three reflects best practice and this module guides its inclusion into what you are already doing. **It does not require you to significantly change what you do, but it does elevate how and why you do it.**

So together, the 3-Dimensions are WHAT students are able to DO with their new understanding of the content, HOW they make sense of the content, and WHY they are learning it in the first place.

The Disciplinary Core Ideas (DCI)
This is your local, state, or national content standard, and it represents only the partial content you must teach. **This is WHAT students are learning.**

The Cross-Cutting Concepts (CCC)
This is the list of big principles that are taught in and across every grade level K-12 and links the different domains of science. **This is WHY connections to larger scientific principles are so important to sensemaking.**

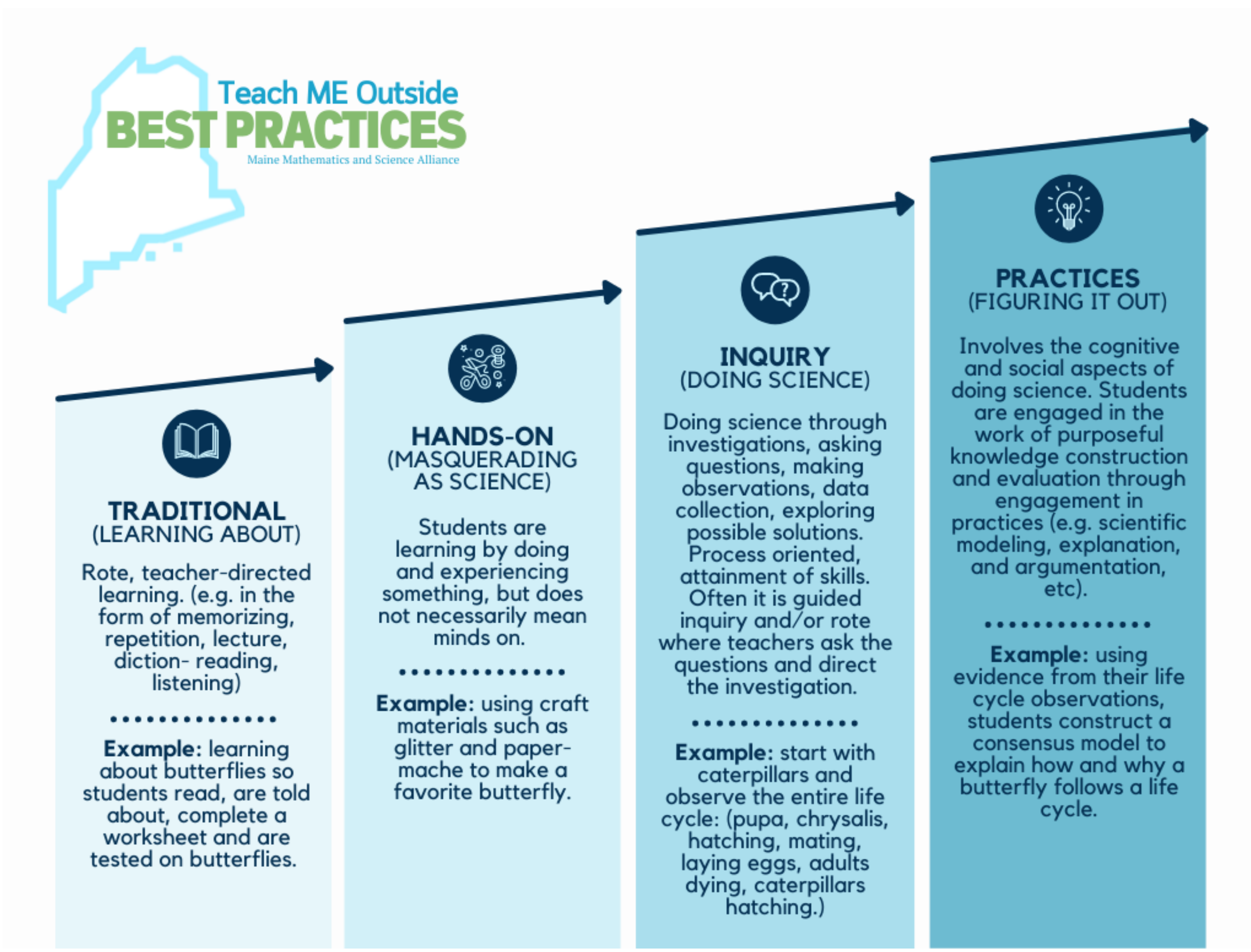
Patterns	**Cause & Effect**	**Scale, Proportion & Quantity**	**Systems & System Models**	**Energy & Matter**	**Structure & Function**	**Stability & Change**

The Scientific Practices
This is what students are able to actually DO with the content they learn. This is the WHY and HOW students come to understand the content standard. There is a continuum of the way this happens from less effective to more effective. **This is HOW students demonstrate what they are learning.**

Additional Resources: *Cultivating a next-generation classroom culture*. *Science Scope. NSTA The Science Teacher.* January 2016. By Christina Krist, Lisa Brody, Michael Novak, and Keetra Tipton

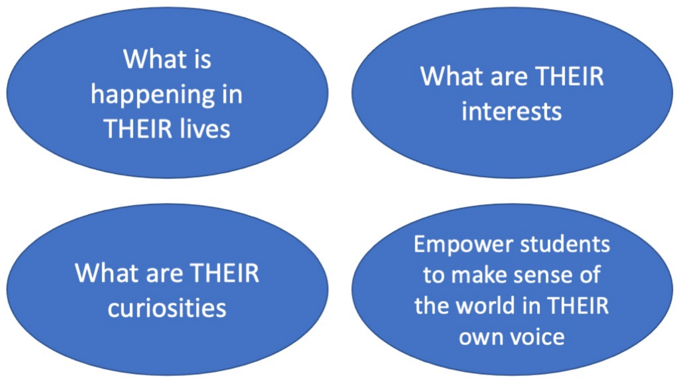
3. Teaching Continuum

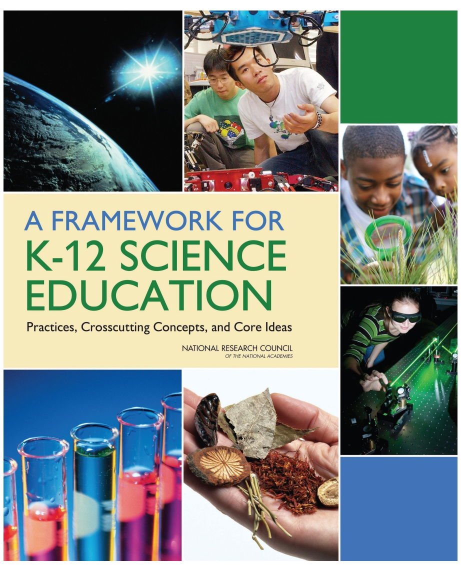
The below graphic outlines what "learning about" and "figuring out" looks like from both a teacher's and learner's perspective. All four categories can have a place in teaching, but Best Practice captures all the other categories, and puts coherence from students' perspective foremost and makes the knowledge useful. The tools in this toolkit will help guide your teaching.



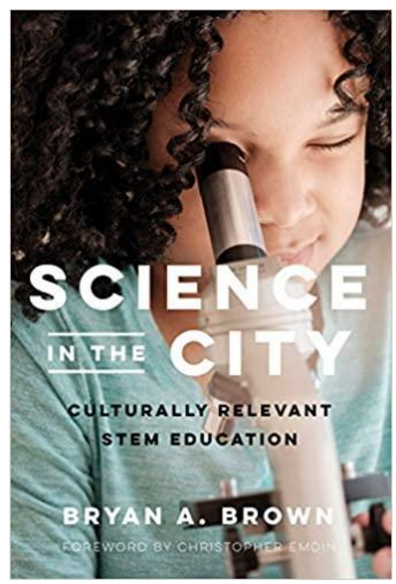
4. Adapting Curriculum

Recent research and reform argue that curriculum should be coherent for students. Student coherence supports equitable sensemaking, but only if we educators teach from the students' perspectives rather than ours.





"Designed to help children continually build on and revise their knowledge and abilities, **starting from their curiosity about what they see around them** and their initial conceptions about how the world works." (NRC, 2012)



"Impactful science teaching happens when we start in the lives of the children and empower them to make sense of the world **in their own voice.**" (Brown, 2019)

In traditional approaches to teaching, units are sequenced based on how experts understand the relationship among concepts. This means that it typically requires a prior understanding of the concepts being taught to understand why a unit is sequenced the way it is.

Students don't have that, but you do. The result is that the sequence of activities may make sense to the teacher but does not necessarily make sense to the students.

For example, you may understand how certain activities to learn about cells will help students understand important biological concepts, but students may only know that they are learning about cells because that's the title of the current chapter in the textbook or because you told them.

In the **Science Best Practices** approach, the sequence of activities is designed to make sense to students. We call this **"coherence from the students' perspective."**

When a unit or series of lessons are coherent from the student perspective, a visitor to the classroom on any given day, should be able to walk over to a student or group of students and ask, "what are you learning" or "what are you figuring out?" [We hope visitors are not asking students, "what are you doing?" Asking, "what are you doing," is a closed-ended question, because it can be answered in a few words. Student: "we're learning about rocks."]

Asking instead, "What are you figuring out?" …students have to think about that…what connections they are making, the problems they are trying to solve that deal with rocks, but it isn't just about rocks.
In this scenario, students will be able to answer in a way that describes a question they are trying to figure out or a problem they are trying to solve.

As you are well aware, students often experience their classes as a series of disconnected activities and lessons. Science is no exception. In units that are coherent from the student perspective, educators work with students to figure out together what the class needs to work on, and how to go about it.

The sequencing of our own instruction makes complete sense to us, but we are the educators, we are the experts, we actually know the thing that we are teaching. To students, this could actually appear as a series of unrelated events.

These lessons can still be engaging and interesting (especially if they are hands-on), but to a student, it appears as "today we're going to do Oobleck and tomorrow we're sinking metal blocks in water, but I don't know what they have in common."

That is what we mean when we say, "hands on" doesn't necessarily mean "minds on."