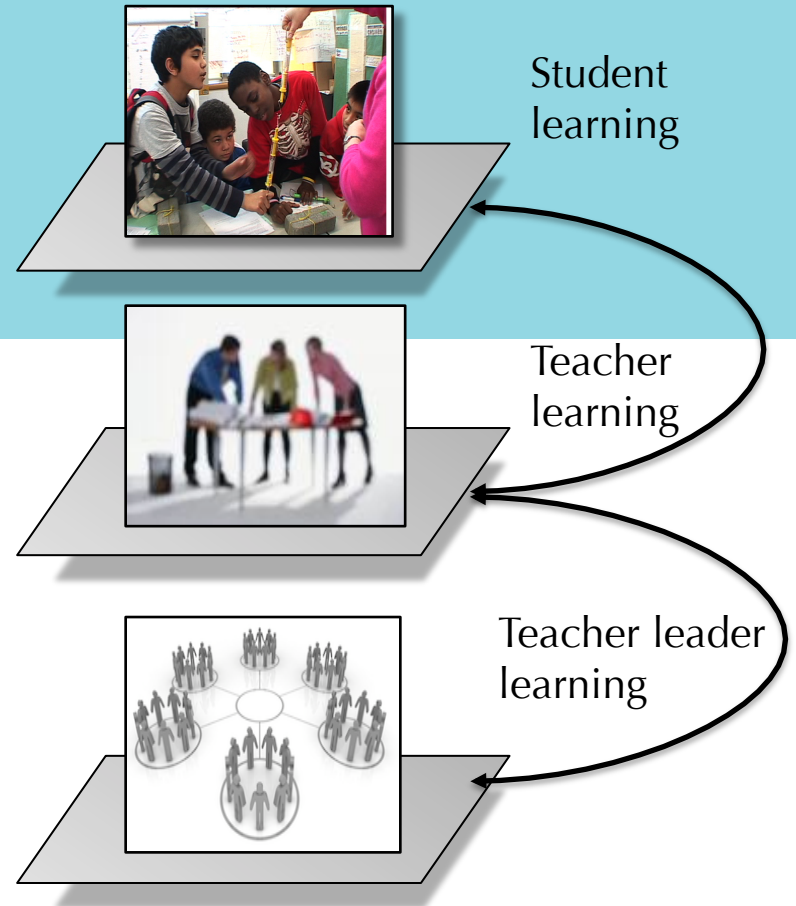


Mobilizing a Community for Learning

South Carolina's Academic Standards for Science and Engineering



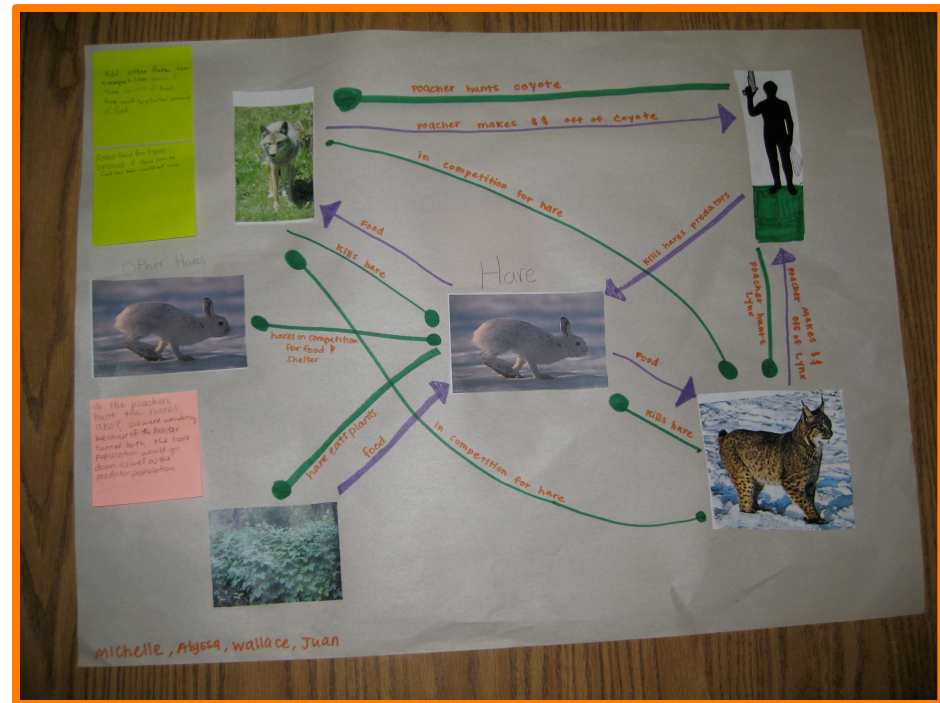
LESS

is more, and...

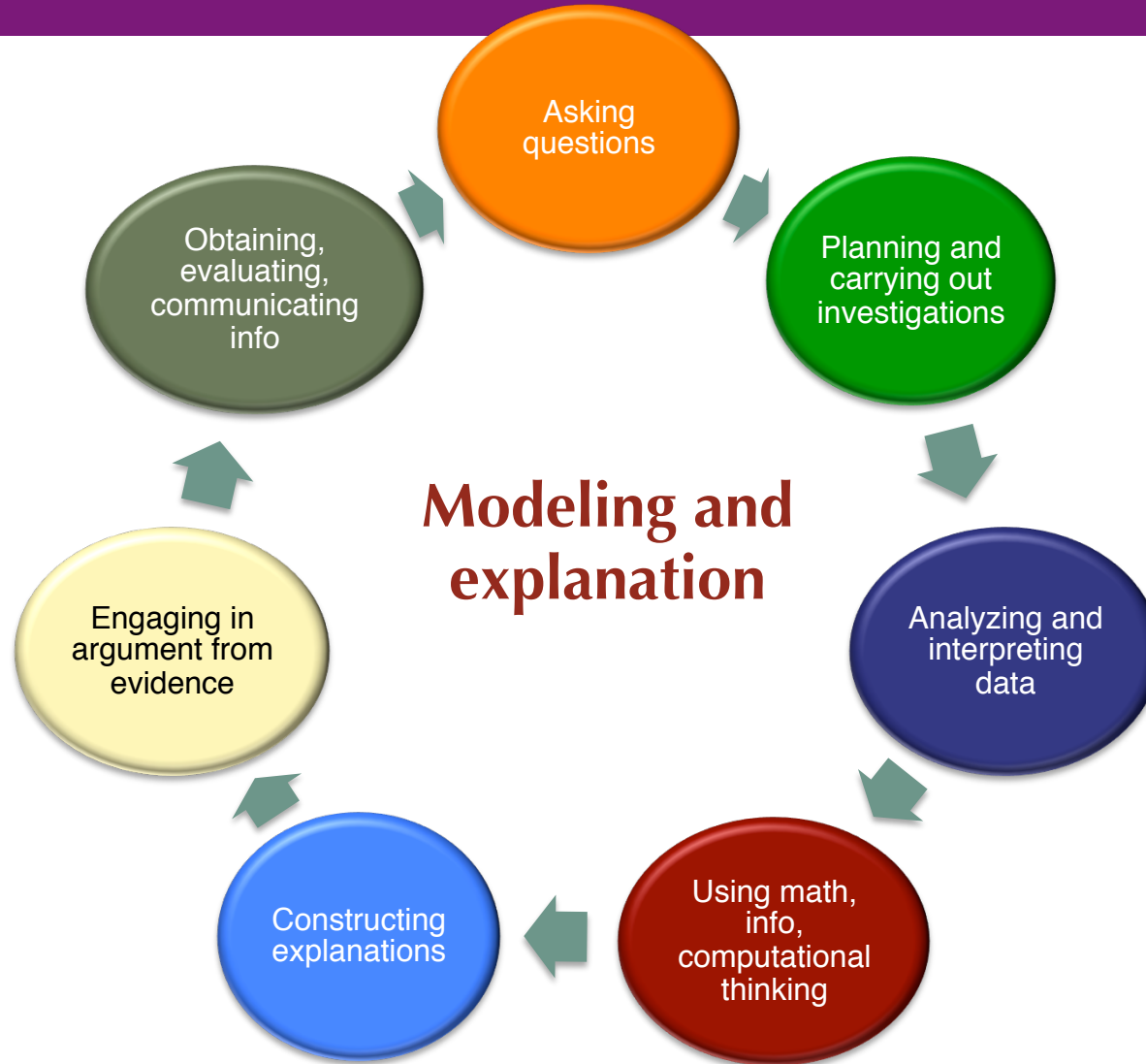


- Performances by students = scientific practices + core content ideas

- **“Develop and use a model to support explanations about the transfer of matter and energy into and out of ecosystems.”**



Not all science practices are “equal”



Models are externalized ideas that change over time in response to evidence—pushing towards explanation



Two

Hatch

Air

Three

top going in

latch begins to open

Air pushing out

Steam

* all the air was pushing out but the only way to get out was all the pressure to fold in and to get out the latch.

Four

* all the Steam is out because the latch is open so it all went away and only little air is left.

drawing! MAYA

open

Air

Two

closed

WARM Air

* warm inside cold outside

* fast molecules

Three:

Air compressing

* cold inside & outside

* slower moving molecules

Everything is cooled

* less pressure.

* equalized pressure and temp



OK, but what does this look like in the classroom?

Teaching 3rd graders about sound

Will we see:

- Hypothesizing?
- Asking questions?
- Modeling?
- Explanation?
- Arguing with evidence?
- Designing studies?
- Analyzing data?

The image shows a student's work on a science experiment. It consists of three hand-drawn diagrams and handwritten text. The first diagram, titled "Before singing", shows a boy's face and a glass. The second diagram, titled "During singing" and signed "Wesley", shows the boy singing into the glass, with arrows indicating "Vibration" and "expanding here" at the base of the glass, and a note "Thicker than here". The third diagram, titled "After singing", shows the boy's face and a shattered glass with the word "Crack" written above it. Below the diagrams is handwritten text on lined paper:

used
pped
imes.

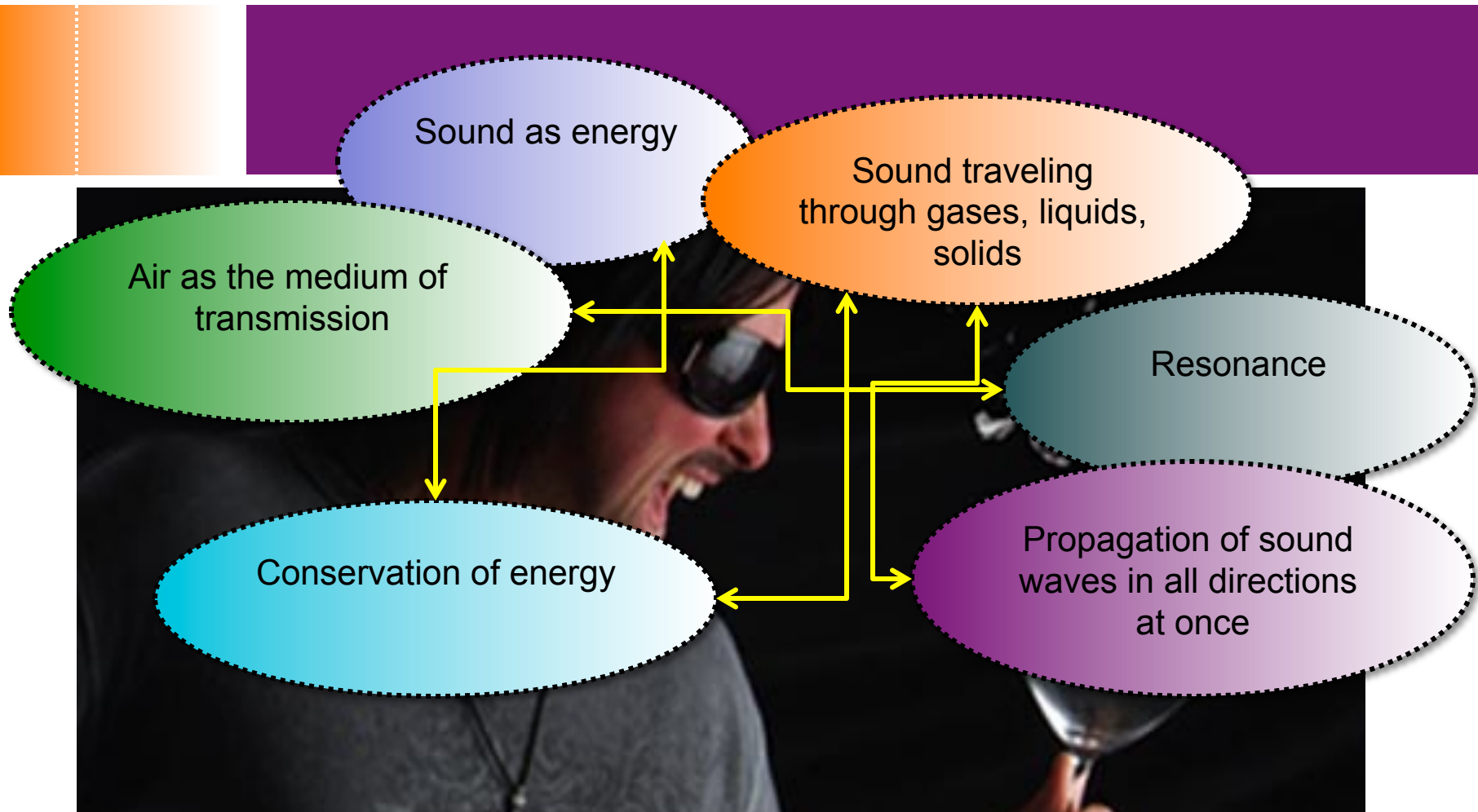
Next, when the singer was singing I observed that the glass was vibrating and trying to expand but it was too brittle so it couldn't so it shattered.

Finally, when the singer stopped singing I observed that the glass was shattered and there were pieces of glass everywhere, but the part that you hold is thicker so it didn't shatter.





“Less is more” pays off:
The emergence of sophisticated ideas



What science ideas have to be
“pulled together” by our 3rd graders?

What new teaching will demand

Some of this teaching will be very familiar:

- Lab activities
- Experiments
- Readings



Some will seem very different:

- Basing a unit on one complex phenomenon
- Emphasis on evidence-based explanations
- Asking students to make their thinking public
- Revising ideas in response to new evidence
- Using talk differently in the classroom

The 5 tasks of the teacher leader community

1. Assembling colleagues who can work towards a shared vision of instructional excellence
2. Becoming familiar with the Standards + with ambitious forms of teaching
3. Imagining how all these ideas about practice get represented to teachers
4. Developing tools to help teachers “take the first steps”
5. Arranging for teachers to observe each other taking risks to improve instruction

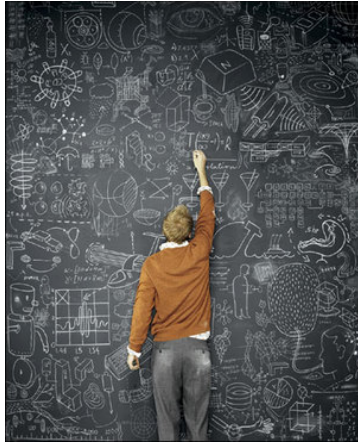


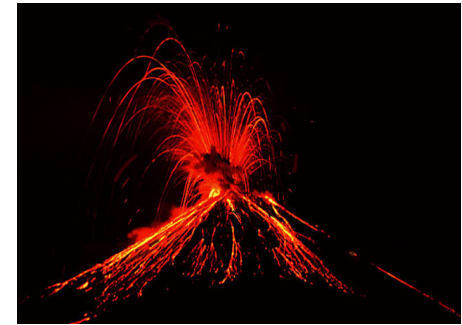
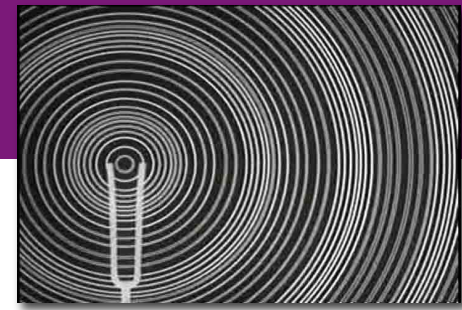
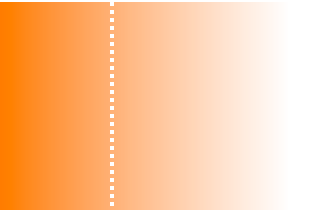
5

Just following the Standards will not ensure good teaching

| What students are capable of | Trends in teaching |
|--|--|
| <ul style="list-style-type: none">• Can reason about abstractions | <ul style="list-style-type: none">• Lack of student engagement |
| <ul style="list-style-type: none">• Can construct and revise scientific models | <ul style="list-style-type: none">• Content presented as facts, definitions, algorithms |
| <ul style="list-style-type: none">• Can defend, adapt, theories based on evidence | <ul style="list-style-type: none">• Few connections between activity and science ideas |
| <ul style="list-style-type: none">• Can design experiments that include sophisticated controls for external variables) | <ul style="list-style-type: none">• Student ideas not used as resources, no challenging of ideas |
| <ul style="list-style-type: none">• Can monitoring own progress towards deep understanding | <ul style="list-style-type: none">• Questioning and discourse the weakest aspect of classroom practice |

Corcoran & Gerry, 2011; Kane & Staiger, 2012; Pasley, 2002; Roth et al., 2006; Weiss et al., 2003





Engagement in practices



For scientists, practices are the means to:

- Discovery
- Innovation
- New puzzles



For students, engagement in practices:

- Fosters deep understanding of content
- Engages them with evidence and argument
- Not just “imitating scientists”