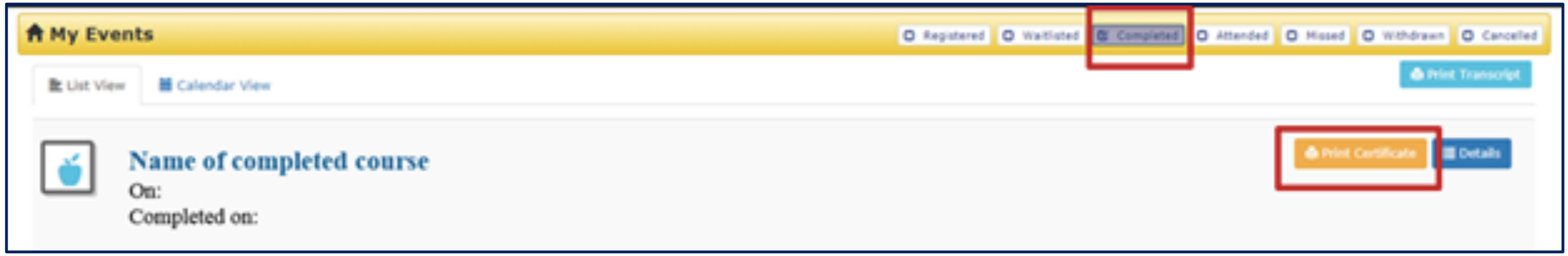
WELCOME!

Please review this information while we wait for all to join!

Attendance, Resources & PD Clock Hours

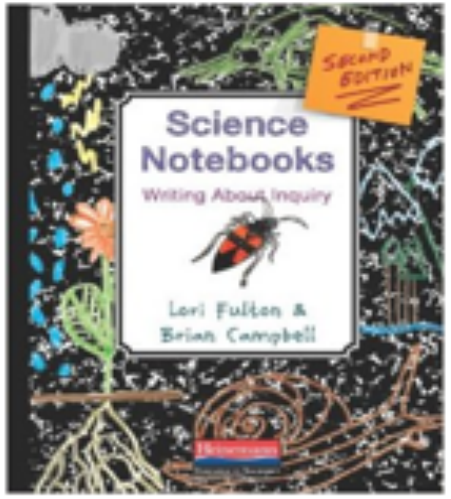
- **You must stay on the whole time- 1 hour- to receive credit**
- **<u>YOU</u> print your certificate through ADE Connect- please wait 24-48 hours of webinar before printing certificates**



- **AFTER WEBINAR- you will receive PDF of presentation and resource page**

Arizona Department of Education

5-E INSTRUCTIONAL MODEL & SCIENCE NOTEBOOKS




Methods & Strategies

Science Notebooks as Learning Tools

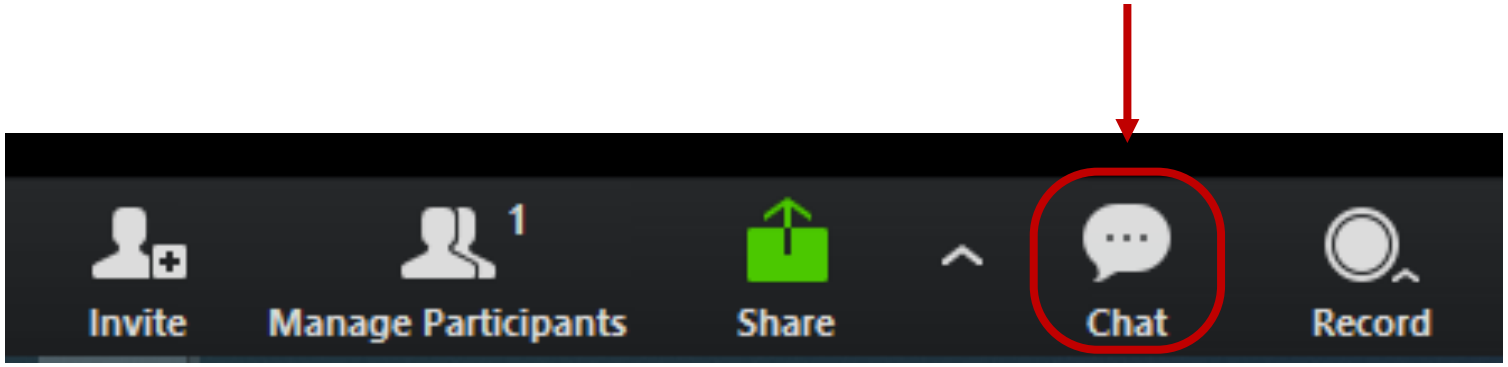
Lessons from a multi-year professional study group offer insights on getting the most out of science notebooks.

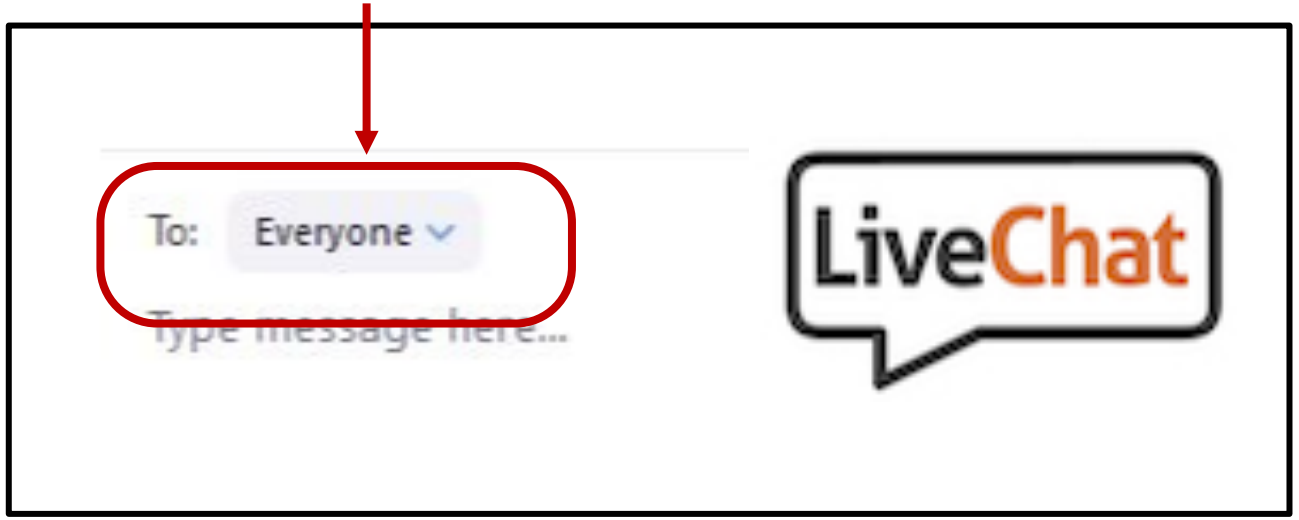
Hi!

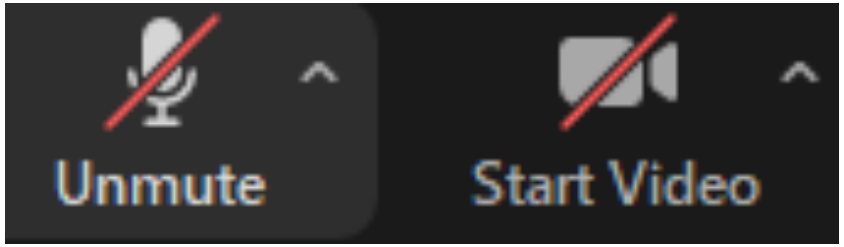
I'm Rebecca Garelli

ADE K-12 Science & STEM Specialist

Webinar Norms:







1. What is your current position or job title?

2. Have you had used a science notebook with students before? If so, with what grade level(s)?

3. Have you had a chance to look at the NEW Az Science Standards?

Goals:

- Understand how using science notebooks directly correlates to 3-Dimensional instruction and the new Arizona Science Standards
- Discuss rationale of using science notebooks as a learning tool
- Deepen understanding of the 5-E Instructional Model
- Relate the components of 5-E Model to science notebook organization

Overview of Shifts

What would you see less of?

What would you see more of?

What are 3-5 items that resonate with you?

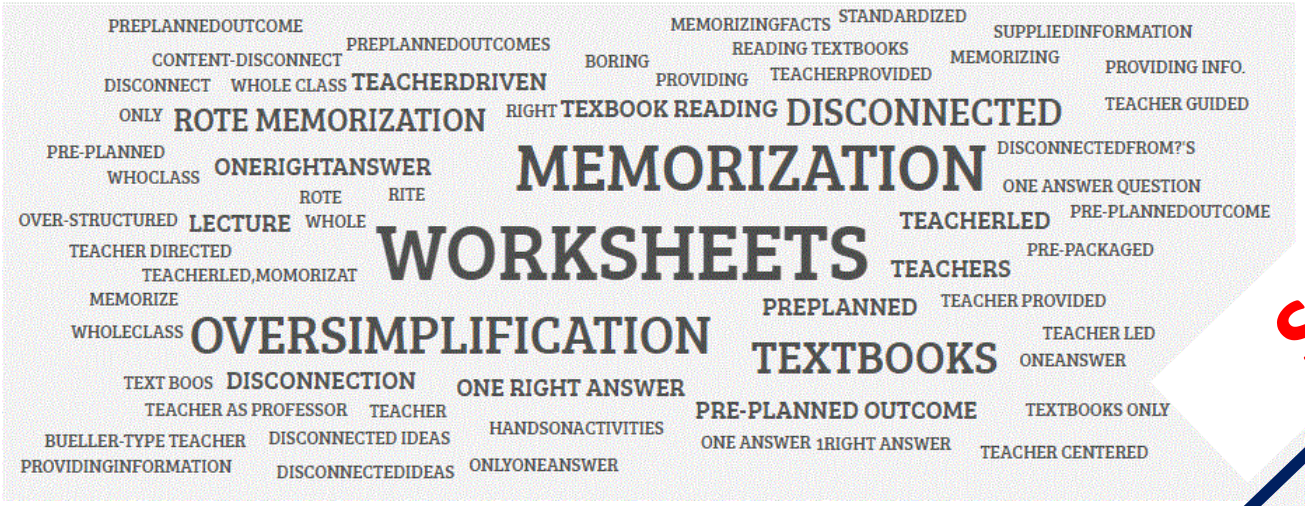
A New Vision for Science Education

Implications of the Vision of the Framework for K-12 Science Education and the Arizona Science Standards

SCIENCE EDUCATION WILL INVOLVE LESS:	SCIENCE EDUCATION WILL INVOLVE MORE:
Rote memorization of facts and terminology	Facts and terminology learned as needed while developing explanations and designing solutions supported by evidence-based arguments and reasoning.
Learning of ideas disconnected from questions about phenomena	Systems thinking and modeling to explain phenomena and to give a context for the ideas to be learned
Teachers providing information to the whole class	Students conducting investigations, solving problems, and engaging in discussions with teachers' guidance
Teachers posing questions with only one right answer	Students discussing open-ended questions that focus on the strength of the evidence used to generate claims
Students reading textbooks and answering questions at the end of the chapter	Students reading multiple sources, including science-related magazine and journal articles and web-based resources; students developing summaries of information.
Pre-planned outcome for "cookbook" laboratories or hands-on activities	Multiple investigations driven by students' questions with a range of possible outcomes that collectively lead to a deep understanding of established core scientific ideas
Worksheets	Student writing of journals, reports, posters, and media presentations that explain and argue
Oversimplification of activities for students who are perceived to be less able to do science and engineering	Provision of supports so that all students can engage in sophisticated science and engineering practices

Less of this….. More of this…..

In a science classroom you would see less of…..



LEARNING ABOUT

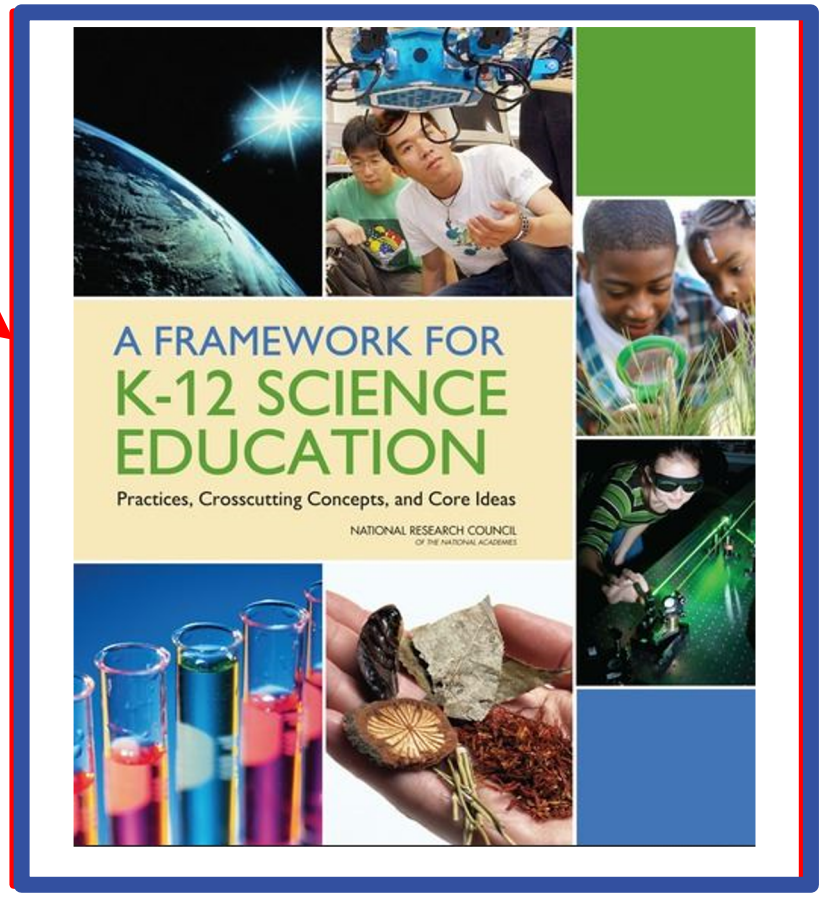
SHIFT

FIGURING OUT

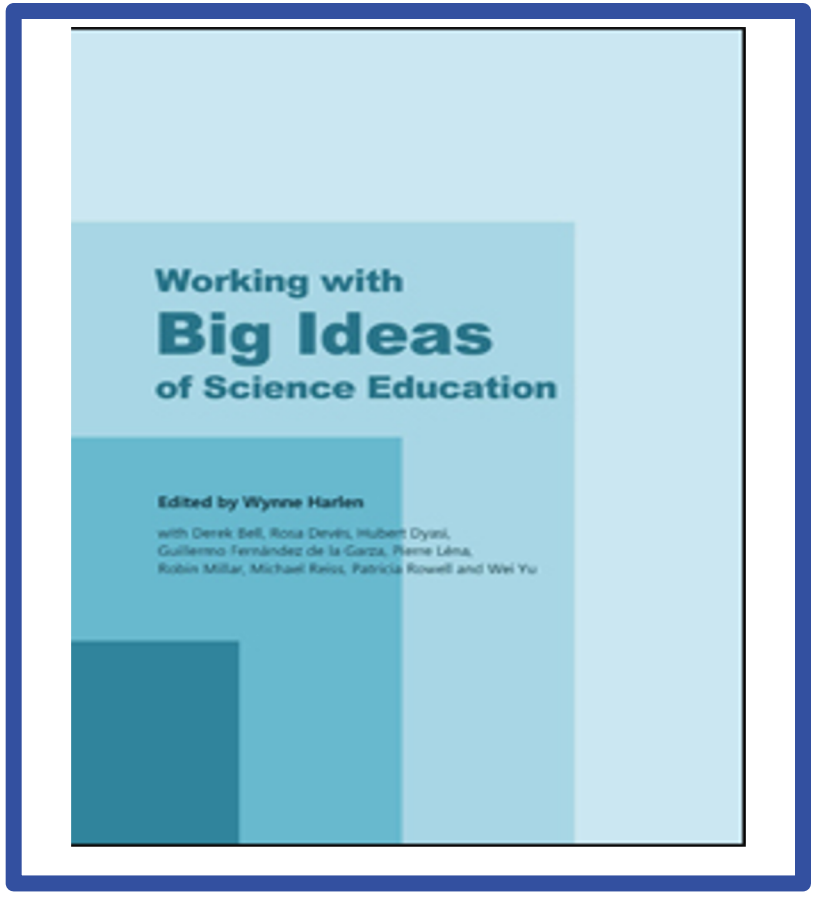
…nce classroom you would see more of…..

Background Information

NGSS



AzSS



AzSS

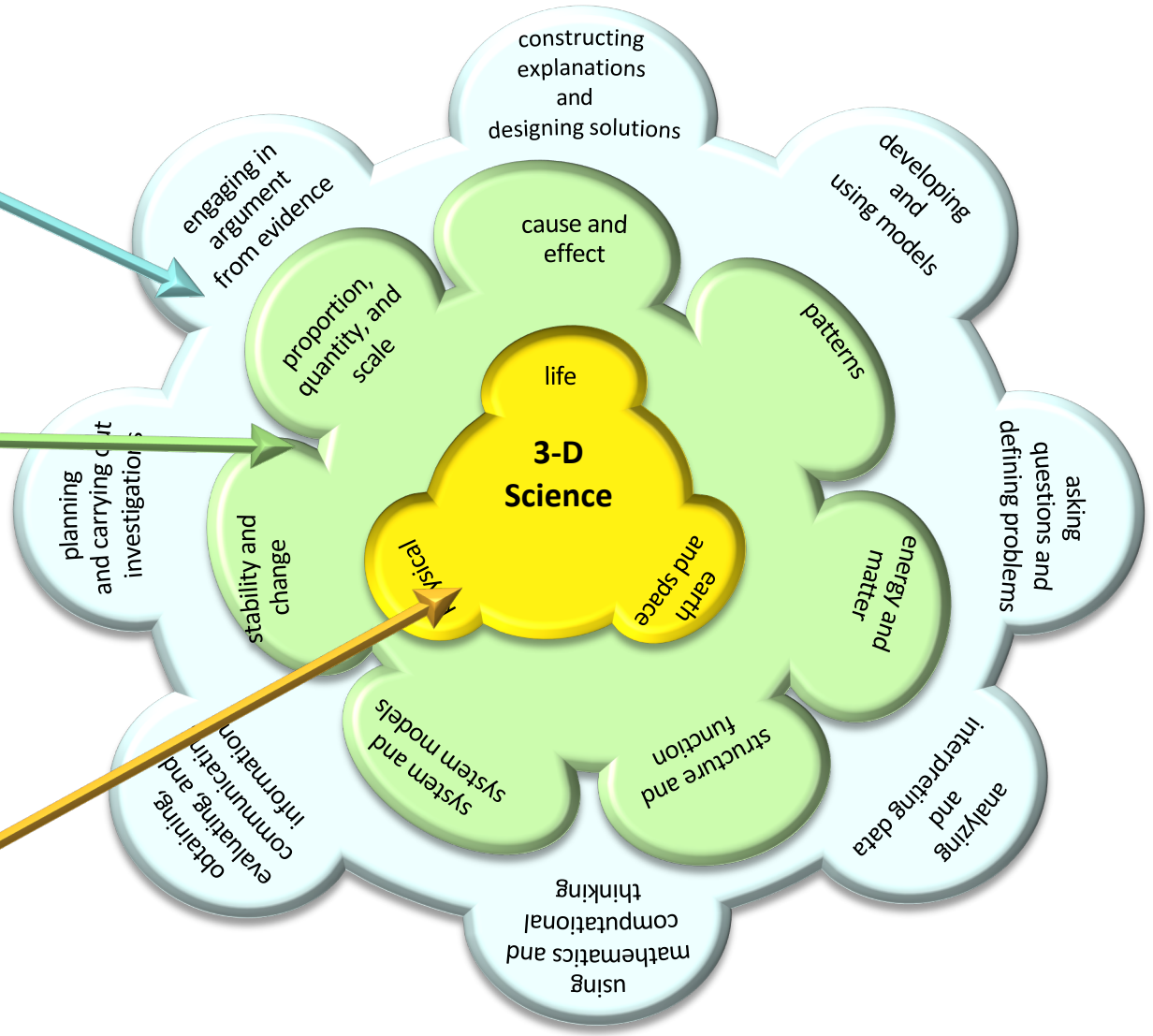
"Framework-Based" State, not an NGSS state

What is 3-Dimensional Science Instruction?

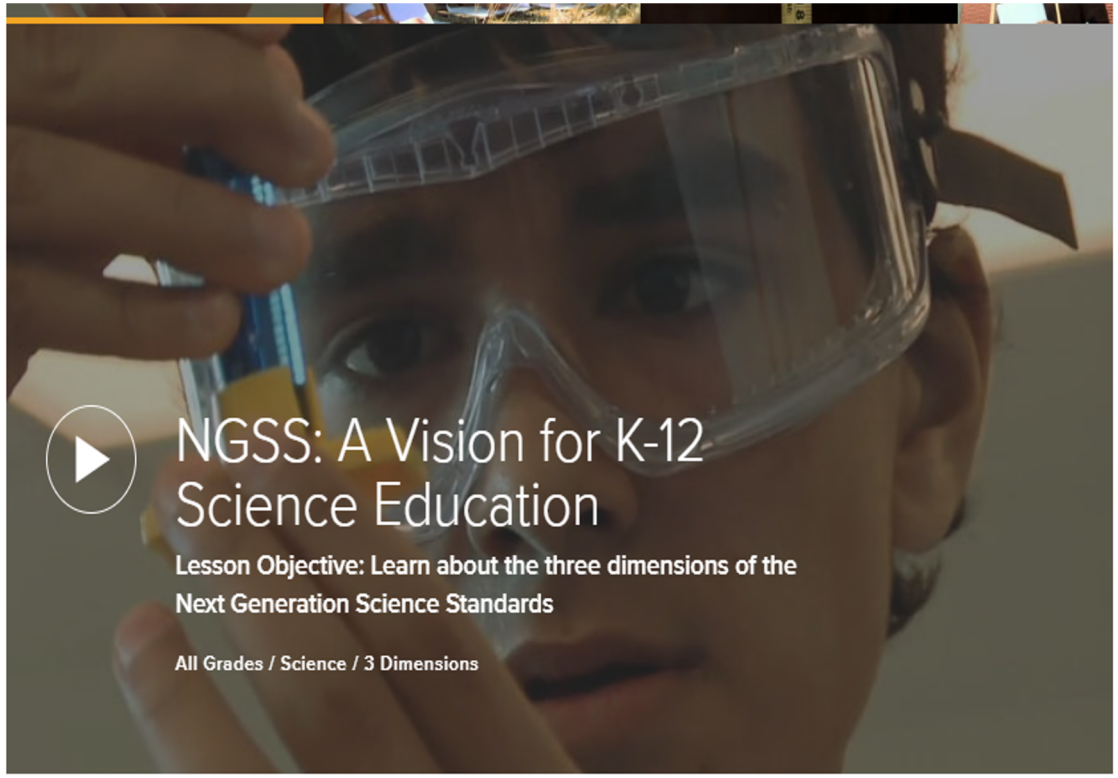
Science & Engineering Practices

Crosscutting Concepts

Core Ideas



What Is 3-Dimensional Science Instruction?



1. How do the Arizona Science Standards represent a shift in science education?
2. What did you see the students & teacher doing that could be put into a science notebook?

Goals:

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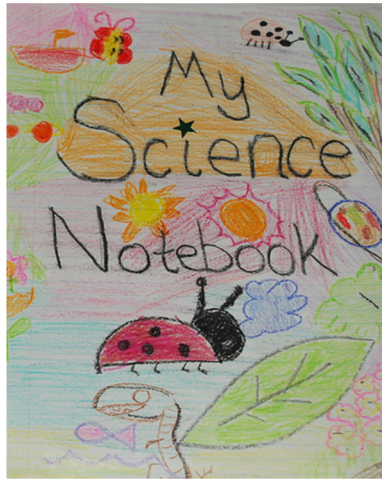
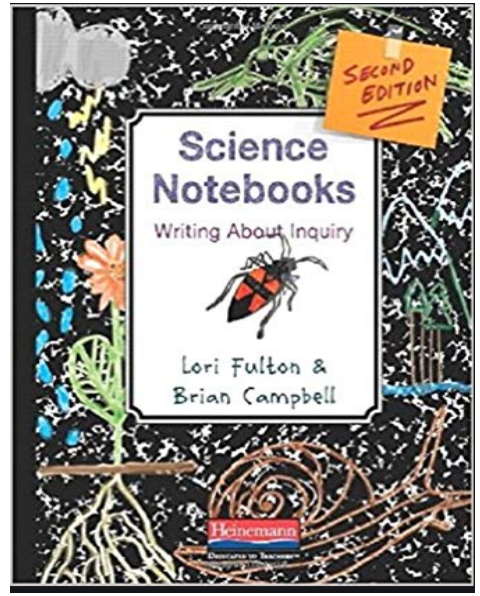


Let's Discuss the Semantics…

What is the difference among science journals, logs, and notebooks?

Journals	Logs	Notebooks
Used **after** an investigation	Used **during** investigation	Used **before, during, and after** investigation
Keeps reflection of lesson, "Today in science I...	Keeps data over time	Keeps plans, questions, data, thoughts, explanations, analysis, pictures



**As described in introduction to Science Notebooks: Writing about Inquiry 2nd edition (Fulton and Campbell, 2014)*

Why science notebooks?

Students:	Teachers:

• Gain ownership over their learning
• Organize ideas, reveal student thinking, makes thinking visible
• Reflect on and reference prior learning experiences
• Used as a resource when speaking with peers
• Engage in the 8 Science & Engineering Practices (act as scientists/engineers)
  • Analyze & interpret data, construct explanations and argue from evidence
  • Draw initial models, revised models, and consensus models
	• Use as both formative and summative assessment tool
	• Support differentiation
	• Support literacy skills
	• Helps support teacher collaboration and refinement of practice by providing authentic student samples
	• Planning tool

Science and Engineering Practices

Dimension 1

What we do

1. Asking Questions and Defining Problems
2. Developing and Using Models
3. Planning and Carrying Out Investigations
4. Analyzing and Interpreting Data
5. Using Mathematics and Computational Thinking
6. Constructing Explanations and Designing Solutions
7. Engaging in Argument from Evidence
8. Obtaining, Evaluating, and Communicating Information

TABLE 1.

Development of science notebook implementation.

Implementation of Science Notebooks	Novice		Developing		Experienced
Purpose	The notebook as "bound worksheets"	The notebook as a recording device	The notebook as a resource	The notebook as a tool	The notebook as a learning tool
Teacher Actions	Dictates what to record or leaves all decisions open to the students	Reminds or suggests that students use particular strategies to record	Guides development of the notebook through supports and scaffolding	Continues to guide development and provides opportunities for students to self-assess their entries	Structures opportunities to help students determine meaningful ways to collect and organize data and to synthesize their thinking
Teacher Focus	Science activity and basic elements	Basic elements and observations	Scientific content	Student understanding of the scientific content	Students using information in the notebook to push their understanding of the scientific content further

Take Stock

Where do you believe you fall on this chart at the point in time?

Novice, Developing, or Experienced?

Goals:

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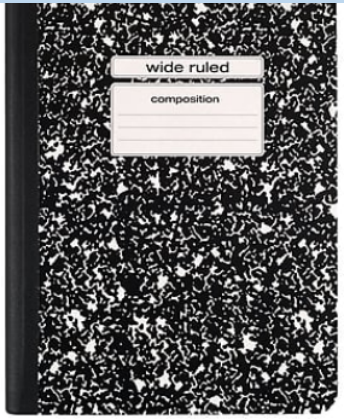


5-E Model Comfort Level

LiveChat

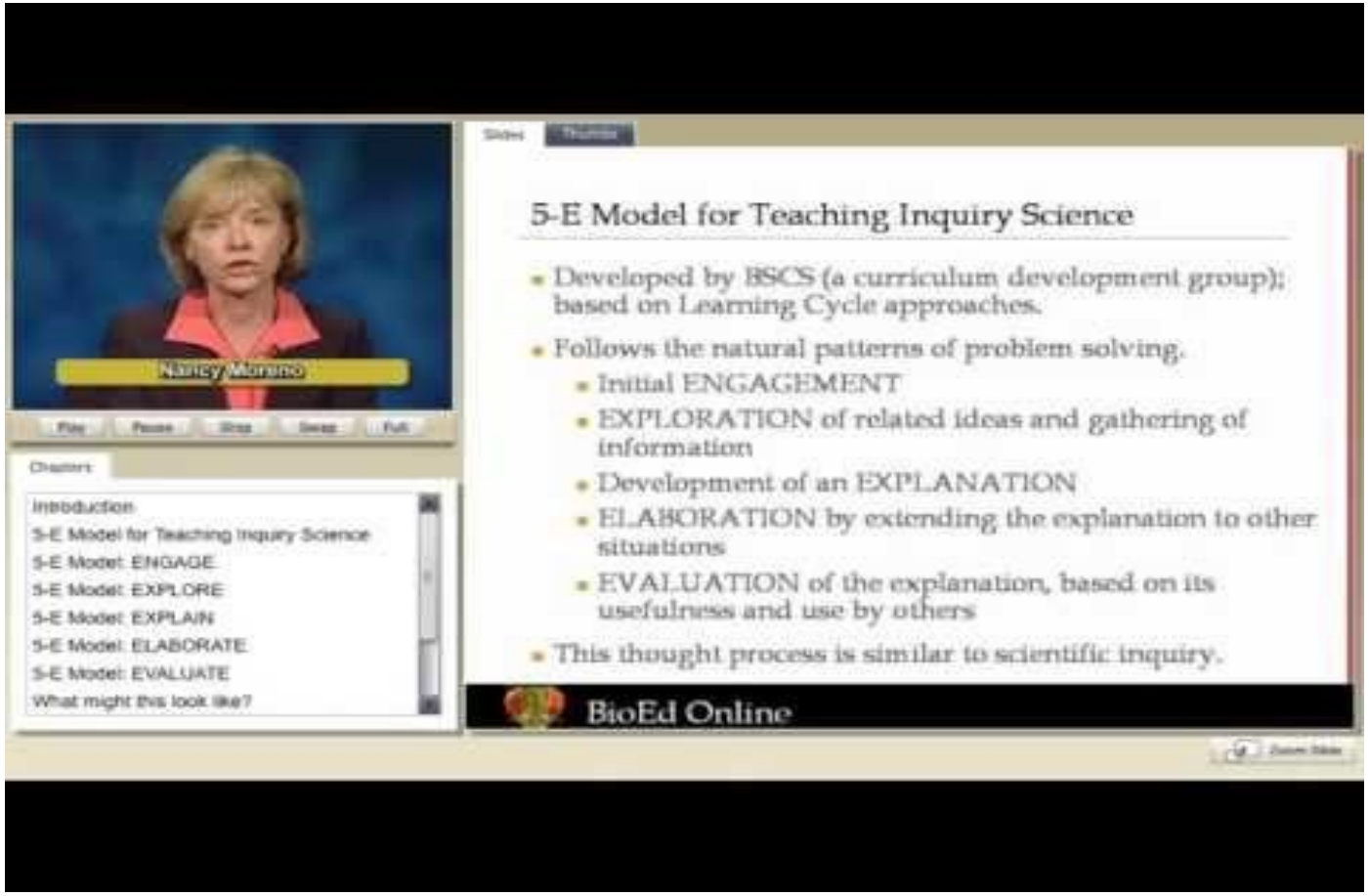
1- What are the 5Es?!?

2- I've heard of the 5Es…

3- I've dabbled with the 5Es…

4- I am a 5E Master!!

What is the 5-E Instructional Model?



LiveChat

While watching, THINK 1st, then CHAT:

What aspects of this instructional model might you already be doing with your students?

5E Instructional Model

Engage. The engage activity should make connections between past and present learning experiences, expose prior conceptions, and organize students' thinking toward the learning outcomes of activating in the instructional sequence

Explore. Experiences in the explore phase provide students with a common base of activities within which students wrestle with their current conceptions about a natural phenomenon through the science and engineering practices in the performance expectation. Learners may complete activities that help them use prior knowledge to generate new ideas, explore questions, design and conduct investigations, analyze and interpret data, and/or develop and use models.

Explain. During the explain phase students are provided opportunities to demonstrate their conceptual understandings and use of science and engineering practices. In this phase teachers or instructional materials employ sense-making strategies and introduce academic language. An explanation from the teacher or other resources may guide learners toward a deeper understanding, which is a critical part of this phase.

Elaborate. Teachers or instructional materials challenge and extend students' conceptual understanding and use of science and engineering practices during the elaborate phase. Through new experiences, the students develop deeper or broader understanding by applying their understanding and practice in a new context. During the elaborate phase teachers may emphasize the crosscutting concept in the foreground of the instructional sequence.

Evaluate. Experiences in the evaluate phase encourage students to assess their conceptual understanding and use of the practices. The experiences allow teachers to evaluate student progress toward achieving the performance expectation(s).

Model?

Phenomena

SEP & CI

SEP & CI

CCC

Think: what are the key features of each 5E phase?

What we have figured out

5Es	What the Teacher Does	What the Student Does
Engage	• Creates interest • Generates curiosity • Raises questions • Elicits responses that uncover what the students know or think about the concept/topic	• Asks questions such as, Why did this happen? What do I already know about this? What can I find out about this? • Shows interest in the topic
Explore	• Encourages the students to work together without direct instruction from the teacher • Observes and listens to the students as they interact • Asks probing questions to redirect the students' investigations when necessary • Provides time for students to puzzle through problems	• Thinks freely but within the limits of the activity • Test predictions and hypotheses • Forms new predictions and hypotheses • Tries alternatives and discusses them with others • Records observations and ideas • Suspends judgment
Explain	• Encourages the students to explain concepts and definitions in their own words • Asks for justification (evidence) and clarification from students • Formally provides definitions, explanations, and new labels • Uses students' previous experiences as basis for explaining concepts	• Explains possible solutions or answers to others. • Listens officially to others' explanations • Questions other's explanations • Listens to and tries to comprehend explanations the teacher offers • Refers to previous activities • Uses recorded observations in explanations
Elaborate	• Expects the students to use formal labels, definitions, and explanations provided previously • Encourages the students to apply to extend the concepts and skills in new situations • Reminds the students to existing data and evidence and asks, What do you already know? Why do you think...? • Strategies from Explore apply here also	• Applies new labels, definitions, explanations, and skills in new, but similar situations • Uses previous information to ask questions, propose solutions, make decisions, and design experiments • Draws reasonable conclusions form evidence • Records observations and explanations • Checks for understandings among peers
Evaluate	• Observes the students as they apply new concept and skills • Assesses students' knowledge &/or skills • Looks for evidence that the students have changed their thinking or behaviors • Allows students to assess their own learning and group-process skills • Asks open-ended questions, such as: Why do you think...? What evidence do you have? What do you know about x? How would you explain?	• Answers open-ended questions by using observations, evidence, and previously accepted explanations • Demonstrates an understanding or knowledge of the concept or skill • Evaluates his or her own progress and knowledge • Asks related questions that would encourage future investigations

Student

As you read, think what information students might write or record in their science notebook.

Choose one of the 5E phases and explain something a student may write in the notebook.

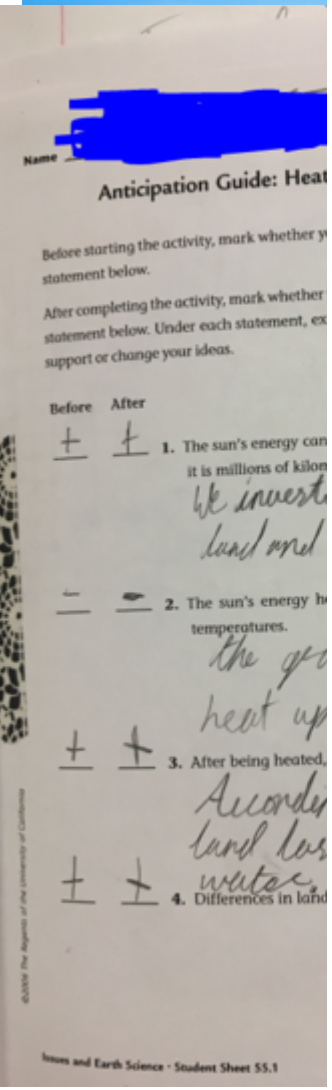
Integrating the 5E into Science Notebooks

Components:

- Title:
- Date:
- Driving Question:
- Background/ Getting Ready:
- Materials:
- Safety:
- Data:
- Analysis/ Explanation
- Build Understanding/ Take It Further:
- Wrap-Up/ What We Figured Out:

5E	Component	Example of Component Items (what could go in the notebook)
ENGAGE	Title:	Write the actual title of the lesson at the beginning of the lesson *(Example: Reflecting Light)*
	Date:	Record the date the learning sequence or lesson started
	Driving Question:	Write the driving question of the day, what are students trying to figure out? *(Based on the anchoring phenomena you are working with, details what they will be figuring out without revealing the answer)*
	Background or Getting Ready:	Engage students with the **anchoring phenomena**. Students write any prior knowledge relevant through probing questions, formative assessment probe related to phenomena. Students can **generate and ask questions** to place on a **Driving Question Board**, think about phenomena using an "I notice, I wonder" chart. *(What do students need to think about before they begin exploring?)*
EXPLORE	Materials:	Students do not write out a list of materials. Rather, if the exploration requires materials needed **to plan carry out investigations**, they need to check the materials to ensure they have what they need. If they do, they place a ✓ next to the word "materials" in their notebook.
	Safety:	Discuss any safety issues or concerns for the exploration, students do not write anything down, but place a ✓ next to the word "safety" in their notebook.
	Data:	**Gather evidence and obtain, evaluate, and communicate information.** Students can write notes, responses, **initial models & drawings, record observations, collect data, graphic organizers, data tables, graphs**, etc. (Use any tools & strategies **to gather evidence and analyze and interpret data**) Students can be exposed to subsequent investigative phenomena in which they may want to **design and conduct investigations.**
EXPLAIN	Analysis/ Explanation:	Facilitate discussion around how to **analyze and interpret data** and begin **constructing explanations and arguing from evidence**. Students can use graphic organizers like **Claims-Evidence-Reasoning (CER)** or use strategies like the **I² strategy** to **analyze and interpret data** and make sense of data, or **analogy mapping** to explain models. Goal is to connect the exploration and explain to reflect on what we have figured out so far in the instructional sequence to deepen understanding. Students may also listen to peers and provide feedback for each other. Use **Productive Talk Moves** to facilitate student discourse.
ELABORATE	Build Understanding/ Take It Further:	Research new information, apply what we have figured out to a new scenario, **analogous phenomena**, or other real-world application, **propose solutions**, make decisions (to circle back to explore again if needed), **design additional investigations** to push thinking further. Goal is to challenge and extend students student's conceptual understanding. **Crosscutting Concepts** can be emphasized here.
EVALUATE	Wrap-Up/ What We Figured Out:	Answer the driving question, use a **summary table** to summarize what we figured out, give an exit ticket, **use sticky bars (before & after),** reflections, formative or summative assessments, quick checks, use analogous phenomena for summative. Experiences should encourage student to assess their conceptual understanding and use of the 8 Science & Engineering Practices.

BLUE= SEPS ***RED= INSTRUCTIONAL STRATEGIES*** **Created by Rebecca Garelli for ASTA Annual Conference, Queen Creek, AZ, 2017, modified 2019**


Name [redacted]

Anticipation Guide: Heat

Before starting the activity, mark whether y
statement below.

After completing the activity, mark whether
statement below. Under each statement, ex
support or change your ideas.

Before	After	
+	+	1. The sun's energy can … it is millions of kilom … We invest … land and …
−	−	2. The sun's energy h … temperatures. … the gr … heat up …
+	+	3. After being heated, … Accordi … land los … water.
+	+	4. Differences in land …

Issues and Earth Science · Student Sheet 55.1

Name:_____ Hour:_____ Date:_____

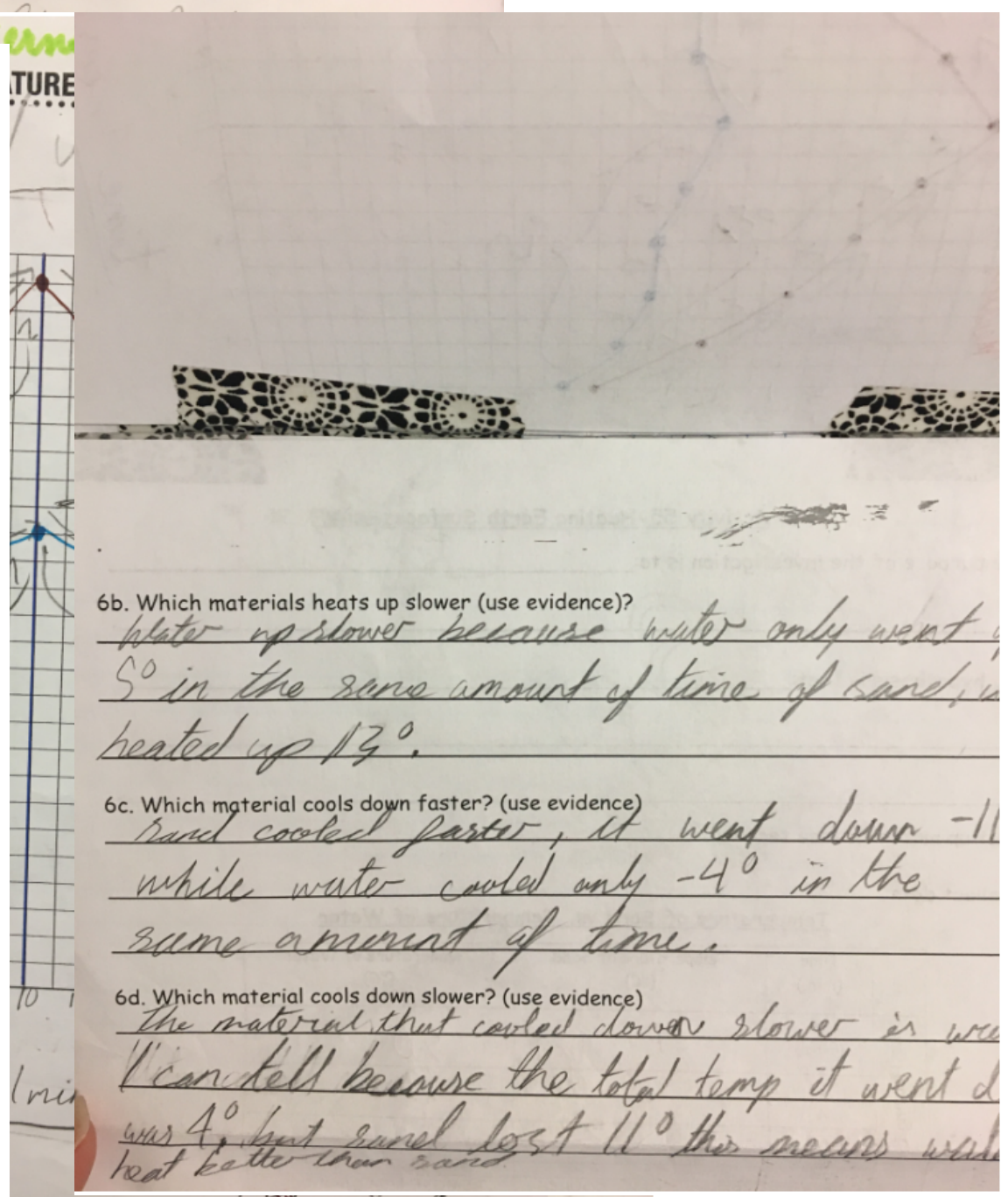
QUESTION:

CLAIM:

EVIDENCE #1:

REASONING #1:

EVIDENCE #2:


6b. Which materials heats up slower (use evidence)?
Water up slower because water only went … 5° in the same amount of time of sand, … heated up 13°.

6c. Which material cools down faster? (use evidence)
Sand cooled faster, it went down -11 … while water cooled only -4° in the same amount of time.

6d. Which material cools down slower? (use evidence)
The material that cooled down slower is wa … I can tell because the total temp it went d … was 4° but sand lost 11° that means wat … heat better than sand

Act 1 Living or Non-Living

Date 1/22/19

Challenge Question How can we know if something is living or non-living

Getting Started K-W-L

Organizisms any living thing (plants, animals, etcs)

Materials
safety

Data

Analysis

Evidence of Life

- shelter
- needs nutrients
- can grow
- can die
- needs food
- can reproduce
- needs water
- needs oxygen
- need sunlight

living | non-living

Name [redacted]

Period [redacted] Date [redacted]

LIVING OR NONLIVING?

1. Copy in the spaces below your class list of characteristics that define life.
2. Use this definition to decide whether the objects below are living or nonliving.
3. *If it is living,* explain how you know.
4. *If it is nonliving,* explain why someone might think it is living.

Characteristics of life

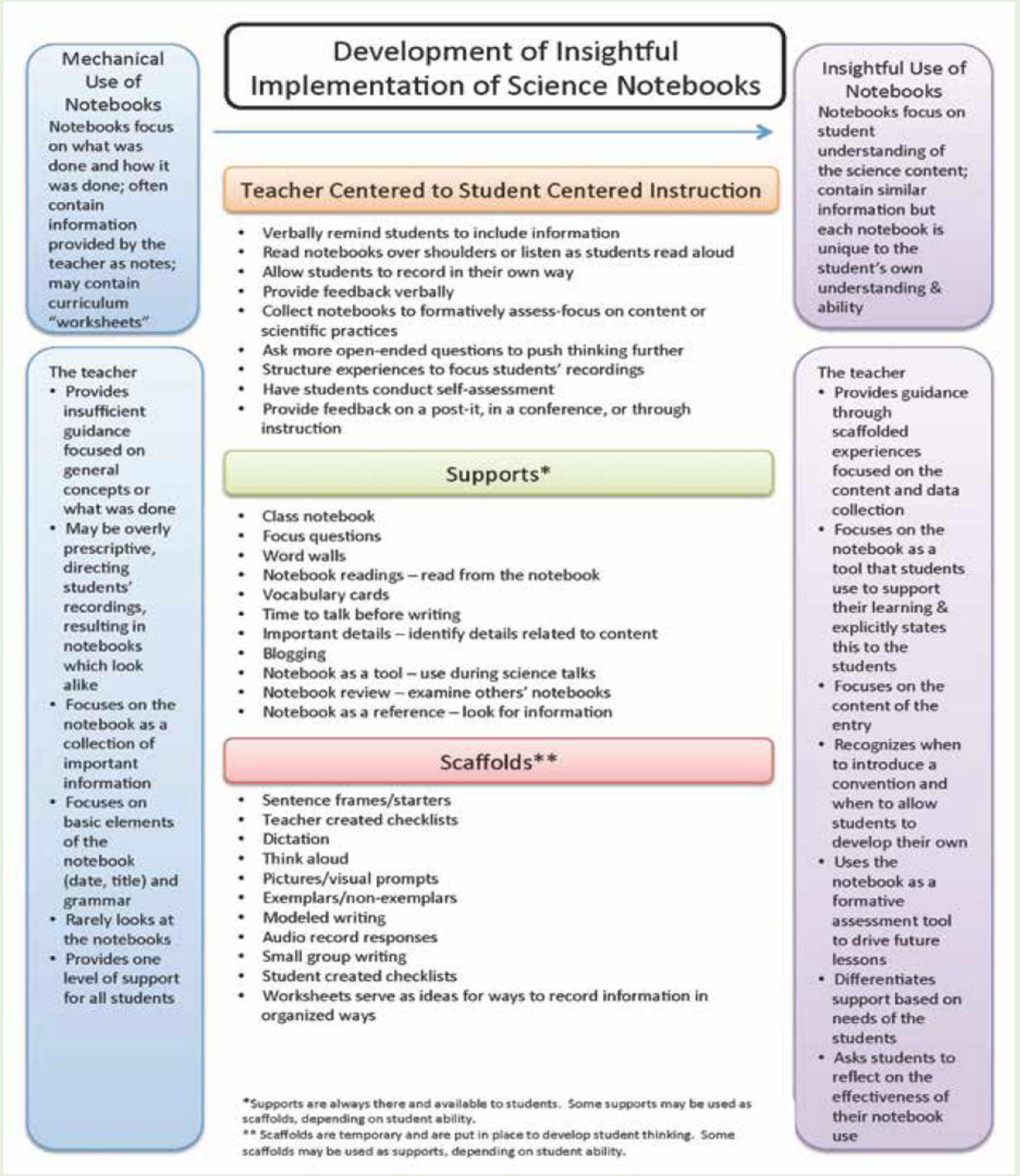
1. has cells
2. grow and develop
3. uses energy
4. similar chemicals
5. reproduced
6. respond to environment
7.
8.

Object	Living or nonliving?	Evidence or explanation
Mushroom	living	- grow - uses energy - reproduce - made of cells
Cheese	nonliving	- doesn't grow - no energy - don't reproduce
Ear of corn	living	- grow - uses energy - reproduce
Rain	non-living	- can't grow - not made of cells
Sun	non living	- doesn't meet needs
Eggs	non living	- doesn't use energy
Waterfall	non living	- doesn't have homeostasis
Fire	non living	- doesn't meet all needs
Robot	non living	- can't grow - no cells

[redacted]

s enter

wide ruled
composition



et Goals

LiveChat

As it relates to implementing notebooks insightfully, what are your top two goals?

WELCOME!

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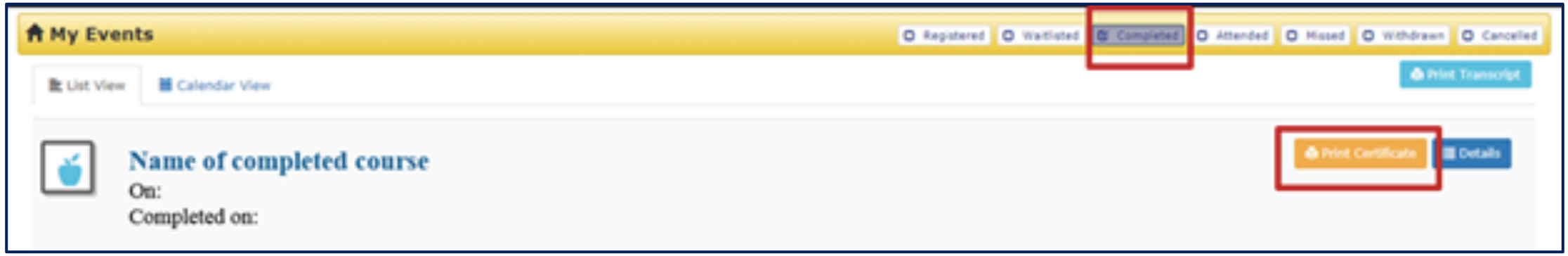

- **AFTER WEBINAR- you will receive PDF of presentation and resource page**

Thanks!

Any questions?

Please contact: Rebecca Garelli

Rebecca.Garelli@azed.gov