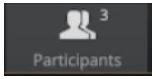
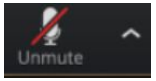
ZOOM CONFERENCE INFO

Rename Yourself



1. Open “Participants”
2. Hover over your name
3. Click “Rename”
4. Type your name, your school, and grade level

Audio



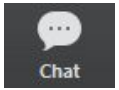
1. Please remain muted unless speaking to avoid background noise. You can unmute yourself by clicking “Unmute” in the lower left-hand corner of the Zoom call.

2. You do not have to use audio if you do not have a microphone.

Video

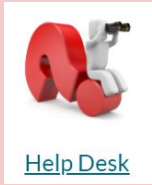
We love seeing your smiling faces! But if you would like you can turn the video off by clicking “Stop Video” in the lower left-hand corner of the Zoom call.

Chat



To view or type in chat, click the “Chat” icon.

Have a Question? Need Additional Tech Support? Contact the Help Desk from the main page of the ASSIST Conference webpage.



Putting Montana Students First

Principled-Design of Assessment: How Science Was Constructed

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ELSIE ARNTZEN, STATE SUPERINTENDENT
OPI.MT.GOV

Putting Montana Students First

Welcome and Introductions

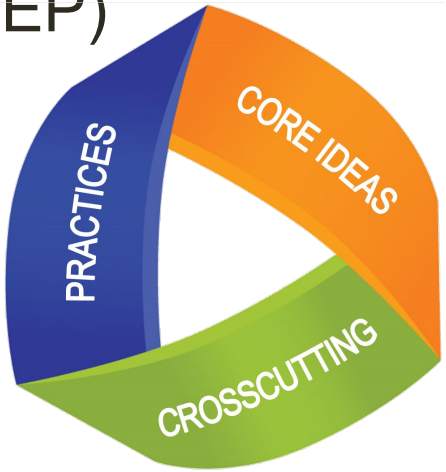
- Use the chat to introduce yourself:
  - Name
  - School/District/Organization
  - Role

Agenda

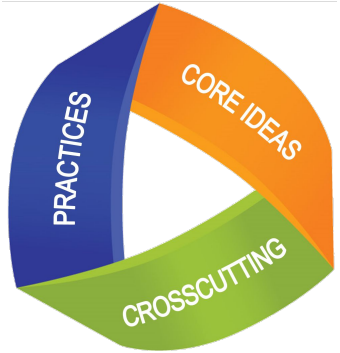
- Three Dimensions of Montana Science Standards
- Assessing Three Dimensions
- Sample Assessment Items
- Backwards Design

Three Dimensions of Montana Science Standards

- Disciplinary Core Ideas (DCI)
- Science and Engineering Practices (SEP)
- Cross Cutting Concepts (CCC)



Sample Standard



Students who demonstrate understanding can:

4-ESS3-2. **Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.*** [Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [*Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.*]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.

Disciplinary Core Ideas

ESS3.B: Natural Hazards

- A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. *(Note: This Disciplinary Core Idea can also be found in 3.WC.)*

ETS1.B: Designing Solutions to Engineering Problems

- Testing a solution involves investigating how well it performs under a range of likely conditions. *(secondary)*

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships are routinely identified, tested, and used to explain change.

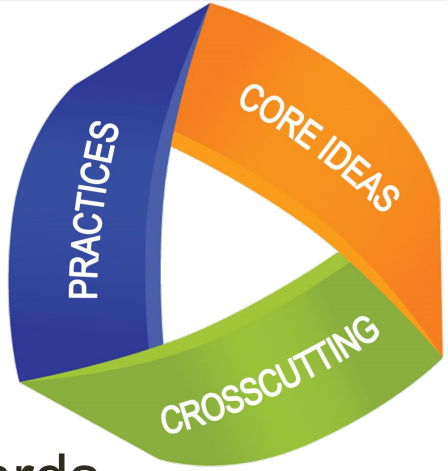
Connections to Engineering, Technology, and Applications of Science

Influence of Engineering, Technology, and Science on Society and the Natural World

- Engineers improve existing technologies or develop new ones to increase their benefits, to decrease known risks, and to meet societal demands.

Connections to other DCIs in fourth grade:

Breakout Rooms



- If you teach science now:
  - How did the adoption of these standards change the design of your instruction?
- If you taught science in the past:
  - How would your science instruction need to shift in order to match these standards?
- If you have never taught science:
  - How do you anticipate these standards impact instruction in your school or district?

Assessing Three Dimensions

- Returning to our sample standard, let's think more deeply about what this means for students!

Independent Think Time - What do you think students know and are able to do if they have reached mastery on this standard?

Students who demonstrate understanding can:

4-ESS3-2. **Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.*** [Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [*Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.*]

Evidence Statements

- Evidence Statements break the standard down further to outline what an assessment would generate evidence of in order to assess this standard

Observable features of the student performance by the end of the grade:		
1	Using scientific knowledge to generate design solutions	
	a	Given a natural Earth process that can have a negative effect on humans (e.g., an earthquake, volcano, flood, landslide), students use scientific information about that Earth process and its effects to design at least two solutions that reduce its effect on humans.
	b	In their design solutions, students describe* and use cause and effect relationships between the Earth process and its observed effect.
2	Describing* criteria and constraints, including quantification when appropriate	
	a	Students describe* the given criteria for the design solutions, including using scientific information about the Earth process to describe* how well the design must alleviate the effect of the Earth process on humans.
	b	Students describe* the given constraints of the solution (e.g., cost, materials, time, relevant scientific information), including performance under a range of likely conditions.
3	Evaluating potential solutions	
	a	Students evaluate each design solution based on whether and how well it meets the each of the given criteria and constraints.
	b	Students compare the design solutions to each other based on how well each meets the given criteria and constraints.
	c	Students describe* the design solutions in terms of how each alters the effect of the Earth process on humans.

Independent Design Challenge

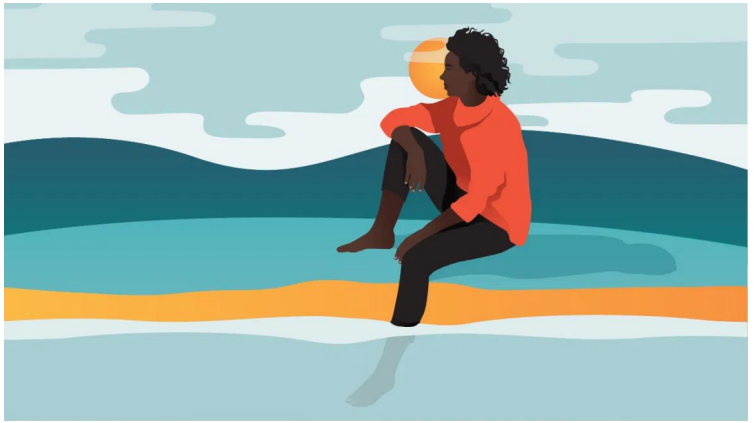
- Design a classroom activity that would help you to know what a student knows and is able to do in relation to our sample standard.

5-LS1-1 From Molecules to Organisms: Structures and Processes
Students who demonstrate understanding can: **5-LS1-1.** **Support an argument that plants get the materials they need for growth chiefly from air and water.** [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]

Reflection

Could your activity be modified for a large scale assessment setting?

Why or why not?

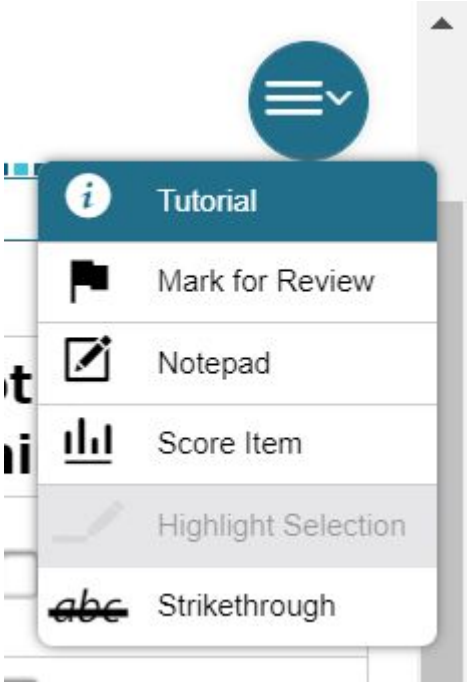


Sample Assessment Items

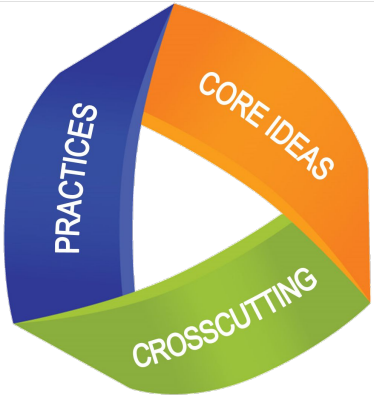
- Sample assessment items and practice tests that can be used with students are both accessible to Montana Educators.
  - We will now engage with a sample item:
    - Click on the Sample Assessment Items link on the session page
    - Click “Sign In”
    - Select “Elementary”
    - Click “Start Science Sample Items”
    - Click “Select”
    - Engage with Sound and Video Check and click “Continue”
    - Click “Begin Test Now”

Engage with Item 1!

- Read the text on the left hand side of the screen and then respond to the questions on the right hand side.
- When you are done responding use the three horizontal lines in the upper right hand corner to select “Score Item” from the drop down
- Review your score and use the score rationale to reflect on the item
  - How does this item get at the standard?
  - If a student is able to receive full credit on this item what do we know about what they know and are able to do?
  - How does this the depth and breadth of this item compare to the activity you designed in the Independent Design Challenge?



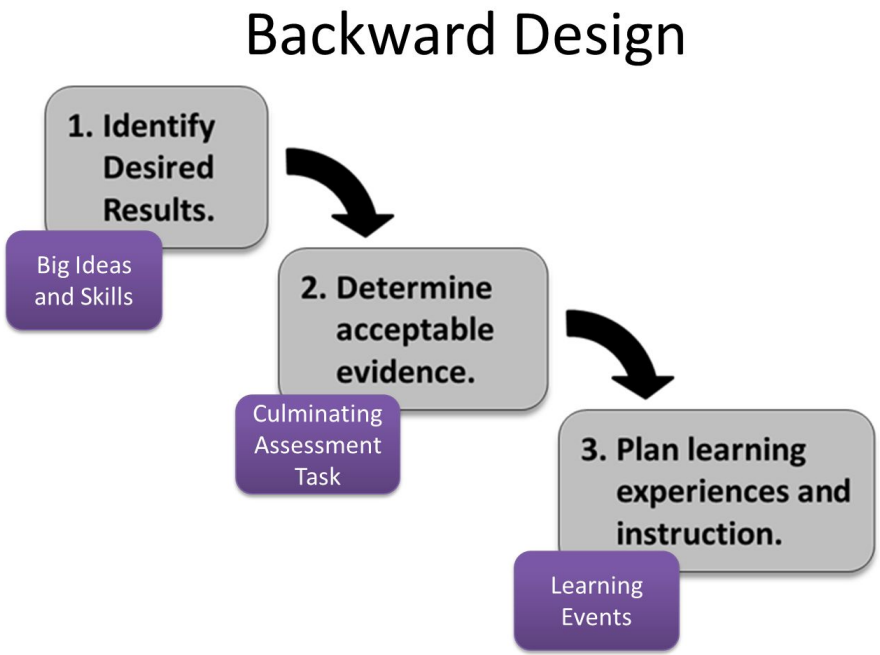
Breakout Rooms



- Round 1
  - Briefly share your classroom activity design
- Round 2
  - Share one thing from the evidence statement that your classroom activity assessed more effectively than the sample item
- Round 3
  - Share one thing from the evidence statement that the sample item assesses more effectively than your classroom activity
- Upon Return:
  - We will share our reflections on whether this assessment item is valid to assess this standard

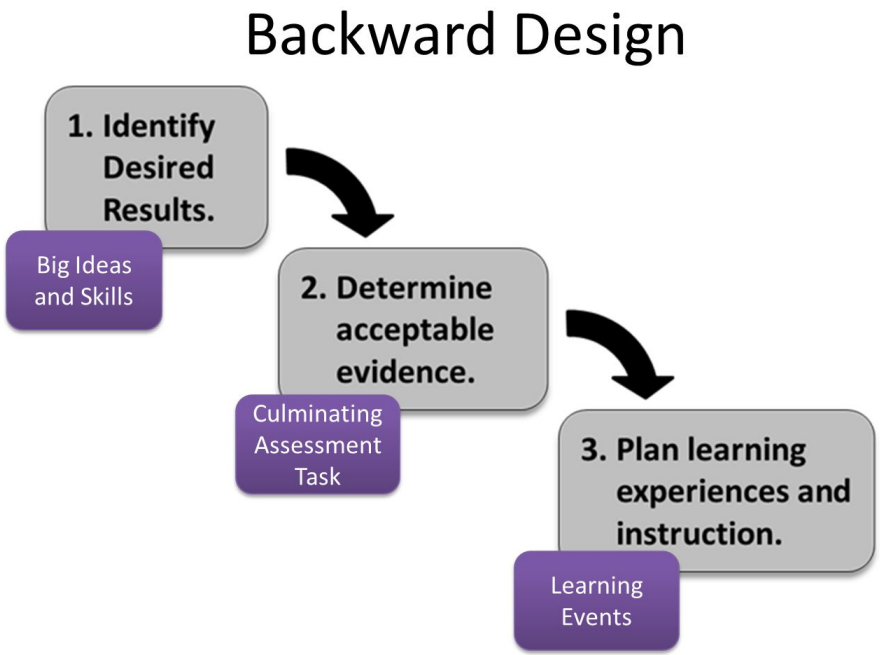
Backwards Design

Classroom
1.
2.
3.



Backwards Design

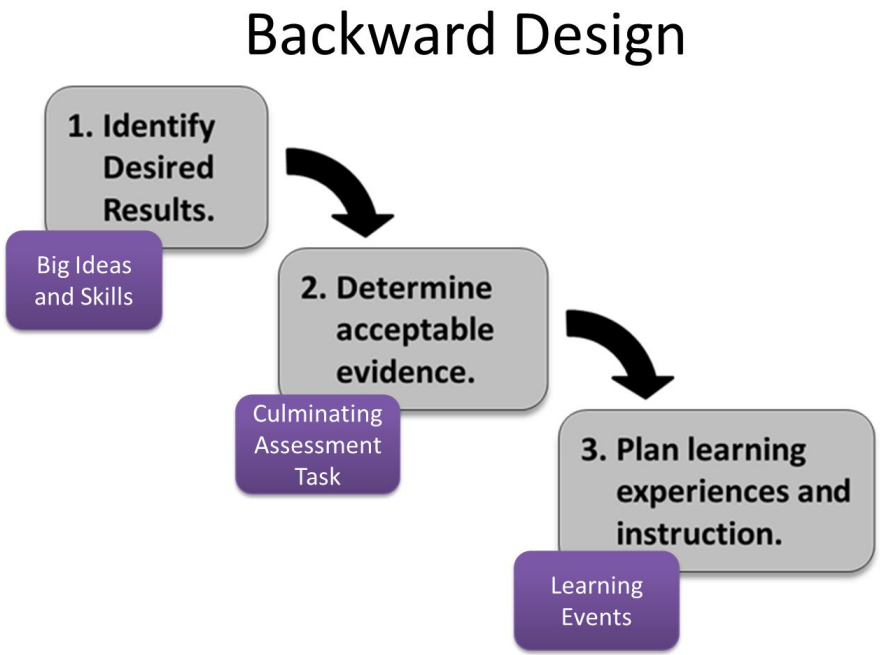
Classroom
1. Standards
2. Assessment
3. Instruction



Assessment
1.
2.
3.

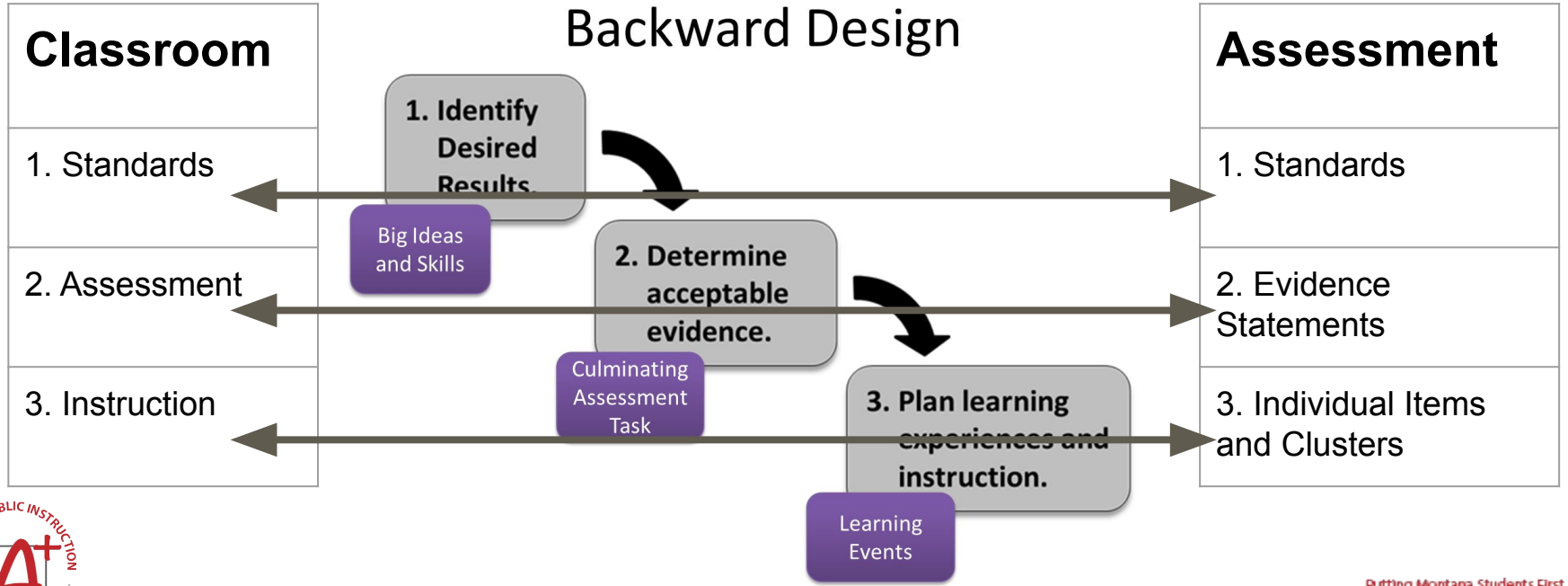
Backwards Design

Classroom
1. Standards
2. Assessment
3. Instruction



Assessment
1. Standards
2. Evidence Statements
3. Individual Items and Clusters

Backwards Design



Building the Summative Test

- Items are built with a focus on a balanced bank that will allow us to build assessments that meet our blueprint
- Items are reviewed by the OPI and Montana Educators and Science Education Leaders
- Montana Educators participate in Item Writing Workshops to design items specific to Montana's context

End of Session

The session is now over.

- Use the Interactive Schedule to select your next session.
  - You will be placed in the waiting room until the start of the next session.
- Complete the session evaluation.
- Ask Questions at the Help Desk
- Join the “networking room”!