Advances in Multidimensional Classroom Science Assessment Design

2020 OPI Data and Assessment "Assist" Conference Workshop on Principled Design

January 13, 2020
Helena, Montana

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Overview of Workshop Goals and Agenda

Charlene Turner
9:20 a.m. – 9:30 a.m.

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Workshop Goals

- To increase participants' knowledge of a principled-approach for developing three-dimensional tasks aligned to the Montana Science Standards for use within classrooms
- To increase participants' knowledge of the characteristics and features of high-quality assessment tasks aligned to the Montana Science Standards
- To provide tools and resources that will build participants' capacity to use and facilitate a principled design approach to design or evaluate classroom science assessment tasks
- To increase participants' ability to evaluate the quality of science assessment tasks based on their understanding of principled design and NGSS-based criteria

Agenda

9:20 am – 9:30 am	Overview of Workshop Goals and Agenda	Charlene Turner
9:30 am – 9:45 am	Orientation to the SCILLSS Project	Charlene Turner
9:45 am – 10:15 am	A Principled-approach to Develop Classroom Science Assessment Tasks	Daisy Rutstein
10:15 am – 11:00 am	Overview and Discussion: Purpose and Development of an Unpacking Tool	Bill Herrera Charlene Turner
11:00 am – 11:10 am	**Break**	
11:10 am – 11:55 am	Overview and Discussion: Purpose and Development of a Task Specifications Tool	Bill Herrera Charlene Turner
11:55 am – 12:05 pm	**Break**	
12:05 pm – 12:40 pm	Overview and Activity: Designing High-Quality Assessment Tasks Using the Design Tools and Evaluating Science Assessment Tasks	Bill Herrera Charlene Turner Daisy Rutstein
12:40 pm	Adjourn	

Orientation to the SCILLSS Project

Charlene Turner
9:30 a.m. – 9:45 a.m.

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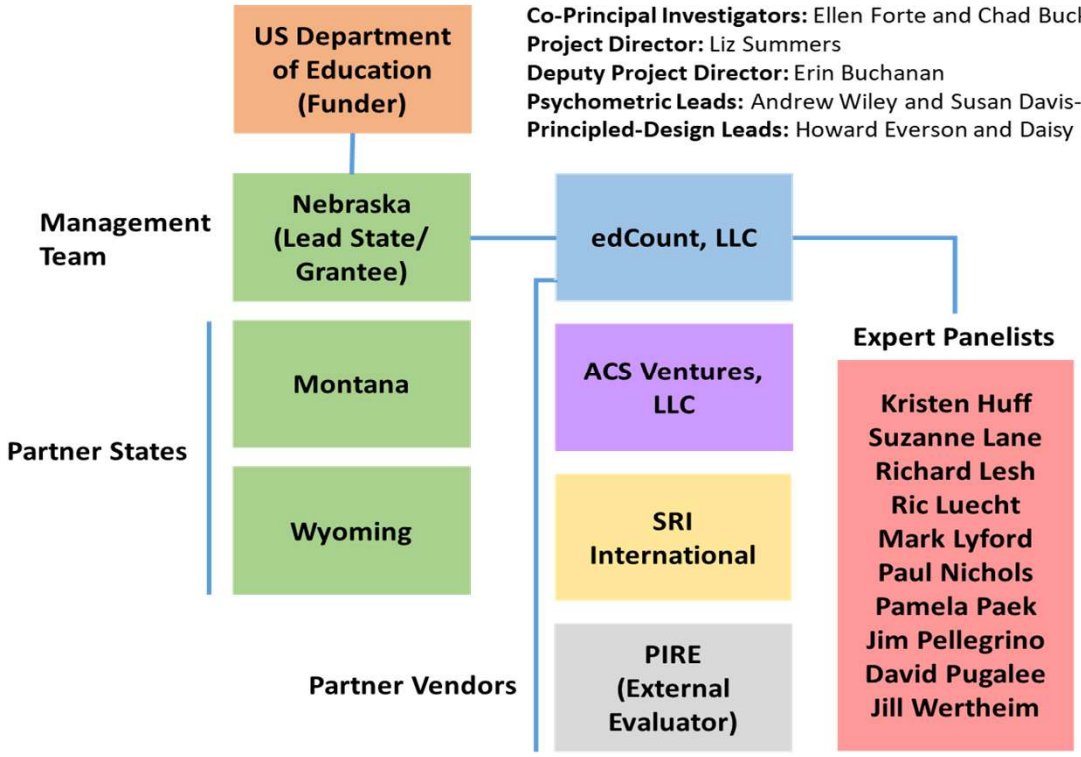
About SCILLSS

- **S**trengthening **C**laims-based **I**nterpretations and Uses of **L**ocal and **L**arge-scale **S**cience Assessment **S**cores
- One of two projects funded by the US Department of Education's Enhanced Assessment Instruments Grant Program (EAG), announced in December 2016
- Four-year timeline (April 2017 – December 2020)
- Collaborative partnership including three states, four organizations, and 10 expert panel members
- Nebraska is the grantee and lead state; Montana and Wyoming are partner states

SCILLSS Partner States, Organizations, and Staff

Co-Principal Investigators: Ellen Forte and Chad Buckendahl
Project Director: Liz Summers
Deputy Project Director: Erin Buchanan
Psychometric Leads: Andrew Wiley and Susan Davis-Becker
Principled-Design Leads: Howard Everson and Daisy Rutstein



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SCILLSS Project Goals

- Create a science assessment design model that **establishes alignment with three-dimensional science standards by eliciting common construct definitions** that drive curriculum, instruction, and assessment
- Strengthen a shared knowledge base among instruction and assessment stakeholders for using **principled-design approaches** to create and evaluate science assessments that **generate meaningful and useful scores**
- Establish a means for state and local educators to **connect statewide assessment results with local assessments and instruction** in a coherent, standards-based system

SCILLSS Resources and Student Learning

SCILLSS Goal 1, Coherence: Establish a means for states to strengthen the meaning of statewide science assessment results and to connect those results with local science curriculum, instruction, and assessment

SCILLSS Goal 2, Support Implementation of Principled-Design: Strengthen the knowledge base and experience among stakeholders in using principled-design approaches to create and evaluate quality science assessments that generate meaningful and useful scores

Student learning in relation to goals and expectations

Interim and other classroom assessments

Annual assessments

SCILLSS resources

A Principled-Design Approach to Creating PLDs and Building Score Scales

Purpose: To explain how and why to develop PLDs and score scales using a principled-design approach

Audience: State and local educators; vendors

Format: White paper

Guide to Developing Three-Dimensional Science Tasks for Large-Scale Assessments

Purpose: To guide implementation of principled-approaches for developing three-dimensional tasks aligned to NGSS-like standards for large-scale science assessments

Audience: State administrators; vendors

Format: Guidebook; templates; tasks; exemplars

Guide to Developing Three-Dimensional Science Tasks for Classroom Assessments

Purpose: To guide implementation of principled-approaches for developing three-dimensional tasks aligned to NGSS-like standards for use within classrooms

Audience: Local educators and administrators

Format: Guidebook; templates; tasks; exemplars

Professional Learning Sessions on Using a Principled Approach to Designing Classroom Assessment Tasks

Purpose: To support local educators in applying principled-design in the development of classroom assessment tasks that link to curriculum and instruction

Audience: Local educators and administrators

Format: Workbook; templates; PPT slides; guiding questions

Theory of Action Principles

- Assessment systems are developed such that they can inform improvements to curriculum and instruction
- Assessments are equitable, accessible, and culturally relevant for widest range of students
- Educators use student performance data appropriately to monitor progress toward CCR and to inform teaching
- State assessments connect coherently to local C-I-A in a way that provides comprehensive coverage of the standards
- Stakeholders collaborate to effectively coordinate alignment of C-I-A systems

Assessment Fundamentals

Self-Evaluation Protocols

Purpose: To support educators in evaluating the quality of the assessments in their assessment systems

Audience: State and local educators; vendors

Format: Protocol

Assessment Literacy Workbook

Purpose: To strengthen educators' understanding of and ability to make good decisions about assessments

Audience: State and local educators; vendors

Format: Digital workbook

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Strengthening Claims-based Interpretations and Uses of Local and Large-scale Science Assessment Scores

Home | Policy | NGSS | Principled-Design | Universal Design | SCILLSS Resources

- SCILLSS Resources
- Validity Resources
- NGSS Resources
- Assessment Resources
- SCILLSS Contacts

SCILLSS Resources

The SCILLSS project is producing a wide range of resources for public access and use.

These resources connect visitors with relevant research, instruments, and theoretical frameworks to help inform further work in this field, during and beyond the life of the SCILLSS project period.

Quarterly Newsletters

Year 1

- Quarter 1 (April-May 2017) click here
- Quarter 2 (June-September 2017) click here
- Quarter 3 (October-December 2017) click here
- Quarter 4 (January-March 2018) click here

Year 2

- Quarter 1 (April-June 2018) click here
- Quarter 2 (July-September 2018) click here
- Quarter 3 (October-December 2018) click here
- Quarter 4 (January-March 2019) click here

State Assessment Resources

SCILLSS Resources

www.scillsspartners.org/scillss-resources/

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Comments and Questions

A Principled-approach to Develop Classroom Science Assessment Tasks

Daisy Rutstein

9:45 a.m. – 10:15 a.m.

Assessment in the Service of Learning

- Assessment is the art and science of knowing what students know.
- Assessments provide "evidence" of students' knowledge, skills, and abilities (KSAs).
- Evidence supports teacher "inferences" of what students know and can do.
- Inferences guide and inform instruction.

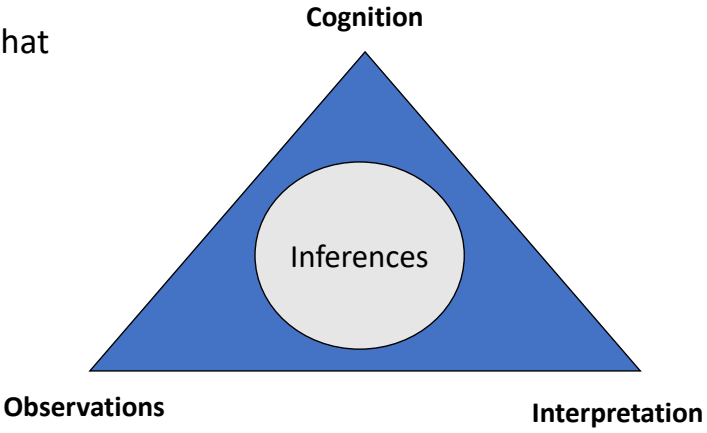
Assessment: A Process of Reasoning from Evidence

Cognition-model of how students represent knowledge

Observations-tasks or situations that allow us to observe students' performance

Interpretation-method of making sense of the data

Inference-judging what students know and can do



Coherence is Key

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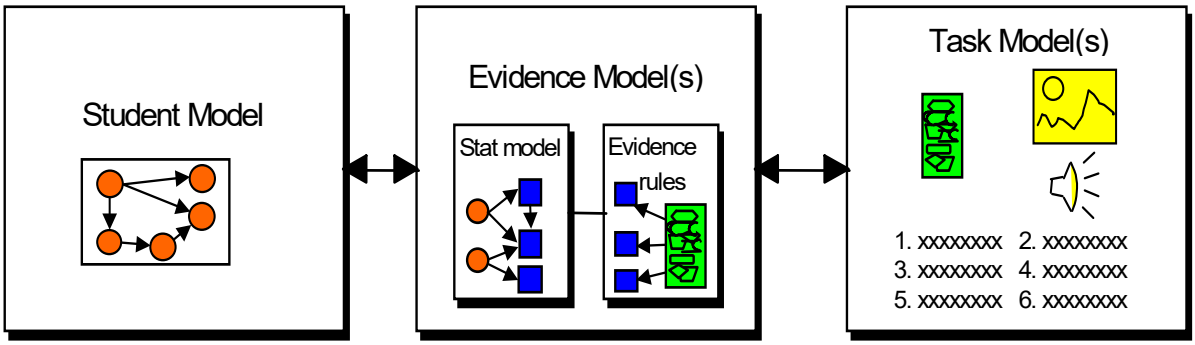
Principled-design Development Purpose

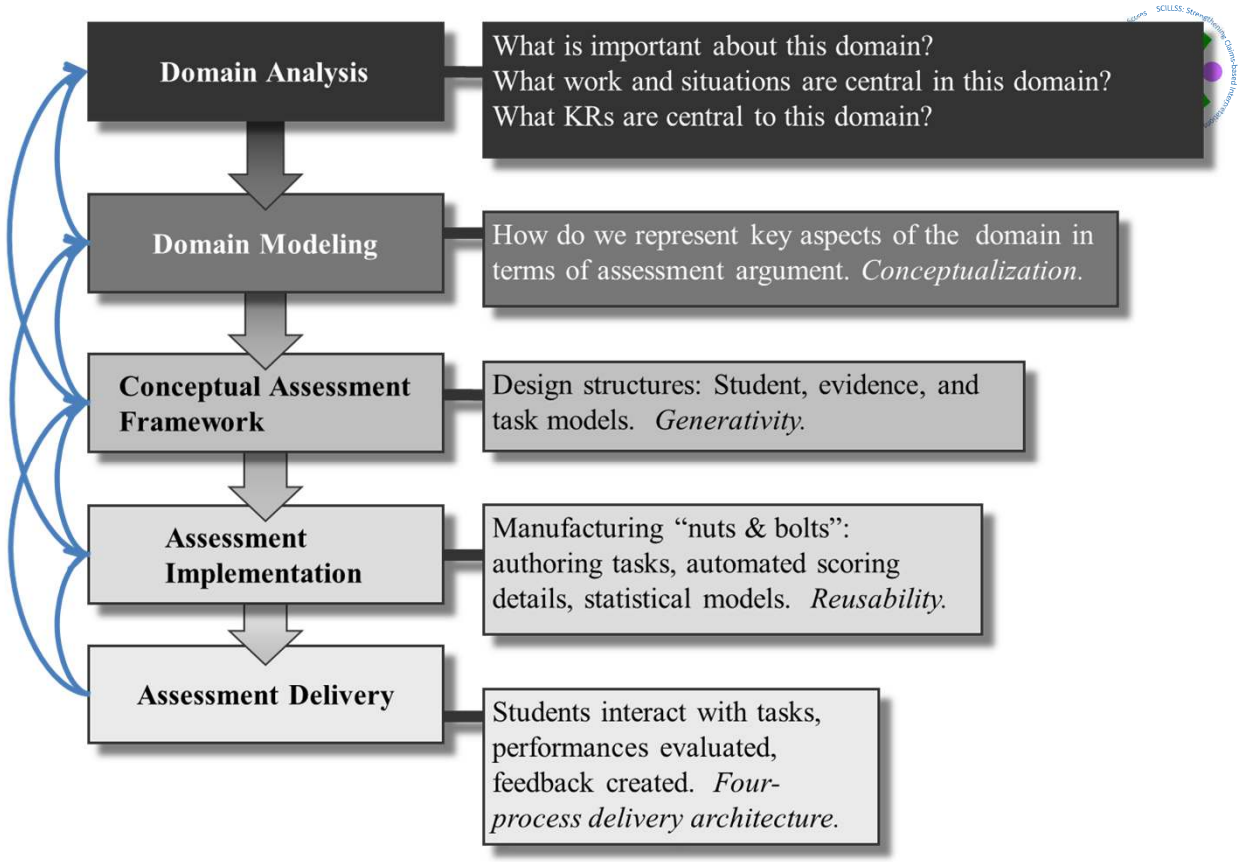
- What is a principled-design development process?
  - Guide to the development of a task that focuses the developer on the purpose of the assessment and the information required in order to design tasks that meet this purpose
- Why do we use a principled-design development process?
  - Highlight the design decisions that need to be made in the process in order to develop tasks with valid and reliable inferences
  - Articulate a **replicable and scalable design process** that states and other organizations can use to develop on-demand state summative and classroom-embedded three-dimensional science assessments
- How have we used this process?
  - Developed a **sample set of exemplary resources** to demonstrate the outcomes of the process for the development of on-demand state summative and classroom-embedded three-dimensional science assessments

Evidence-Centered Design (ECD)

Formal, multiple-layered framework for assessment development based on Messick's (1994) guiding questions:

- What complex of knowledge, skills, or other attributes should be assessed?
- What behaviors or performances should reveal those constructs?
- What tasks or situations should elicit those behaviors?





- From Mislevy & Riconscente, 2006

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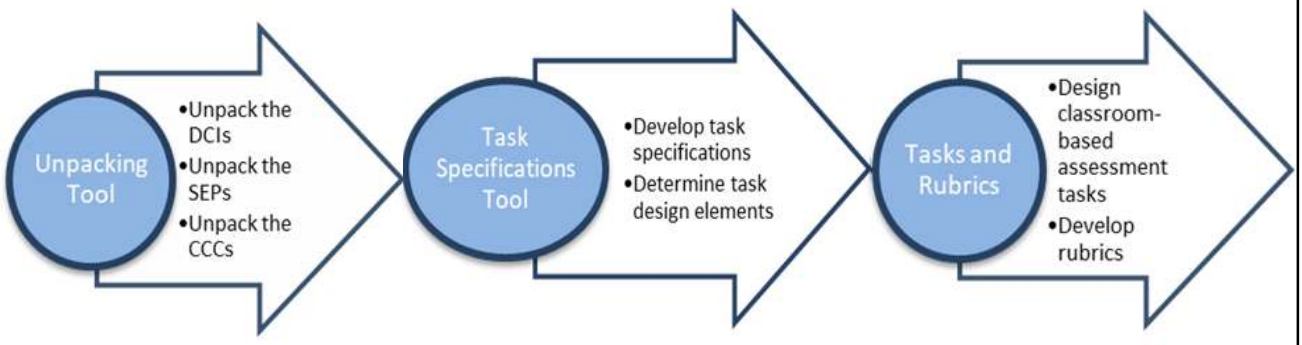
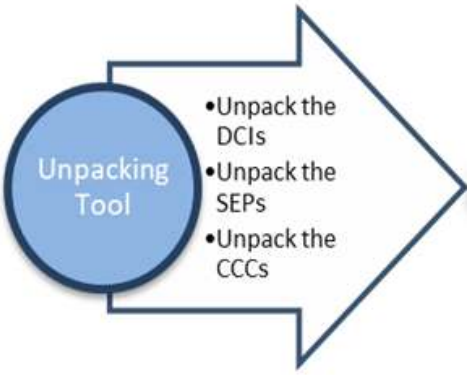
ECD for Classroom-based assessments



Benefits of our Approach to Developing Classroom-based Assessments of Three-dimensional Science Learning

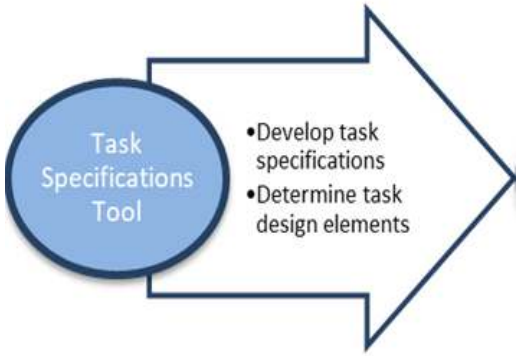
- Highlights the intended outcomes of classroom-based assessment
- Points to the connections among curriculum, instruction, and assessment, which are linked in a coherent system
- Provides tools to accomplish the development of classroom-based assessment tasks and rubrics

Overview of the Principled-design Approach: Domain Analysis



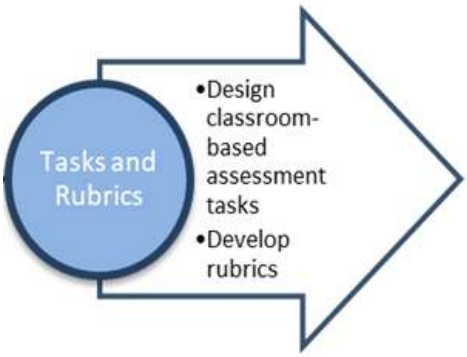
- **Goal:**
  - To obtain a deep understanding of the PE and its components
  - Provide information on how students engage with the different components
  - Provide information on the boundaries of student performance

Overview of the Principled-design Approach: Domain Modeling and Conceptual Assessment Framework



- **Goal:**
  - To clearly lay out the assessment argument
    - What will be covered?
    - What will not be covered?
    - How will students demonstrate their knowledge?
    - What do tasks look like?

Overview of the Principled-design Approach: Assessment Implementation



- **Goal:**
  - To develop tasks and rubrics that are aligned to the assessment argument

Concluding Remarks

- Iterative process
- May seem like a lot of work in the beginning but can save time later
- ECD does not specify the specifics of the fields; ECD is about the structure and the process
  - Part of following an ECD approach is determining what process best fits the specific situation

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Comments and Questions

References

Mislevy, R. J., & Riconscente, M. M. (2006). Evidence-centered assessment design: Layers, concepts, and terminology. In S. Downing & T. Haladyna (Eds.), *Handbook of Test Development* (pp. 61-90). Mahwah, NJ: Erlbaum.

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Overview and Discussion: Purpose and Development of an Unpacking Tool

Bill Herrera and Charlene Turner

10:15 a.m. – 11:00 a.m.

Unpacking the Dimensions of a Performance Expectation

- Provides a clear focus for what is to be measured and helps educators to plan for assessment
- Ensures educators who are designing NGSS-aligned tasks have a clear and deep understanding of each of the dimensions represented in a PE prior to beginning task development

Unpacking the Dimensions of a Performance Expectation Tool

- Provides guidance for unpacking a PE
- Template for documenting unpacking

Grade:

NGSS Performance Expectation:

	Science and Engineering Practices (SEP)	Disciplinary Core Ideas (DCI)	Crosscutting Concepts (CCC)	
	SEP:	**DCI:**	**CCC:**	
Key Aspects	•	•	•	
Prior Knowledge	•	•	**Relationships to SEPs**	•

Components of the Unpacking Tool

- *Key aspects* are the underlying concepts that support each dimension of the PE and represent knowledge necessary for understanding or investigating more complex ideas and solving problems.
- *Prior knowledge* refers to the background knowledge that is expected of students to develop an understanding of the SEP and DCI.
- *Relationships between the CCC and the SEP* is included since when students are performing a SEP, they are often addressing one of the CCCs.

Unpacking Tool for 5-PS1-1

Grade: 5

NGSS Performance Expectation: 5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [*Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.*]

	Science and Engineering Practices (SEP)	Disciplinary Core Ideas (DCI)	Crosscutting Concepts (CCC)
Foundations	**SEP: Developing and Using Models** Use models to describe phenomena.	**PS1.A: Structure and Properties of Matter** Matter of any type can be subdivided into particles that are too small to see, but even then, the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.	**CCC: Scale, Proportion, and Quantity** Natural objects exist from the very small to the immensely large.

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Unpacking Tool for 5-PS1-1

Grade: 5	
NGSS Performance Expectation: 5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [*Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.*]	
	Disciplinary Core Ideas (DCI)
Foundations	**PS1.A: Structure and Properties of Matter** Matter of any type can be subdivided into particles that are too small to see, but even then, the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.
Key Aspects	• Everything around us (matter) is made up of particles that are too small to be seen. • Matter that cannot be seen can be detected in other ways. • Gas (air) has mass and takes up space. • Gas (air) particles, which are too small to be seen, can affect larger particles and objects. • Gas particles, which freely move around in space, until they hit a material that keeps them from moving further, thus trapping the gas (e.g., air inflating a basketball, an expanding balloon).
Prior Knowledge	• Matter is anything that occupies space and has mass. • Matter can change in different ways.

Unpacking Tool for 5-PS1-1

Grade: 5	
NGSS Performance Expectation: 5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [*Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.*]	
	Science and Engineering Practices (SEP)
Foundations	**SEP: Developing and Using Models** Use models to describe phenomena.
Key Aspects	• Identify components of the model. • Use a model to reason about a phenomenon. • Reason about the relationship of the different components of a model. • Select and identify relevant aspects of a situation or phenomena to include in the model.
Prior Knowledge	• Knowledge that a model contains elements (observable and unobservable) that represent specific aspects of real-world phenomena • Knowledge that models are used to help explain or predict phenomena

Unpacking Tool for 5-PS1-1

Grade: 5	
NGSS Performance Expectation: 5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [*Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.*]	
	Crosscutting Concepts (CCC)
Foundations	**CCC: Scale, Proportion, and Quantity** Natural objects exist from the very small to the immensely large.
Key Aspects	• Understand the units used to measure and compare quantities. • Describe relationships between natural objects which vary in size (very small to the immensely large). • Understanding of scale involves not only understanding systems and processes vary in size, time span, and energy, but also different mechanisms operate at different scales.
Relationships to SEPs	• Models describe the scale of natural objects. • Data analysis serves to demonstrate the relative magnitude of some properties or processes. • Calculate proportions correctly and measure accurately for valid results.

Resources for Unpacking

- *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*
- Montana's Science Content Standards
- The NGSS
- NGSS Appendices E, F, and G

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Activity/Discussion (10-15 minutes)

- How do you currently incorporate the three dimensions into instructional planning, lesson content, and/or assessment?
- How would the unpacking tool support the development of high-quality tasks to measure students' science learning of the Montana Science Content Standards?
- How would you enhance this tool to better reflect the Montana Science Content Standards (e.g., integration of Montana Indian Education for All)?

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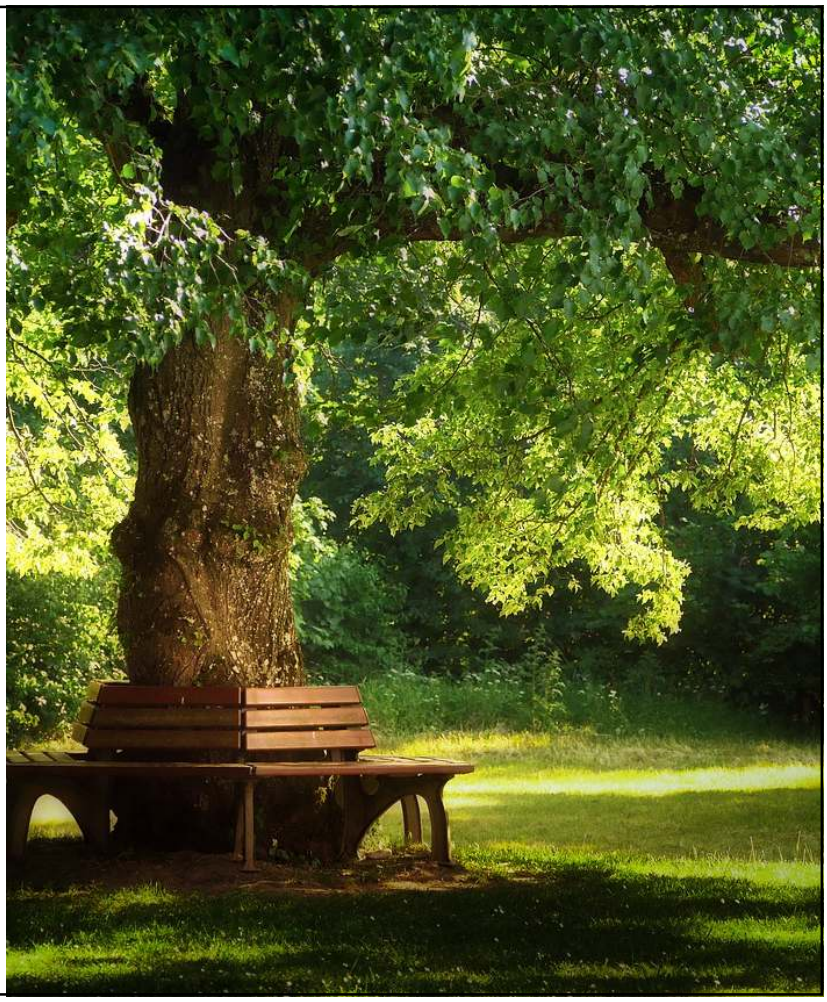
Break



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Overview and Discussion: Purpose and Development of a Task Specification Tool

Bill Herrera and Charlene Turner

11:10 a.m. – 11:55 a.m.

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Identifying Assessment Task Specifications

- Allows educators to translate the PE-specific unpacking of the three dimensions into assessment tasks
- Allows educators to determine what counts as evidence for student learning
- Helps educators develop assessment tasks that allow students opportunities to call upon, transfer, and apply learning that has occurred during instruction to new challenges, much the way a scientist or engineer would, in an assessment situation

Assessment Task Specifications Tool

- Identifies key elements needed to be addressed by task developers to develop meaningful and interpretable assessment tasks
- Template for documenting task specifications

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Assessment Task Specifications Tool

Element and Description	Example
Performance Expectation • Indicate the PE from the instructional sequence to be assessed.	• 5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen.
Knowledge, Skills & Abilities (KSAs) • Develop statements which specify what is expected of students to demonstrate (i.e., knowledge, skills, and abilities) to provide evidence that they have learned one or more aspects of a PE.	• **KSA1:** Develop a model to describe matter. • **KSA2:** Use a provided model to describe matter. • **KSA3:** Use a provided model to describe that matter is made of particles too small to be seen. • **KSA4:** Develop a model to describe that matter is made of particles too small to be seen.

- Synthesize the **key aspects** of the dimensions, both independently and collectively, from the unpacking tool to craft the KSA statements
- The statements should represent a range of KSAs that collectively meet the expectations of the PE
- Some KSAs might be more discrete, simplistic, and one-dimensional while others might be more comprehensive, complex, and multi-dimensional
- Educators can select one or more KSAs from this "menu of options" for measurement by an assessment task

Assessment Task Specifications Tool

Element	Example	Description
Student Demonstration of Learning • List what students should be able to do to demonstrate that they have met the KSA(s). • Define qualities of student performance that constitute student evidence.	• Model accurately represents the observable phenomena • Model accurately captures all mechanistic features of the observable phenomena • Scale of model components is relevant to various objects, systems, and processes • Model and response accurately describe the particles in the two conditions (i.e., before and after stirring) • Describes a phenomenon that includes the idea that matter is made of particles too small to be seen • Correctly identifies and describes relevant relationships between components of the model	•
Work Product • Determine the "vehicles" (i.e., work products) that are intended to contain observable evidence (e.g., a model, an argument, a description, a graph, a chart).	• Draw a model • Complete a model • Constructed-response	•

- For each KSA, identify the types of performances that provide evidence that students have met the KSA

Example:

KSA1: Develop a model to describe matter.

✓ Model accurately represents the observable phenomena.

✓ Model accurately captures all mechanistic features of the observable phenomena.

✓ Scale of model components is relevant to various objects, systems, and processes

- Describe the work products (i.e., item types, situations, stimuli) that will allow students to fully demonstrate the focal KSA(s)
- Educators can pick from this "menu of options" to select a work product or combination of work products appropriate for measuring the focal KSA(s)

Assessment Task Specifications Tool

Element and Description	Example
Task Features • List the task features from which the task writer selects to develop an assessment task. • Reference the "Clarification Statement" in the NGSS for the PE as appropriate. • Note: A single question/task may not represent all the features listed.	• All tasks must prompt students to describe relationships between observed phenomenon or evidence and reasoning underlying the observation/evidence. • Students use scientific reasoning and process skills. • All tasks must elicit core ideas as defined in the PE. • All tasks must include elements from at least two dimensions of the NGSS.
Aspects of an assessment task that <u>can be varied</u> to shift complexity or focus • Allows for a range of tasks to be developed of varying complexity. • Allows for development of tasks that focus on various skills related to the PE. • Allows the task developer to match features of the task with the characteristics of students such as their interests, familiarity, and provided instruction.	• Complexity of scientific concept(s) to be modeled • Function of the model: • to explain a mechanism underlying a phenomenon; • to predict future outcomes; • to describe a phenomenon; • to generate data to inform how the world works • The degree to which components of the model are provided • The model may be provided for revision or one that is created from scratch • Representation of model • What matter is being modeled

- Determine the common foundational features of assessment tasks that would be appropriate for measuring student progress in the KSAs.
- Task features can influence the design of the task in terms of structure, content, and complexity.

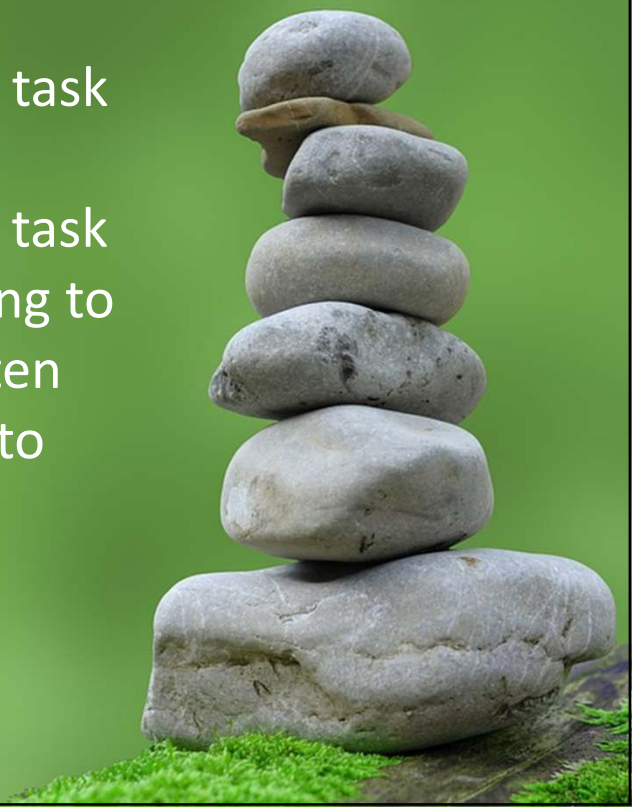
- Consider the variable features of tasks, or aspects of tasks that a designer can vary further to focus attention on certain aspects of capabilities, make tasks harder or easier, or bring in or avoid other knowledge.
- These features describe ranges of types of task stimuli that can be used to prompt more or less sophisticated levels of understanding of the KSAs.

Assessment Task Specifications Tool

Element and Description	Example	
Assessment Boundaries • List information that is NOT assessed (i.e., related above grade-level ideas and skills). • Reference the "Assessment Boundary" in the NGSS for the PE as appropriate.	• Students are not expected to know that matter is made of atoms and molecules. • Students are not expected to explain the properties of the particles. • Students are not expected to apply proportional reasoning skills (Note: should not be included, as students learn proportions in in grade 6,CCSSM). • Density should not be included. • Mass and weight are not distinguished.	•

- Determine the above grade-level ideas and skills for the KSAs/PE by referencing the above grade/band standards and NGSS Appendices E, F, and G.
- Refer to the "Assessment Boundary" if indicated in the PE.

Developing an assessment task is a balancing act involving multiple tradeoffs. No one task can do everything and trying to fit too much into a task often makes the results difficult to interpret.



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Activity/Discussion (10-15 minutes)

- Which aspects of this tool would be most useful to you when designing tasks?
- How could this tool help you determine appropriate evidence of student learning – both their accurate understandings and misconceptions?
- How could you use evidence or artifacts of student learning from the tasks/items to inform your practice and to provide constructive feedback to students and families?

Break

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Overview and Activity: Designing High-Quality Tasks Using the Design Tools

Bill Herrera, Charlene Turner, and Daisy Rutstein

12:05 p.m. – 12:40 p.m.

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Foundational Principles for Assessment Design in Science

Achieve Task Screener

Criterion A	Criterion B	Criterion C	Criterion D
Phenomena- and Problem-focused	Sense-making using the dimensions	Equitable and fair to all students	Right stakeholders, right information

Classroom-based Assessment Tasks

- Enable educators to get their fingers on the pulse of individual students, groups of students, and/or the entire class as to where they are in their science learning and collect evidence to ultimately inform instruction
- Must elicit evidence related to students' integration of knowledge of DCIs, engagement with SEPs, and facility with building connections across ideas
- Provide an indication of the student's current understanding of the selected KSAs as set forth in the Task Specifications Tool
- May include multiple parts, questions, or prompts connected to a phenomenon or problem-solving context or event

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Assessment Purposes

- What do we hope to learn from the assessment?
  - Is it to gain an understanding of what students are struggling with?
  - Is it to determine if students have learned the material?
  - Is it to compare students?
  - Is it to assign a grade?
  - Is it to help figure out what the next steps should be in terms of instruction?
- How does this help us determine when to assess?
  - Before instruction?
  - In the middle of instruction?
  - After instruction?

Assessment Evidence

- What aspect of students engaging in the task allows me to say something about the student?
  - Is it the response to a multiple-choice (MC) item?
  - Is it the accuracy of the response?
  - Is it the speed at which they solved the problem?
- How and/or why does this aspect reflect on the student?
  - Does the MC item represent common student challenges?
  - Is there a correct answer that students should know?
  - Does speed relate to how well the student knows the subject area?

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Evaluating Assessment Tasks

- Is the purpose of the assessment task appropriate for the situation?
- What will I learn about my students from using this task and how does this align to what I have been teaching?
- Is the evidence enough to support the claims about the student?
- Are there any other explanations for why a student might not do well on this task?

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Example Classroom-based Task

Student Task

Grade: 5

NGSS Performance Expectation: 5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen.

Background Information

This task is about the particles of matter. Be sure to answer question 1 and question 2.

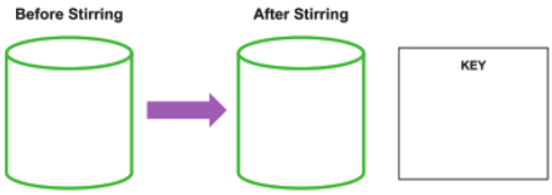
Task

1. Jose cleaned his salt water fish tank. The water in the tank looked clear. His friend Carl visits and asks, "Why can't I see the salt in the water?" Jose creates a model to show Carl what happens to salt when stirred into water.

Complete the model below to show:

- the salt particles and water particles *before* stirring the mixture
- the salt particles and water particles *after* stirring the mixture

Be sure to complete the key to show the salt particles and water particles in both conditions of your model.



2. Describe the change to the salt particles after being stirred in the water. Be sure to use information from your model to support your explanation.

_____

_____

Anticipatory set
Reminder to student

Task context/stimulus

Prompt/question and student directions

Provided model and key templates

Prompt/question and student directions

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Verification of Task Alignment

Verification of Alignment to Aspects of the Unpacking and Task Specifications Tools Integrated into the 5-PS1-1 Classroom-based NGSS Assessment Task

NGSS Performance Expectation: 5-PS1-1

Knowledge, Skills & Abilities: KSA4: Develop a model to describe that matter is made of particles too small to be seen.

Student Demonstration of Learning:

- Developing and using a model that describes a phenomenon that includes the idea that matter is made of particles too small to be seen.
- Identify and describe relevant relationships between components of a model.

Work Product:

- Complete a model
- Constructed-response

Task Features:

- All tasks must prompt students to describe relationships between observed phenomenon or evidence and reasoning underlying the observation/evidence.
- All tasks must elicit core ideas as defined in the PE.
- All tasks must include elements from at least two dimensions of the NGSS.

	Science and Engineering Practices (SEP)	Disciplinary Core Ideas (DCI)	Crosscutting Concepts (CCC)
Foundations	**SEP: Developing and Using Models**	**PS1.A: Structure and Properties of Matter**	**CCC: Scale, Proportion, and Quantity**
Key Aspects	• Use a model to describe phenomena. • Reason about the relationship of the different components of a model. • Select and identify relevant aspects of a situation or phenomena to include in the model.	• Everything around us (matter) is made up of particles that are too small to be seen.	• Describe relationships between natural objects, which vary in size (very small to the immensely large).
Prior Knowledge		• Matter can change in different ways.	**Relationships to SEPs** • Models describe the scale of natural objects.

Developing and Using Models
Use a model to describe phenomena.
Reason about the relationship of the different components of a model.
Select and identify relevant aspects of a situation or phenomena to include in the model.

Student Task

Grade: 5

NGSS Performance Expectation: 5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen.

Background Information

This task is about the particles of matter. Be sure to answer question 1 and question 2.

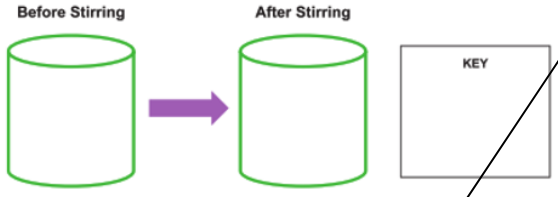
Task

1. Jose cleaned his salt water fish tank. The water in the tank looked clear. His friend Carl visits and asks, "Why can't I see the salt in the water?" Jose creates a model to show Carl what happens to salt when stirred into water.

Complete the model below to show:

- the salt particles and water particles *before* stirring the mixture
- the salt particles and water particles *after* stirring the mixture

Be sure to complete the key to show the salt particles and water particles in both conditions of your model.



2. Describe the change to the salt particles after being stirred in the water. Be sure to use information from your model to support your explanation.

_____

_____

Task Features:
All tasks must prompt students to describe relationships between observed phenomenon or evidence and reasoning underlying the observation/evidence. All tasks must elicit core ideas as defined in the PE. The items within a task should integrate the dimensions.

Student Demonstration of Learning:
Identify and describe relevant relationships between components of a model. Developing and using a model that describes a phenomenon that includes the idea that matter is made of particles too small to be seen.

Scale, Proportion, and Quantity
Describe relationships between natural objects, which vary in size (very small to the immensely large).

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Activity/Discussion (20 minutes)

1. Review the SCILLSS grade 8 assessment task and the example grade 8 science unit quiz.
2. Evaluate, compare, and contrast (i.e., similarities and differences) the two science assessments based on the presented criteria for high-quality science assessment:
   - **intentional design**
   - **phenomena and problem-focused**
   - **sensemaking using the dimensions**
   - **equitable and fair**
   - **right stakeholders, right information**
3. Record your observations on the provided form.
4. Plan to share your responses with the larger group.

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Review Worksheet

SCILLSS Grade 8 Science Assessment Task/Items				Grade 8 Science End-of-Unit Assessment Task/Items			
1. Do the items in the task reflect an intentional design based on the assessed knowledge, skills, and abilities (e.g., varying degrees of complexity, types of demonstration of student learning, types of work products)?							
Strongly Agree	**Agree**	**Disagree**	**Strongly Disagree**	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
☐	☐	☐	☐	☐	☐	☐	☐
Notes:				**Notes:**			

Comments and Questions

Thank you!

Please tell us how the session went by completing the survey:

- **Survey Monkey:**

https://www.surveymonkey.com/r/MT2020SCILLSSWorkshop

- **QR Code:**