Montana’s Formative Science Repository

Montana Data Use Conference (MDUC)
Tuesday, September 26, 2017
Radisson Hotel in Helena, MT 59601
Ashley McGrath & Michelle McCarthy
Session Objectives

Standards Context
- History of Science Standards in MT

Assessment Context
- Summative Plans
- SCILLSS Partnership
- ACESSE Partnership

Methods
- PAO Science Mission
- PAO Timeline
- Example of PAO Forms & Process

Results
- PAO Phase I Findings

Future Work
- Example of Repository Materials

Formative Assessment - is a deliberate process used by teachers and students during instruction that provides actionable feedback used to adjust ongoing teaching and learning strategies to improve students’ attainment of curricular learning targets/goals.
Standards Context

What students should KNOW and be able to DO

- **Formative Assessment** - is a deliberate process used by teachers and students during instruction that provides actionable feedback used to adjust ongoing teaching and learning strategies to improve students’ attainment of curricular learning targets/goals.
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2012: Publication of A Framework for K-12 Science Education

2013: Publication of Next Generation Science Standards

2013: A critical look at NGSS for Montana and verification of gap analysis.

2014: NAEP Item Classification Study

2014: NRC Report Published on Assessments for NGSS identifies NAEP as a potential exemplar

• Last Science Standards adoption was in 2006.
• In 2009, the Essential Learning Expectations (ELE’s) were written in an effort to provide guidance and support for teachers.

• Note: Standards review period is approximately every five years.
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Assessment Context

Summative Assessments
Benchmarked to college and career readiness

Montana Science Performance Standards (NGSS-aligned) for college and career readiness

Teachers and schools have information and tools they need to improve teaching and learning

Teacher resources for Formative Assessment Practices to improve instruction and student learning

Interim Assessments Flexible, open, used for actionable feedback

All students leave high school college and career ready
Design Requirements

• Administered not less than one time during—
  • grades 3 through 5;
  • grades 6 through 9; and
  • grades 10 through 12. (ESSA Sec.1111 (b)(2)(B)(v)).

• **Assessment and instruction are inseparable**
  • Worth Taking
  • High-Quality
  • Time-limited
  • Fair and Supportive
  • One of multiple measures
  • Ties to improved learning

• **Formative Assessment** - is a **deliberate process** used by teachers and students during instruction that provides **actionable feedback** used to **adjust ongoing teaching and learning strategies** to improve students’ **attainment of curricular learning targets/goals.**
Summative Science Plans

• Since FY 2008 Montana has used the MontCAS CRT for Science.

• Two year contract extension for the MontCAS CRT-Science.

• Plan to measure the three-dimensional standards beginning in the spring of 2020.
Partnerships

• Montana is a partner state in the “Strengthening Claims-Based Interpretations and Uses of Local and Large-Scale Science Assessments” (SCILLSS) Educational Assistance Grant (EAG) funded by the US Department of Education.

• The Advancing Coherent and Equitable Systems of Science Education (ACESSE, or “access”) project brings together partners from educational research and practice to improve equity by building coherence in science education. - Council of State Science Supervisors

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**Montana’s Theory of Action**

**Formative Assessment** - is a deliberate process used by teachers and students during instruction that provides actionable feedback used to adjust ongoing teaching and learning strategies to improve students’ attainment of curricular learning targets/goals.
What is Formative Assessment?

Formative Assessment is a deliberate process used by teachers and students during instruction that provides actionable feedback used to adjust ongoing teaching and learning strategies to improve students’ attainment of curricular learning goals. There are four attributes in the Formative Assessment Process, represented graphically as a clover.

A Balanced Assessment System

The Smarter Balanced Assessment Consortium is committed to ensuring that all students leave high school prepared for postsecondary success. A balanced assessment system—which includes the formative assessment process as well as interim and summative assessments—provides tools to improve teaching and learning. The formative assessment process is an essential component of a balanced assessment system.

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Website: https://www.smarterbalancedlibrary.org/
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Benefits of NAEP Items:
- Free and Accessible
- Rigorous
- Inclusion of science practices
- Benefits of NAEP Items
- Variety of Formats
- Available scoring Guides
- Available performance data

Why NAEP?
• **Formative Assessment** - is a deliberate process used by teachers and students during instruction that provides actionable feedback used to adjust ongoing teaching and learning strategies to improve students’ attainment of curricular learning targets/goals.

**What is PAO Science?**

Last Row: Marshall Lagge, Bruce Dudek
Sixth Row: Amanda Obery, Emily Currier, Karla Miller, Jessica Eilertson, John Deming, Jared Betz
Fifth Row: Chris DeWald, Jennifer Stadum, Sue Mohr, Lily Haines, Nicole Kirschten
Fourth Row: Ashley McGrath, Katie Burke, Melissa Johnson, Lindsay Manzo, Debbie Hanson
Third Row: Maureen Karlin, Jacqueline Marshall, Michelle McCarthy, Brian Williams
Second Row: Jodi Hall, Audrey Howard, Roni Sells, Monica Tomayer, Katherine Aune
Front: Karen Pollari, Marcy Fortner, Yvonne Field, Molly Ward, Mary Williams, Summer Graber
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PAO Science Mission

The following statements define the significance of this work:

1. PAO provides a model for taking existing Framework-aligned assessment materials and methods to examine them for formative purposes.

2. PAO provides a step-wise Understanding by Design (UbD) process using carefully crafted forms to consider resources and instructional strategies for instructional intention, clarity, evidence production, feedback, and closing the learning gap.

3. PAO offers guidance on accessibility through identifying areas of existing accessibility and areas where additional support or modification may be needed to meet the needs of all students.

4. PAO provides a state-specific form to increase the student engagement, authenticity, and connections to the community through the cultural relevance and significance section of this project.

5. PAO provides rubrics and processes for reviewing and considering materials for inclusion or exclusion in the online repository.

6. PAO Groups identify formative materials for inclusion on the OPI’s online repository which will be freely shared with Montana educators across the state.
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**PAO Data Collection Forms**

1. Authors
2. Strategy Type
   - Stand Alone Item
   - Cohesive Set
3. Alignment Type
   - Multi-part alignment
   - Distinct alignment
4. Confirm Qualities
   - Confirm
   - Refute

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<th>1. Standard</th>
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2. **Formative Strategy**

### Formative Strategy Description:

3. **Formative Process**

4. Name the steps the teacher takes to introduce this formative assessment or activity to students. *(What the Teacher Does)*

5. Name the steps the student takes to provide information to themselves or the teacher about their understanding. *(What the Student Does)*

6. Describe the role of feedback.

7. List the student skills that are reinforced with this activity.

8. Describe any embedded curricular goals and/or connections to other disciplines.

9. Name the steps the teacher takes to close the activity.

10. **Identify Supplemental Resources**

11. **Comments**

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**Describe Support Strategy**

**Identify Student Group**

**Identify Accessibility**

- Severe
- Moderate
- Mild

**Describe for Sensitivity & Bias**

- What strategies or techniques can the teacher use to address the sensitivity and bias issue?
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PAO Phase I Findings

Facts:

• 25 teachers participated in this science formative development project.

• There were several teachers who participated on the team that wrote the Montana Science Standards (2016).

• Several informal science educators (e.g., educators from museums, science centers, etc. who work with teachers throughout the school year) were also participants.

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PAO Phase I Findings

Benefits to State:

- This workshop increased teacher’s knowledge of the new science standards and around developing formative assessments that measure these new standards.

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PAO Phase I Findings

Benefits to Teachers:

• “The course overall helped me grow. I appreciated the face-to-face experience the most, truly my best learning style”. – PAO Teacher Participant
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PAO Phase I Findings

Benefits to Students:

• Students of teachers who were a part of this workshop will have teachers who have more confidence teaching the new science standards.
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Goals for PAO Phase II

- Use the Hub evaluations and PAO in-person evaluation to revise the Hub Course materials for future re-launch.

- Use the evaluation feedback to revise “PAO Forms”, “Review Rubric” and “Cover Profile” for clarity and usability.

- Continue to expand our formative resource repository using the established training, development process, and review process.

- Continue to build statewide capacity through opportunities listed in “Future Interest Survey”.

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**Formative Activity Overview**

This Montana teacher developed formative assessment emphasizes the process and specific instructional strategies. "Student Constructed Rubric". All Montana Formative Science Resources were created to identify the instructional process(es), intended assessment, and expected student outcomes (PAO process). Teachers can use the PAO process to identify:

- The Learning Goal — "What is taught?" and/or "where are we headed);
- The Anticipated Product and Action — "What has been learned?" and/or "what gaps exist"); and
- The Learning Outcomes — "How do we close the learning gap?" and/or "are we on track").

The PAO process provides guidance on how the educators can act on evidence to support ongoing teaching and learning to identify and close student learning gaps. Resources include instruction on how to provide ideas for eliciting student evidence to support instruction aligned to the Montana Science Standards (2016) "MS-ESS3-1," and to meet the grade-appropriate three-dimensional nature of the A Framework for K-12 Science Education, that is the intersection of ESS3-1, SEF-B, and CCC-1 to support student learning towards MS-ESS3-1.

**Formative Activity Description**

This type of formative activity is best used as a check for understanding after the content has already been learned. This formative strategy will help students by the end of grade 8 have an understanding of the "annual cycle of the rock strata and the fossil record" (A Framework for K-12 Science Education, p. 148). This activity helps students understand their own learning toward the identified learning goal (i.e., MS-ESS3-1) through constructing a typical constructed response summative item as a group. As a group, the teacher guides students to mastery of this concept by helping them recognize the level of evidence needed for optimal comprehension. This activity also helps familiarize students with the concept of assessment through identifying features of performance and scoring.

**Alignment to Next Generation Science Standards (NGSS)**

MS-ESS3-1. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth’s 4.6 billion-year-old history.

**Suggested Time for Activity**

Two 45-minute sessions. This activity will take less than 45 minutes unless students do not have any prior knowledge of how CR items are scored. If students are unfamiliar with this concept, we encourage teachers to complete the pre-activity first. The pre-activity should take less than 45 minutes to complete.

**Activity Description**

What does the Teacher Do?

Before this activity takes place, the teacher should identify a CR item that measures the standards well. Students should have familiarity with taking CR items in class before implementing this strategy. As an introduction to the activity, have students practice scoring a CR item with the 'Draw a conclusion about soil permeability using data' item. Follow the pre-activity instructions which should take less than 45 minutes as a class.

After completing the pre-activity, the first step of this MS-ESS3-1 activity is to have students individually take the teacher-preidentified CR item to demonstrate their understanding. For demonstration purposes, the "Identify and explain most recent rock formation" will be used.

After students have taken the item, collect the answers from your students. Display the CR item for the whole class to follow along with and participate in as a group. Pose the CR question to the group, include three MLSIs in the class discussion:

- What demonstrates the student knows this content (e.g., evidence or observable information)?
- What demonstrates the student met the practice (e.g., evidence or observable information)?
- What do point values look like (e.g., what is full credit - how many points, what is partial credit - how many options, what are examples of wrong answers that might be misconceptions)?

Follow the activity instructions which should take less than 45 minutes as a class. The teacher gains valuable information about what concepts are clear to students through the whole class discussion and the students regulate their understanding through using their class-generated rubric to score themselves with. This strategy is mostly an example of self-regulated feedback, however, it is possible through how this activity is delivered that it will also serve as task and process feedback.

**Activity Closure and Success Criteria**

In a "turn and share with your partner" fashion, the teacher ends the activity through the use of guiding questions. Follow the activity instructions which should take less than 45 minutes as a class. Students should be able to answer the storyline question, "How do people figure out that the earth and life on earth have changed through time?" from participating in this MS-ESS3-1 formative strategy. Furthermore, students should have a stronger connection to applying the crosscutting concepts of patterns, scale, proportion, and quantity, and systems and systems modeling, as they are specifically addressed in this formative assessment for MS-ESS3-1.
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Build Statewide Capacity

What Next?

• For example:
  • **Resource in Practice** - teachers use this work during the year and submit evidence of student work, personal reflections, and/or activity in action (video).
  • **Feedback on Resources** – pilot them and provide personal experience or modifications of resources.
  • **Contribute to the Pool** – submit more formative resources to the repository.

See the Hub Catalog for ideas and additional courses!

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Questions?

Ashley McGrath  
NAEP State Coordinator  
Montana Office of Public Instruction  
- Phone: 406.444.3450  
- E-mail: amcgrath@mt.gov  
- Website: [http://opi.mt.gov/Leadership/Assessment-Accountability/NAEP](http://opi.mt.gov/Leadership/Assessment-Accountability/NAEP)

Michelle McCarthy  
Science Instructional Coordinator  
Montana Office of Public Instruction  
- Phone: 406.444.3537  
- E-mail: MMcCarthy5@mt.gov  
- Website: [http://opi.mt.gov/Educators/Teaching-Learning/K-12-Content-Standards-Revision](http://opi.mt.gov/Educators/Teaching-Learning/K-12-Content-Standards-Revision)

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