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

Wyoming Department of Education
Science Assessment System:
Theory of Action

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Table of Contents

Introduction to SCILLSS

The Strengthening Claims-based Interpretations and Uses of Local and Large-scale Science Assessment Scores (SCILLSS) project aims to strengthen the knowledge base among stakeholders for using principled-design approaches to create and evaluate quality science assessments that generate meaningful and useful scores, and to establish a means for states to strengthen the meaning of statewide assessment results and to connect those results with local assessments in a complementary system. The Wyoming Department of Education (WDE) is working in collaboration with two other state education agencies (the Nebraska Department of Education and the Montana Office of Public Instruction), four organizations (edCount, ACS Ventures, SRI International, and the Pacific Institute for Research & Evaluation (PIRE)), and a technical advisory panel of 10 experts that contribute an essential combination of expertise in principled-design, measurement, assessment literacy, and classroom practices to support the implementation of this project. The SCILLSS project is funded by the US Department of Education's Enhanced Assessment Instruments Grant Program.

Purpose of State Theory of Action

All assessments are designed with a purpose in mind, and only by identifying and clarifying this purpose, or set of purposes, can one begin to determine how to evaluate the validity of the interpretations of the scores an assessment yields. A principled-design approach to assessment development enables state assessment systems to be set up in such a way that demonstrates that the end goals of the system were thought about during the design and development phase. This is achieved, in part, through the development of a Theory of Action (ToA), which demonstrates the claims and assumptions that must hold true to support the interpretation(s) and use(s) of assessment scores. Development of a ToA is essential for states to better articulate how their assessment claims connect with, and are supported by, test scores and other sources of evidence. This deep analysis of a state's argument for score meaning helps to strengthen both the validity and coherence of their system. Such an approach also provides stakeholders with ample documentation of design and development logic and decisions, which can be used for future learning, evaluations, and development projects.

Further, developing a ToA through the implementation of a principled-design approach is a key first step to ensuring that assessment development activities and objectives meet the standards of the professional testing community as communicated through the *Standards for Educational and Psychological Testing* (hereafter referred to as the *Standards*; AERA, APA, & NCME, 2014). The *Standards* are the primary guidelines used to improve upon current practices and develop new processes for assessment system evaluation and design. The ToA is an essential element of an assessment system's design that directly supports Standard 1.0: "Clear articulation of each intended test score interpretation for a specified use should be set forth, and appropriate validity evidence in support of each intended interpretation should be provided" (AERA, APA, & NCME, 2014, p. 23).

Thus, as a participating state in the SCILLSS project, Wyoming developed a state-specific ToA to identify the specific assessment-related claims or issues that are critical to support score meaning within their system, and contributed to the development of a common project ToA that reflects the processes, activities, and desired project outcomes shared by the participating states. The ToA is a living document that the WDE will update over time and throughout the duration of the project. Each update will be posted to the SCILLSS project website at www.scillsspartners.org.

Development Process for State Theory of Action

Development of Wyoming's ToA began with 2015 legislative action. The Wyoming legislature directed the State Board of Education to convene the Wyoming Assessment Task Force (ATF) to evaluate Wyoming's current state assessment system and make recommendations for its future. The 24 ATF members, comprising teachers, superintendents, business community members, higher education members, school board members, principals, curriculum directors, and teachers of English learners met seven times between June 1 and October 1, 2015 to deliberate over many technical, policy, and practical issues associated with implementing an improved assessment system. Research documentation, public comment, and stakeholder feedback were considered throughout the process. The ATF identified key challenges associated with the current assessment system and articulated its goals and intended uses of a new system; these goals and intended uses were incorporated into the ToA. The WDE presented ATF findings to the WY State Board of Education, followed by briefings to the Legislative Select and Joint Education Committees. In preparation for the assessment request for proposals (RFP), the ToA was reviewed by the Wyoming Technical Advisory Committee (TAC).

To help Wyoming and the other SCILLSS participating states establish a foundation in the structure of a ToA, the SCILLSS organizational partners first developed a ToA template and development guide. For each of the components of the ToA, state representatives were asked to consider a series of questions to articulate the guiding philosophy behind their system in which the SCILLSS project is integrated:

1. **Statewide Assessment System Design:** What are the assessment system claims? How is the assessment system designed? How must the assessment system function to provide interpretable and usable scores?
2. **System Setting and Use:** How are stakeholders meant to use assessment information? What are some of the conditions that must be in place for the assessment system to function as intended?
3. **Teacher Actions:** What activities are expected of teachers? How do teachers interact with students in the classroom? How do teachers use student work to track progress?
4. **Student Actions:** What activities are expected of students? How do students interact with teachers and other students? How do students track their progress?
5. **Student Outcomes:** What are the intended student goals, outcomes, or consequences of the assessment system (e.g., for students, teachers, instruction)?

Onsite Collaborative ToA Development

Validity evaluation experts convened all SCILLSS project staff at a two-day project kickoff meeting in Lincoln, Nebraska in June of 2017 and provided a comprehensive overview of principled-design, how a ToA fits within that approach, and the goals of the ToA for both the SCILLSS project and each individual state. The project staff divided participants into state-specific groups in the same room, with one validity evaluation expert assigned to each group. Facilitators posted large, blank pieces of paper that represented each of the ToA components across the room. In addition to the ToA template and development guide, experts provided state staff with paper, pens, and highlighters to use for brainstorming ideas for each of the ToA components.

Together with a group facilitator and a validity evaluation expert, state staff spent three hours on the first day brainstorming ideas for each of the ToA components, taking into consideration their state-specific contexts and how the SCILLSS activities and approach fit within their state activities and goals.

The guiding questions provided earlier in this document assisted states in brainstorming ideas for each of the components. As they arrived at ideas for each of the ToA components, the group facilitator populated the ToA template, as well as the corresponding large, blank pieces of paper to support states in identifying their commonalities, which ultimately informed the development of a common project ToA.

Upon completion of the brainstorming activity, each state worked with their facilitator and validity evaluation expert to refine their ideas for each of the components of the state-specific ToA. The facilitator led the state staff in a discussion to reach consensus for each component, assisting to clarify language when needed. Furthermore, the facilitator and validity evaluation expert assisted the state staff in articulating the ToA in paragraph form to ensure pictorial and textual representation. At the end of the day, state partners shared out across the groups their drafted, state-specific ToAs. During the discussion, states identified common themes and differences across the state-specific ToAs. A facilitator documented the common themes which were then used to inform the development of the project theory of action.

Unfortunately, WY state staff were not able to attend the meeting in Lincoln, Nebraska due to a scheduling conflict. Therefore, Ellen Forte and Liz Summers from edCount met face-to-face with Laurie Hernandez, Barb Marquer, Sharla Dowling, and Jessica Steinbrenner the morning of June 20, 2017 to: a) share and review the process described above while in Nebraska, b) discuss outcomes of the meeting described above, 3) discuss commonalities and differences between the two state-drafted ToAs, and 4) determine the next steps and support needed for WY staff to draft their own ToA. The state staff determined they would take the information shared by edCount staff and, in three weeks, provide a draft ToA for edCount review.

Following the face-to-face meeting on June 20, 2017, the WDE facilitated the development of the ToA by organizing ATF findings into a visual representation of the goals and intended uses of the Wyoming assessment system in science.

Theory of Action

Wyoming developed a Theory of Action that articulates the characteristics and priorities of its state science assessment system in the context of the larger educational setting that are necessary for meeting its desired outcomes of 1) ensuring Wyoming students integrate science learning based on three-dimensional science standards to ensure application and transfer of knowledge and skills in cross disciplinary ways, 2) ensuring Wyoming students leave high school with the knowledge and skills ready to participate in continued science, technology, engineering, and mathematics (STEM) learning, 3) ensuring Wyoming students apply and transfer science and engineering practices in society, demonstrating readiness for college, careers, or the military, 4) providing timely intervention for struggling students, 5) ensuring educators effectively use statewide assessment data to support instruction and student learning, and 6) ensuring information from the assessment allows stakeholders to track student progress on the standards and toward college, career, and military readiness.

To achieve these objectives, the data from formative, interim, and modular assessments must allow for inferences about student knowledge and skills, and must be used by teachers for developing curriculum and adapting instruction to align with academic expectations in the 2016 Wyoming Science Content and Performance Standards (WYSCPS). School leaders must use the data appropriately in accountability

decisions for schools and districts to support teachers in curriculum, instruction, and assessment decision-making, and allow for educators, students, and families to inform personalized learning.

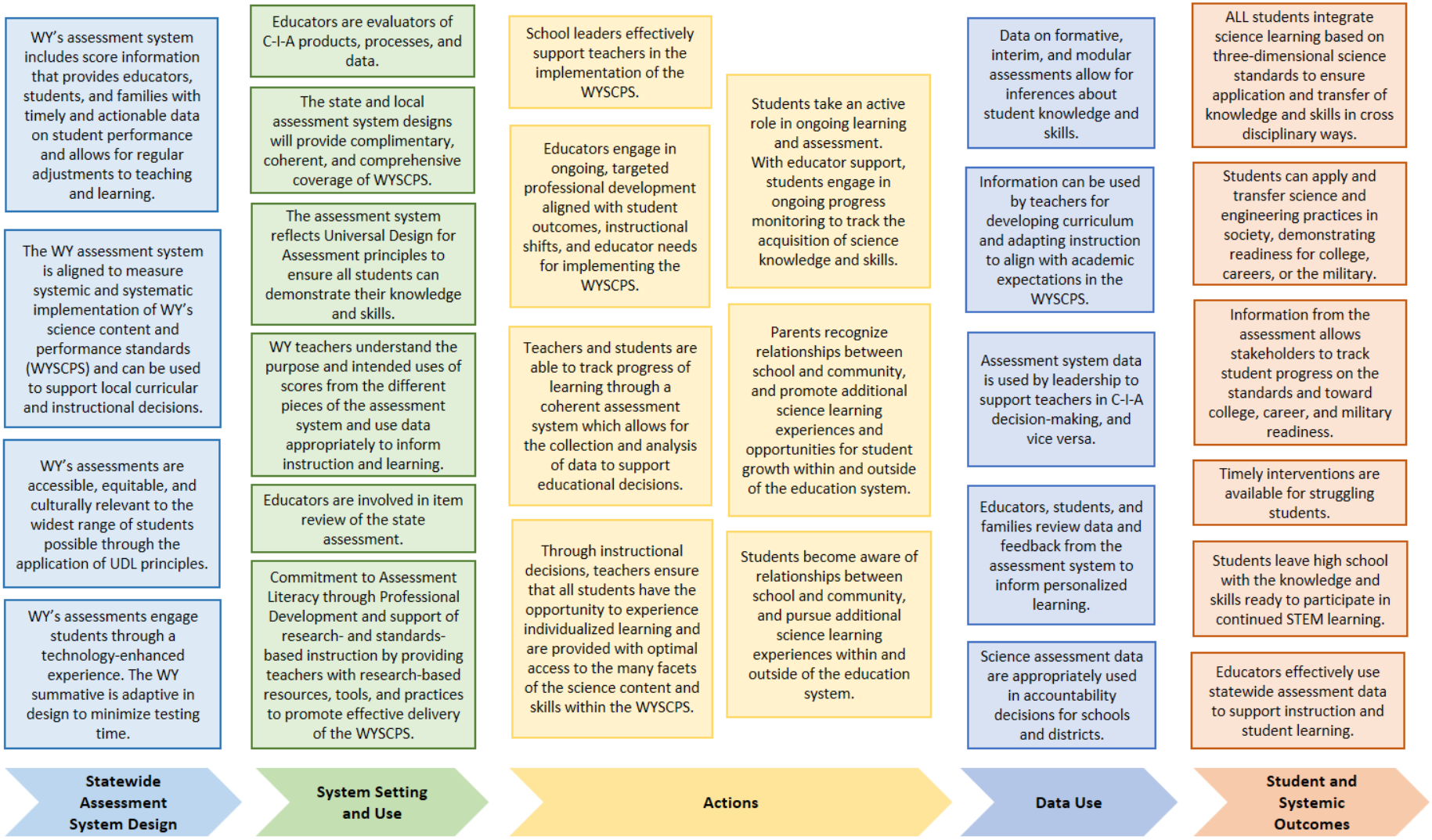
To effectively utilize actionable data, students must take an active role in monitoring and adjusting their learning. Student must become aware of relationships between school and community, pursue additional science learning experiences within and outside of the education system, and take an active role in monitoring their learning progress and acquisition of science knowledge and skills. These student actions will occur if through instructional decisions, teachers ensure that all students have an opportunity to experience individualized learning and are provided with optimal access to the many facets of the science content and skills within the WYSCPS.

To support Wyoming teachers in these endeavors, teachers must have opportunities to engage in targeted professional development aligned with student outcomes, instructional shifts, and educator needs for implementing the WYSCPS, and be effectively supported by school leaders in the implementation of WYSCPS. Professional development must foster a commitment to assessment literacy and support research- and standards-based instruction by providing teachers with research-based resources, tools, and practices to promote effective delivery of the WYSCPS. Furthermore, the state and local assessment system must be designed to provide complimentary, coherent, and comprehensive coverage of the WYSCPS, and provide all students an opportunity to demonstrate their knowledge and skills.

A science assessment designed for use within this system must be aligned to measure systemic and systematic implementation of the WYSCPS and must support and inform local curricular and instructional decisions. The assessment must be accessible, equitable, and culturally relevant to the widest range of students possible through the application of Universal Design for Learning principles and must engage students through a technology-enhanced, adaptive testing experience that minimizes testing time. The assessment must yield results that provide educators, students, and families with timely and actionable data on student performance and that allow for regular adjustments to teaching and learning.

A pictorial representation of the Wyoming Theory of Action is provided in Exhibit 1. First, the five components are displayed together to show how they are combined to comprise the assessment system; then, each component of the Theory of Action is displayed separately. Selected terms and phrases in the Theory of Action are defined in the Glossary of Terms following the exhibit.

Exhibit 1. Wyoming Theory of Action



Statewide Assessment System Design

- WY's assessment system includes score information that provides educators, students, and families with timely and actionable data on student performance and allows for regular adjustments to teaching and learning.
- The WY assessment system is aligned to measure systemic and systematic implementation of WY's science content and performance standards (WYSCPS) and can be used to support local curricular and instructional decisions.
- WY's assessments are accessible, equitable, and culturally relevant to the widest range of students possible through the application of UDL principles.
- WY's assessments engage students through a technology-enhanced experience. The WY summative is adaptive in design to minimize testing time.

System Setting and Use

- Educators are evaluators of C-I-A products, processes, and data.
- The state and local assessment system designs will provide complimentary, coherent, and comprehensive coverage of WYSCPS.
- The assessment system reflects Universal Design for Assessment principles to ensure all students can demonstrate their knowledge and skills.
- WY teachers understand the purpose and intended uses of scores from the different pieces of the assessment system and use data appropriately to inform instruction and learning.
- Educators are involved in item review of the state assessment.
- Commitment to Assessment Literacy through Professional Development and support of research- and standards-based instruction by providing teachers with research-based resources, tools, and practices to promote effective delivery of the WYSCPS.

Actions

- School leaders effectively support teachers in the implementation of the WYSCPS.
- Educators engage in ongoing, targeted professional development aligned with student outcomes, instructional shifts, and educator needs for implementing the WYSCPS.
- Teachers and students are able to track progress of learning through a coherent assessment system which allows for the collection and analysis of data to support educational decisions.
- Through instructional decisions, teachers ensure that all students have the opportunity to experience individualized learning and are provided with optimal access to the many facets of the science content and skills within the WYSCPS.
- Students take an active role in ongoing learning and assessment. With educator support, students engage in ongoing progress monitoring to track the acquisition of science knowledge and skills.
- Parents recognize relationships between school and community, and promote additional science learning experiences and opportunities for student growth within and outside of the education system.

- Students become aware of relationships between school and community, and pursue additional science learning experiences within and outside of the education system.

Data Use

- Data on formative, interim, and modular assessments allow for inferences about student knowledge and skills.
- Information can be used by teachers for developing curriculum and adapting instruction to align with academic expectations in WYSCPS.
- Assessment system data is used by leadership to support teachers in C-I-A decision-making, and vice versa.
- Educators, students, and families review data and feedback from the assessment system to inform personalized learning.
- Science assessment data are appropriately used in accountability decisions for schools and districts.

Student and Systemic Outcomes

- ALL students integrate science learning based on three-dimensional science standards to ensure application and transfer of knowledge and skills in cross disciplinary ways.
- Students can apply and transfer science and engineering practices in society, demonstrating readiness for college, careers, or the military.
- Information from the assessment allows stakeholders to track student progress on the standards and toward college, career, and military readiness.
- Timely interventions are available for struggling students.
- Students leave high school with the knowledge and skills ready to participate in continued STEM learning.
- Educators effectively use statewide assessment data to support instruction and student learning.

Glossary of Terms

District Assessment System	In response to State Supreme Court decisions and legislative mandates, Wyoming requires districts to document that students have had an opportunity to learn the "basket of goods," defined as the content standards in nine subject areas (WY ATF Report, 2015, p.18).
Formative Assessment	A process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievements of intended instructional outcomes (Wiley, 2008, p.3).
Interim Assessment	An interim assessment is a form of assessment that educators use to evaluate where students are in their learning progress and to determine whether they are on track to performing well on future assessments, such as standardized tests or end-of-course exams (Glossary of Education Reform, 2014). Neither formative (e.g., they do not facilitate moment-to-moment targeted analysis of and feedback designed to student learning) nor summative (they do not provide a broad summary of course- or grade-level achievement tied to specific learning objectives) (WY ATF Report, 2015, p.10).
Summative Assessment	Generally infrequent (e.g., administered only once to any given student), a summative assessment is typically given at the end of a defined period to evaluate students' performance against a set of learning targets for the instructional period. The prototypical assessment conjured by the term "summative assessment" is given in a standardized manner statewide (but can also be given nationally or districtwide) and is typically used for accountability or to otherwise inform policy (WY ATF Report, 2015, p.10).

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