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

Nebraska Department of Education
Science Assessment System:
Theory of Action

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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 Nebraska Department of Education (NDE) is working in collaboration with two other state education agencies (the Montana Office of Public Instruction and the Wyoming Department of Education), 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, Nebraska developed a state-specific ToA to identify the 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 NDE 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 Nebraska's ToA was a cyclical process involving multiple stages of review and revision with a diverse representation of Nebraska stakeholders with varying backgrounds, experiences, and expertise in science education. Stakeholder involvement in the development and refinement of the Nebraska ToA was an essential consideration for ensuring the ToA articulates a common vision for science education in Nebraska and matches the state's unique circumstances and needs.

To help Nebraska 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 Liz Summers, group facilitator, and Dr. Chad Buckendahl and Dr. Susan Davis-Becker, validity evaluation experts, NDE 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.

State Review and Refinement Activities

Following the onsite ToA development activities at the project kickoff meeting, the NDE facilitated a review and refinement period with a variety of Nebraska stakeholders to gather feedback for the ToA.

First, the NDE Enhanced Assessment Grant Coordinator, Rhonda True, and NDE Teaching and Learning Science Specialist, Sara Cooper, applied revisions to the ToA using a "reverse-mapping" process. Beginning with the outcomes and then working backwards to system design, this process ensured that the necessary components (data use, actions, system setting & use, and system design) were in place to support and lead to the desired outcomes.

Once initial revisions were applied using the reverse-mapping process, the NDE elicited input and feedback on the ToA, with a focus on the outcomes, from both science cadre members and science leaders from across the state. The Nebraska Science Cadre comprises representatives from Educational Service Units (ESUs) and district science educators from Nebraska.

Further input and feedback was gathered from stakeholders at the "Science Assessment Visioning" meeting in Lincoln, Nebraska on November 15-16, 2017 with Achieve, Inc. The purpose of this meeting was to develop an assessment system vision statement, short-term and long-term coherent assessment plans, and to identify areas where the NDE needs to provide supports for science assessments.

Theory of Action

Nebraska 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 in which 1) all students integrate science learning based on the 3-dimensional science standards to ensure the application and transfer of knowledge and skills in interdisciplinary ways, 2) all students are prepared for postsecondary education, career, and civic opportunities and possess technological and digital readiness; 3) curriculum, instruction, and assessments (CIA) are designed for Nebraska's College and Career Readiness Standards (NE-CCRS) and are implemented systemically and systematically; 4) educators are qualified/credentialed, effective leaders who critically use CIA products, processes, and data to support student college and career readiness; and 5) the assessment system contributes to shifting the underlying skill set of the state's workforce to draw new business via Nebraska students.

To support these outcomes, data must be used from multiple assessment sources (national, state, and classroom-based) to measure student achievement of NE-CCRS and must serve an integral role in the ongoing improvements to instruction and learning. Educators and stakeholders must use assessment information appropriately to develop curriculum and shift instruction to align with NE-CCRS, design learning resources and experiences to promote college and career readiness, and inform accountability decisions for schools and districts. Students, educators, and families must use data to track student progress toward college and career readiness and to inform personalized learning.

We posit that to effectively utilize actionable data, students must take an active role in monitoring and adjusting their learning. Students must recognize relationships between their learning and community, pursue additional science learning experiences and opportunities for innovation within and outside of the education system, take an active role in ongoing learning and assessment to support Career Awareness and Career/College Goals, and with educator support, engage in ongoing progress monitoring using data to track the acquisition of CCR science knowledge and skills.

These student actions will occur if teachers cultivate student interest and engagement in content and practices by effectively integrating the 3-dimensions in authentic, place-based, and culturally-relevant learning experiences centered on phenomena, use formative assessment for collecting and evaluating information in real-time, and appropriately differentiate instruction to ensure all students have the opportunity to learn and are provided with optimal access to the many facets of the science content and skills within NE-CCRS. Educators must be critical developers and evaluators of CIA products, processes, and data. Educators must engage in ongoing, targeted professional development aligned with student outcomes, instructional shifts, and educator needs, and must be critical developers and evaluators of CIA products, processes, and data.

To support teachers in this endeavor, school leaders must effectively support the development and implementation of personalized learning and develop effective teachers and leaders who establish a culture of success. Ongoing and sustainable professional development is needed to support teachers in designing authentic classroom assessments and rubrics to measure student knowledge and skills. The professional development also must be supportive of effective practice, and should allow stakeholders to communicate and collaborate effectively to coordinate the alignment of CIA systems. Professional development opportunities must ultimately aim to ensure students are supported by qualified/credentialed, effective teachers and leaders.

Ultimately, within this system, educators, students, and families must have access to high quality evidence-based strategies, tools, and supports to provide effective learning opportunities for all students. Assessments within the system must be designed to measure and improve student achievement and inform instruction designed for rigorous College and Career Ready Standards. Assessments should elicit data that enable educators, students, and families to track progress of learning and support educational decisions. Score reports must be generated to support appropriate and timely inferences about student knowledge and skills. The accountability system must encourage appropriate, systematic instruction to support interdisciplinary learning.

Nebraska stakeholders play a key role in supporting and developing system assessments, and educators are involved in the development of all system components. Complementary state and local assessments must be designed to provide comprehensive coverage of NE-CCRS and to effectively measure the systemic and systematic implementation of curriculum and instruction designed for NE-CCRS, and must include a range of individualized/adaptive, classroom-based, state, and national/international assessments. Assessments must be designed to reflect Universal Design principles, and be accessible, equitable, and culturally relevant to the widest range of students possible to allow all students to demonstrate their knowledge and skills. The assessment system must be designed to measure student achievement and growth, integrate the six tenets of AQuESTT, and be timely for instruction purposes.

A pictorial representation of the Nebraska ToA 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 ToA is displayed separately. Key terms and phrases in the ToA are defined in the Glossary of Terms following the exhibit.

Exhibit 1. Nebraska Theory of Action

Outcomes

- Curriculum, instruction, and assessments designed for NE-CCRS are implemented systemically and systematically.
- Educators are qualified/credentialed, effective leaders that critically use CIA products, processes, and data to support student college and career readiness.
- ALL students integrate science learning based on the 3-dimensional science standards to ensure application and transfer of knowledge and skills in interdisciplinary ways.
- The assessment system contributes to shifting the underlying skill set of the state's workforce to draw new business via NE students.
- Every student upon completion of secondary education is prepared for postsecondary education, career, and civic opportunities and possesses technological and digital readiness.

Data Use

- Information is used by educators for developing curriculum and shifting instruction to align with NE-CCRS.
- The results of multiple assessment sources (national, state, and classroom-based) are used to measure student achievement of CCRS and used as an integral part of the instructional process.
- Information from the assessment system allows students, educators, and families to track student progress toward college and career readiness and inform personalized learning.
- Information can be used by stakeholders to design learning resources and experiences to promote college and career readiness.
- Science assessment data are appropriately used in AQuESTT and for accountability decisions in schools and districts.

Actions

- Teachers use formative assessment for collecting and evaluating information in real-time.
- Schools and districts develop effective teachers and leaders who establish a culture of success.
- With educator support, students engage in ongoing progress monitoring using data to track the acquisition of CCR science knowledge and skills.
- Students recognize relationships between their learning and community, and pursue additional science learning experiences and opportunities for innovation within and outside of the education system.
- Students and their families take an active role in ongoing learning and assessment to support career awareness and career/college goals.
- Educators are critical developers and evaluators of CIA products, processes, and data.
- Educators engage in ongoing, targeted professional development aligned with student outcomes, instructional shifts, and educator needs.

- Teachers cultivate student interest and engagement in content and practices by effectively integrating the 3-dimensions in authentic, place-based, and culturally-relevant learning experiences centered on phenomena.
- School leaders effectively support the development and implementation of personalized learning.
- Teachers appropriately differentiate instruction to ensure all students have the opportunity to learn and are provided with optimal access to the many facets of the science content and skills within NE-CCRS.

System Setting and Use

- All assessments are used to measure and improve student achievement and inform instruction designed for rigorous College and Career Ready Standards.
- The accountability system encourages appropriate, systematic instruction to support interdisciplinary learning.
- Educators, students, and families have access to high-quality and evidence-based strategies, tools, and supports to provide effective learning opportunities for all students.
- Coherent system provides data so educators, students, and families are able to track progress of learning and allows for the collection and analysis of data to support educational and career decisions.
- Professional development supports effective practice and allows stakeholders to communicate and collaborate effectively to coordinate the alignment of curriculum, instruction, and assessment systems.
- On-going and sustained professional development supports educators in designing authentic classroom assessments and rubrics to measure student knowledge and skills.
- Professional development is designed to assure students are supported by qualified/credentialed, effective teachers and leaders throughout their learning experiences.
- Timely score reports support appropriate inferences about student knowledge and skills.

System Design

- The assessment system is designed to provide effective measurement of systemic and systematic implementation of curriculum and instruction designed for NE-CCRS.
- The complementary state and local assessment system is designed to provide comprehensive coverage of NE-CCRS.
- Educators are involved in assessment development of all system components.
- The assessment system reflects Universal Design principles; assessments are accessible, equitable, and culturally relevant to the widest range of students possible to allow all students to demonstrate their knowledge and skills.
- Nebraska's stakeholders play a role in supporting and developing system assessments.
- The assessment system is designed to measure student achievement and growth, integrates the six tenets of AQuESTT, and is timely for instructional purposes.

- The assessment system includes individualized/adaptive, classroom-based, state, and national/international assessments.

Glossary of Terms

AQuESTT	In 2014, the Nebraska legislature enacted legislation requiring a new accountability system for public schools and districts. The new system is AQuESTT – Accountability for a Quality System Today and Tomorrow. The six AQuESTT tenets are College and Career Ready; Assessment; Educator Effectiveness; Positive Partnerships, Relationships, and Student Success; Transitions; and Educational Opportunities and Access. The tenets represent key investments the State Board of Education believes are necessary for a quality education system.

References

American Educational Research Association (AERA), the American Psychological Association (APA), and the National Council on Measurement in Education (NCME) Joint Committee on Standards for Educational and Psychological Testing. (2014). *Standards for educational and psychological testing*. Washington DC: AERA.