Creating Conditions for Foundational Science Experiences: Lessons Learned From Revising Rhode Island's Early Learning and Development Standards

By Cindy Hoisington

The 21st century has launched an unprecedented focus on science and science, technology, engineering, and mathematics (STEM) education, including the foundational science experiences that children five and under have in preschool and other early-learning settings. The Region 2 Comprehensive Center (R2CC) is providing support to the Rhode Island Department of Education (RIDE) as it expands and enriches the science component of the Rhode Island Early Learning and Development Standards (RIELDS) to align with the state's kindergarten through Grade 12 (K–12) standards and reflect the vision of the Next Generation Science Standards (NGSS) with expectations for all children to *do what scientists do* and *think like scientists think*. R2CC is also contributing to the creation of a curriculum framework that will help early childhood educators interpret and use the standards to guide curriculum, instruction, and assessment.

We offer some highlights of the process RIDE and R2CC undertook together for other state education agencies (SEAs) that are considering similar updates to their early childhood standards.

Synthesize the Research Base on Early Childhood Science

A primary goal in the standards development process is to ensure that the standards are closely tied to current research. Synthesizing the research and analyzing alignment with the current standards was an important first step in our process. Efforts were focused on these core foundational concepts in the research about young children and science:

- Young children's innate curiosity, their drive to seek out relationships and patterns, and their need to make sense of the world around them primes them for science inquiry and learning.
- High-quality and well-facilitated early science experiences are foundational in building skills that life and work in the 21st century increasingly demand—critical thinking, collaboration, communication, and creative problem-solving.
- These experiences contribute to children's achievement in school science and their interest in pursuing STEM opportunities later in life; it also helps level the playing field for children from historically marginalized communities.
- Science provides a rich context for physical, cognitive, and social–emotional development, and for language learning, especially critical for multilingual learners.
- Early learning environments—including water tables, sand tables, building centers, manipulative toys, and outdoor areas designed for play—are well suited to support science exploration and inquiry.

Solicit Feedback on Existing Standards Before Making Changes

RIDE held face-to-face feedback sessions and administered a survey to obtain feedback on the current RIELDS from teachers, caregivers, administrators, and support staff at a range of early-learning settings in the state. Survey questions addressed the structure and design of the RIELDS, the usefulness of the components (*Scientific Inquiry and Application* and *Knowledge of Science Concepts*), the learning goals, and the indicators in supporting instruction and

assessment. R2CC assisted with developing the survey and compiled, organized, and analyzed data from the feedback sessions and surveys.

The feedback provided important information about the strengths of the current standards and areas that would benefit from revision. In general, educators found the learning goals and indicators to be sufficiently comprehensive and the design of the RIELDS to be user-friendly, making the document easy to navigate. Many practitioners noted that expanding *The Knowledge of Science Concepts* component to include physical, life, and Earth/space science, thereby increasing the number of indicators related to each content area would better help guide their curriculum and instruction. The feedback also indicated areas where teachers might benefit from more explicit standards language or professional learning. For example, although the connections to mathematics, cognition, and language are implicit in the current science components, feedback made it clear that practitioners would benefit from having these connections made more pointedly in the individual learning goals and indicators and discussed and analyzed in professional learning rollout sessions.

Gather a Diverse and Knowledgeable Development Team

Establishing a development team with the right mix of skills and expertise was critical to the standards revision process. It was important to gather individuals whose combined knowledge base would ensure that the standards reflect young children's capacity for doing, thinking, and learning in science as well as their unique developmental characteristics, and cultural and language diversity. RIDE's diverse team included members who

- are intimately familiar with the state's diverse early childhood workforce;
- understand relevant RIDE systems and existing policies including the K–12 standards and curriculum framework and overarching multilingual learner initiatives;
- are invested in the state's guiding principles for early learning with a focus on equity;
- understand the basics of universal design for learning (UDL);
- are well-versed in the NGSS vision of a comprehensive science education and how it can be applied with young children in early learning settings; and
- understand the critical intersections between science and the other STEM disciplines and to the cognitive, language, literacy, and social–emotional domains of development.

Establishing clear roles for writers and reviewers was key to the development process. Experts in early childhood pedagogy and science formed the core writing team and RIDE administrators, UDL specialists, and multilingual learner experts provided input through reviews during the development process. It was also important to have RIDE's program supervisor involved in the writing process to ensure that the examples of what children know and are able to do were directly connected to experiences children actually have in classrooms. R2CC brought content expertise to the team by promoting iterative discussion and providing coaching about how to construct the examples (previously called indicators) in the newly developed *Scientific Practices and Application* standard and the three new content area standards that supported clarity, consistency, and coherence across the age ranges.

Review and Compare a Selection of Early Learning Science Standards from Other SEAs

RIDE reviewed other SEAs' early learning science standards with a focus on SEAs that had recently updated the science component, and, together, we created a side-by-side comparison.

Not surprisingly, we found a wide range in the extent to which individual SEAs prioritize science practices and content; distinguish physical, life, and Earth/space science content; explicate individual standards (e.g. physical science as "investigates physical objects" or as "children construct concepts of the properties of matter, sound, motion, and energy through exploration and investigation"); incorporate NGSS language and terms such as sense-making, evidence-based thinking, and problem-solving; and incorporate direct guidance for educators in best science teaching practices.

During this review focused on the big picture—the overall organization and approach each SEA took and how well different elements of each standards document hung together. This review stimulated discussion about overarching questions, such as "How do we balance the need to reflect NGSS practices and language and the need to maintain the document's accessibility to early educators?" and "Where and how can we incorporate teaching strategies that help teachers use the standards to guide science instruction?"

Create Coherence With Guiding Principles and a Clear Vision for the Revisions

Early in the process, we reflected on the RIELDS guiding principles as an anchor for the standards and made key decisions about what changes would be most impactful. We decided, for example, that the overall design of the document would be preserved; the content standards would be fleshed out to distinguish physical, life, and Earth/space science; and instructional strategies, as well as specific descriptions of the NGSS practices, would be reserved for the curriculum framework document. We found the following questions helpful in coming to consensus:

- How might we shift some terms in the current RIELDS (e.g., learning goals, indicators, and "most children will for example") to avoid the temptation for teachers to use them directly as curriculum and assessment tools?
- How can we describe the practice and content standards so they are comprehensive and reflect the NGSS vision while still being accessible to educators?
- What NGSS terms are we planning to incorporate that may be new to educators (e.g., scientific practices, collect and analyze data) and where and how will we define them?
- How will we integrate connections to engineering and technology?
- How many examples of a standard will we include at each age level and to what degree of detail?

Having answered these questions, we were deep into the process of crafting examples that represent ways in which children at different ages and stages might express learning in relation to the specific practice and content standards. To do so, we drew on current RIELDS indicators, developmental milestones indicators, the team's expert knowledge, and guiding documents such as the National Science Teaching Association's (NSTA) Position Statement on Early Childhood Science Education to help keep us grounded.

One of the issues we continue to grapple with, especially when it comes to alignment between the early learning and K–12 documents, is how can we best emphasize the uniqueness of early childhood and the important roles of play, family engagement, direct experience, and integrated learning AND communicate with early childhood educators in an accessible, compelling, and meaningful way while still maintaining alignment with existing documents designed for K-12.

We approach this challenge in the same way we have engaged in this process, with a commitment to the values that reflect a well-rounded and well-grounded science education: evidence-based thinking, collaboration, communication, and problem-solving. We are excited to see how the new RIELDS science standards will help educators nurture these values in all of Rhode Island's young children.

The content of this blog was developed under a grant from the Department of Education through the Office of Program and Grantee Support Services (PGSS) within the Office of Elementary and Secondary Education (OESE), by the Region 2 Comprehensive Center at WestEd under Award #S283B190057. This contains resources that are provided for the reader's convenience. These materials may contain the views and recommendations of various subject matter experts as well as hypertext links, contact addresses, and websites to information created and maintained by other public and private organizations. The U.S. Department of Education does not control or guarantee the accuracy, relevance, timeliness, or completeness of any outside information included in these materials. The views expressed herein do not necessarily represent the positions or policies of the U.S. Department of Education. No official endorsement by the U.S. Department of Education of any product, commodity, service, enterprise, curriculum, or program of instruction mentioned in this document is intended or should be inferred.