

Building a Professional Learning Community around Science Assessment: Designing and Using Assessment Tasks to Support Multi-Dimensional Instruction

Brian D. Gane, University of Illinois at Chicago, bgane@uic.edu
Elizabeth M. Lehman, University of Chicago, emlehman@uchicago.edu
Meg S. Bates, University of Chicago, megschleppenbach@uchicago.edu
Sania Z. Zaidi, University of Illinois at Chicago, sania@uic.edu
Alexa W. C. Lee-Hassan, University of Illinois at Chicago, aleeha2@uic.edu
Diksha Gaur, University of Illinois at Chicago, dgaur2@uic.edu
Krystal Madden, University of Illinois at Chicago, kmadde4@uic.edu
James W. Pellegrino, University of Illinois at Chicago, pellegjw@uic.edu

Abstract: We report on early-stage outcomes of a 4-year research and development project aimed at understanding how to build and sustain the capacity of teachers to instruct and formatively assess in ways that are aligned with the NRC's *Framework for K-12 Science Education* (i.e., multi-dimensional learning). In particular, we are building a professional learning community (PLC) around assessment of the U.S. *Next Generation Science Standards*, predicated on teachers designing assessment tasks that support instruction.

Problem context and major issues addressed

Science learning is changing from focusing on recalling facts and information to using scientific knowledge and practices to make sense of phenomena. Such multi-dimensional, knowledge-in-use is a hallmark of the vision for science typified by *A Framework for K-12 Science Education* (NRC, 2012) and the *Next Generation Science Standards* (NGSS; NGSS Lead States, 2013). This knowledge-in-use perspective requires aligned changes to curriculum, instruction, and assessment for efficient and effective student learning (NRC, 2001). In this context, instructionally supportive classroom assessments are critical. Our project has created a design process for developing multi-dimensional assessment tasks and used it to develop and validate tasks aligned to specific NGSS performance expectations (PEs) (Harris, Krajcik, Pellegrino, & DeBarger, 2019). Previously, researchers used this process to build tasks that were then implemented by teachers. The current project engages teachers, the end-users, in all stages of the assessment design process. Our goal is two-fold: (a) build a PLC with one cohort of teachers as we collaboratively develop assessment tasks that fit the NGSS, and (b) integrate a new cohort of teachers in the PLC as they learn to use these tasks in their classroom to support instruction and student learning.

Theoretical and methodological approaches

Professional learning communities (PLCs) are sustained groups of teachers who support and critique each other as they work to change aspects of their practice. Teachers often *know* what practices they should use, but actually using them in *action* is a challenge (Wiliam, 2007). Teachers need professional learning that connects directly to classroom needs (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). PLCs allow teachers to collectively learn from and support each other, as they wrestle with these issues of practice. PLCs around assessment is a promising opportunity (Wiliam & Thompson, 2008); few teachers receive explicit pre-service training on how to use assessments in their classroom (Popham, 2009). We argue that assessment can be used as an entry point into exploring the NGSS and the changes in instruction that they require. Assessment design brings to the forefront questions such as, "What knowledge, skills, and abilities must students demonstrate?" and "How can students demonstrate these knowledge, skills, and abilities?" Answers to these questions guide instruction and enactment of curriculum ("How can we support students as they acquire these knowledge, skills, and abilities?") and can be used to backwards-design instruction or curriculum. Our PLC is focused on (a) designing assessment tasks and (b) creating a virtual and in-person community in which teachers collaboratively develop their understanding and use of multi-dimensional, formative assessment and instruction (see Figure 1).

Intervention, sources of evidence, and initial findings

Teachers in Grades 3, 4, and 5 are using the design process to develop assessment tasks for PEs that are sampled from three NGSS disciplines and will then pilot the assessment tasks in their classrooms. Teachers collaborate on all steps of the process and respond to reflection prompts after each step. As we proceed through the design process we are open coding teacher reflection responses and developing axial codes to illuminate how the PLC facilitates

community building and teacher learning. For example, reflection responses after writing the first assessment tasks coded as *Specific Procedure* highlighted how using design patterns to write tasks challenged teachers to think critically about choosing phenomena to engage students and match the assessment goals (see Figure 2).

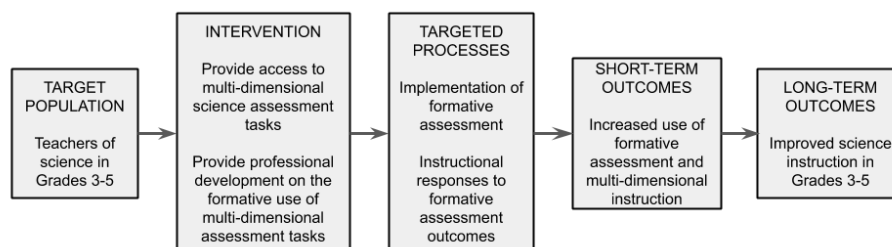


Figure 1. Our theory of action.

Reflection Prompt	Activity	Axial Codes				Total
		General Procedure	Specific Procedure	Tech.	Personal/Social Interactions	
Challenges	Assessment Task	7	11	1	3	22
	Design Patterns	3	6	0	1	10
		4	5	1	2	12
Successes		9	3	1	5	18
Process		7	9	4	15	35
Total		23	23	6	23	75

- “Keeping the tasks aligned to the Learning Performances without having additional phenomena within the task that could be potential distractors.”
- “We had a lot of different ideas and it was a challenge choosing the scenario/phenomena that best fit our Learning Performance.”
- “difficult to find the exact scenario that best fulfills the goals of the Learning Performance”

Figure 2. Example of coding of reflection prompts, focused on writing the assessment task.

Significance

While our work is in an early stage, we believe our PLC design approach and potential outcomes offer novel and promising ideas for promoting teachers’ capacity to use multi-dimensional assessments formatively. The combination of (a) the professional development structure, with teachers jointly developing assessments for classroom use and advancing their own assessment literacy, along with (b) our initial attempts to code the teachers’ reflections, using open and axial codes, will both be topics for productive discussion.

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Acknowledgments

This work is supported by grants from the U.S. National Science Foundation: DRL 1813737 and 1813938.

The Interdisciplinarity of the Learning Sciences, 14th International Conference of the Learning Sciences (ICLS) 2020

June 19-23, 2020, Nashville, Tennessee
Vanderbilt University.

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www.isls.org

ISBN: 978-1-7324672-8-6 (Volume 4, PDF Version)

ISSN: 1573-4552

Cite as: Gresalfi, M. and Horn, I. S. (Eds.). (2020). *The Interdisciplinarity of the Learning Sciences, 14th International Conference of the Learning Sciences (ICLS) 2020, Volume 4*. Nashville, Tennessee: International Society of the Learning Sciences.

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