

Beyond the Design of Assessment Tasks: Expanding the Assessment Toolkit to Support Teachers' Formative Assessment Practices in Elementary Science Classrooms

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Abstract: Teachers experience challenges in effectively using formative assessment practices in their classrooms. In the US, only 28% of elementary teachers report using formative assessment. This study highlights the need to design resources to meet teacher needs and support teachers in making sense of assessment information to inform three-dimensional learning and teaching. By surveying and interviewing five elementary school teachers, we identified specific barriers in using assessment information and 10 key needs from resources designed to support their formative assessment practice in science.

Introduction

Formative assessment practices are important in advancing student learning but difficult to implement (Hattie & Timperley, 2007; Heritage, Kim, Vendlinski & Herman, 2009). Formative assessment applies to the function assessments serve in providing evidence that can be used to support and inform instructional adaptations (Black et al., 2003). To engage in the practice of formative assessment, teachers must use evidence from student responses to determine where students “are in their learning, where they need to go and how best to get there” (Assessment Reform Group, 2002; pp. 1-2). Historically, science education has been inadequate in elementary classrooms (Trygstad, Smith, Banilower, & Nelson, 2013). Elementary schools tend to restrict science instructional time in favor of English language arts (ELA) and math. Given lack of emphasis on science instruction, elementary grade teachers' experience with implementing instruction and formative assessment that is in line with the Next Generation Science Standards (NGSS) (NGSS Lead States, 2013) is limited. Only 28% of elementary school teachers reported using formative assessments to monitor student learning in science (Smith, 2020). To better understand how to support teachers' formative assessment practices, this study explores the following research question: *What do elementary teachers need from resources designed to assist them in making sense of student responses on 3D science assessments?*

Theoretical framing

The formative assessment framework proposed by Wiliam and Thompson (2007) conceptualizes five key strategies for successful formative assessment: (1) clarifying and sharing learning intentions and criteria for success; (2) engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding; (3) providing feedback that moves learners forward; (4) activating students as instructional resources for one another; and (5) activating students as the owners of their own learning. We use this framework to categorize what teachers need from resources designed to aid their formative assessment practice.

Methods

This study is part of a larger project that aims to design and use 3D assessment tasks to help build elementary teachers' capacity to instruct and formatively assess in science. These tasks are developed to measure the 3D performance expectations (PEs) of the NGSS. The five teachers who participated in this study are collaborators in the larger project and were invited to provide feedback on rubric design. These teachers have at least 5 years of experience teaching at upper elementary grades (3–5) and used an NGSS-aligned curriculum.

Data and analysis

Our data consisted of (1) a survey about making sense of assessment information by using resources such as rubrics, (2) a focus group on what teachers find important and useful, and the barriers they face in using resources designed to make sense of assessment information, and (3) individual interviews with teachers to gather feedback on an initial rubric design. We examined the data for emerging themes that would help in identifying key resources

for teachers. We first enacted an open coding approach followed by focus coding to develop themes from our data (Maxwell, 2013), then created conceptual categories in which claims were grounded in data (Emerson, Fretz, & Shaw, 2011).

Findings and discussion

In math and ELA, teachers report frequently using rubrics for two key purposes: (a) to grade student work and (b) monitor student progress over time and on multi-day projects. In science, teachers do not tend to use resources such as rubrics, citing the lower prioritization of science, which led to lower instructional time and fewer assessment opportunities in science. Teachers reported that students have not had adequate opportunities to learn and are wary of using rubrics which will rate a majority of the students on the low end of the scale. In addition, given the lack of in-depth experience with 3D learning targets, it is often not clear to teachers how to make sense of information about students' 3D learning that is contained in resources such as rubrics.

We identified 10 key needs of teachers that should be addressed by resources that accompany assessment tasks. We have categorized them under the key strategies for successful formative assessment practice and highlighted how we will address these needs through resources designed within our larger project.

Of the resources suggested, we gathered feedback from teachers on the initial design of an analytical rubric through individual interviews. The multi-component feature in the rubric provides a fine-grained picture of what students know and can do and allows teachers to focus on a targeted aspect of 3D learning. One major feature in our rubric design is that we have separated evaluating the student response based on criteria from determining proficiency level. By delineating these two, teachers can focus more on whether a student response has met a given criterion and not focus on what it means with respect to proficiency. After evaluating a response on all the criteria, the level of proficiency can be determined by tying the criteria back to the proficiency being measured. Teachers noted that applying the criteria to student responses was straightforward and quick. Teachers reported that they were able to concentrate on whether a criterion was met without making a simultaneous determination about students' proficiency level. This facilitated consistent use of the criteria to make claims about student proficiency. Most teachers said this allowed them to be more objective and consistent in applying the criteria and determining student proficiency. While grading was not the focus of the rubric, all teachers mentioned that it would be straightforward to use this design for grading, if need be.

Significance of the work

This work provides insight into the needs of teachers in resources accompanying an assessment and the use of information from the assessment to make 3D claims about what students know and can do. High-quality assessment resources that address teacher needs can positively impact teachers' use of these resources to make sense of student learning. As a result, teachers will have better insight into what students know and can do, and can make instructional decisions to support 3D learning for all students. Absent accompanying resources that address their needs, teachers are unlikely to use the assessment effectively to guide practice.

References

- Assessment Reform Group. (2002). *Assessment for learning: 10 principles: Research-based principles to guide classroom practice*. University of Cambridge, School of Education.
- Emerson, R. M., Fretz, R. I., & Shaw, L. L. (2011). *Writing ethnographic fieldnotes*. University of Chicago Press.
- Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81-112.
- Heritage, M., Kim, J., Vendlinski, T., & Herman, J. (2009). From evidence to action: A seamless process in formative assessment. *Educational measurement: issues and practice*, 28(3), 24-31.
- Maxwell, J. A. (2012). *Qualitative research design: An interactive approach*. Sage publications.
- NGSS Lead States. (2013). Appendix F of the Next Generation Science Standards: For states, by states. National Academies Press.
- Smith, P. S. (2020). *2018 NSSME+: Trends in U.S. science education from 2012 to 2018*. Horizon Research, Inc.
- Trygstad, P. J., Smith, P. S., Banilower, E. R., & Nelson, M. M. (2013). *The Status of Elementary Science Education: Are We Ready for the Next Generation Science Standards?* Horizon Research, Inc.
- Wiliam, D., & Thompson, M. (2007). Integrating assessment with instruction: what will it take to make it work? In C. A. Dwyer (Eds.) *The future of assessment: shaping teaching and learning* (pp. 53-82). Lawrence Erlbaum Associates.