Without a Map, You're Lost: Using an Assessment Framework to Improve Research

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Introduction

The design of high quality science assessments is essential to building high quality science instructional programs. If we can't research and measure progress effectively, how will we know when it occurs? This presentation discusses two familiar frameworks: the assessment triangle created by National Research Council (NRC 2001) and the BEAR Assessment System (Wilson 2004) and demonstrates how the use of a flexible assessment design framework improves the task of refining research questions, creating learning progressions, and designing assessments.

The NRC Assessment Triangle

In 2001, the National Research Council published Knowing What Students Know: The Science and Design of Educational Assessment (2001). Any assessment is based on three interconnected elements or foundations: the aspects of achievement that are to be assessed (cognition), the tasks used to collect evidence about students' achievement (observation), and the methods used to analyze the evidence resulting from the tasks (interpretation). To understand and improve educational assessment, the principles and beliefs underlying each of these elements, as well as their interrelationships, must be made explicit (NRC 2001).

The BEAR Assessment System: Four Building Blocks

In Constructing Measures (Wilson 2004), a much more detailed assessment design approach is presented that is organized around four building blocks within a highly iterative instrument design process. One of the most promising and relevant features of Wilson’s approach is its reliance on a single explicit developmental construct as the first building block in the process.

Mapping Research Questions

The San Francisco Unified School District identified, among several priorities, the science achievement of English Language Learners and how literacy and language challenges can serve as barriers to accessing math and science content in middle school:

"How can we overcome literacy and language challenges?"

Current Study

Content for this presentation comes from a current multi-year collaboration between the San Francisco Unified School District middle school science teachers, the Berkeley Evaluation and Assessment Research Center (BEAR Center), Stanford University, and the Strategic Education Research Partnership (SERP)

http://portal.sfusd.edu/template/default.cfm
http://bearcenter.berkeley.edu/
http://www.stanford.edu/
http://www.serpinstitute.org/

Mapping Learning Progressions

One draft of a learning progression co-developed with middle school science teachers in the San Francisco Unified School District is shown below.

Mapping Heat Transfer Items

The design of items (items design) and a plan for scoring student responses (outcome space) are the second and third building blocks. It requires the items to be "aimed" at or mapped onto the learning progression (construct) to answer the following research design questions:

"What questions, tasks, or performances will best reveal student knowledge and ability, and what is our plan for interpreting and scoring student responses?"

Interactive Sandbox!

Testing New Item Types

Item: Draw and label an example for each type of heat transfer:

- Is being able to generate scenarios part of "understanding" HT?
- Does a drawing require less "language" and more "science"?
- How will we make sense of student responses?
- Will our data analysis plan tell us how our items are performing?

Contact Information

I am always pleased to hear from other researchers working on issues in assessment, science education, and instrument design.

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