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Study Goals

The study examines 1) the ways elementary teachers know and use the Michigan GLCEs and 2) whether elementary teachers plan lessons that integrate content and process standards in ways that align with science education reform.

Study Rationale

The mismatch between elementary teachers’ understanding of science teaching and reform-based ideas presents a significant barrier to successful implementation of inquiry-based pedagogy in elementary classrooms. Because “...in learning science one must come to understand both the body of knowledge and the process by which this knowledge is established, extended, and revised” (NRC, 2007), there is a need to study the ways elementary teachers integrate lists of content and process standards when planning instruction, so that professional development can better target the areas that elementary teachers need the most support in using these documents.

Study Methods

• 15 elementary teachers completed a survey about how they use state standards in plan instruction.
• In semi-structured phone interviews, four teachers were asked to provide examples of how they would use content and process standards, either separately or together, in classroom instruction.
• HyperResearch software was used to transcribe and code the interviews using an open coding methodology (Strauss and Corbin, 1998) at the sentence and paragraph level.

Data Collection

Sample Survey Item:
LEV.05.11 Explain how behavioral characteristics (adaptation, instinct, learning, habit) of animals help them to survive in the environment.

How would you explain this GLCE to a parent?
Since the predictions about whether or not something is a producer or consumer engages students’ prior knowledge, Teacher C does not specify how students will learn about the energy roles of animals by engaging in these processes.

For example, it is unclear what information students would need to find on the computer and what they would need to interpret in order to better learn the content.

How Teachers Integrate Content and Process Standards

Teacher A
The GLCEs she selected:

How she planned to use them:

Teacher B
How she planned to use them:

Teacher C
How she planned to use them:

References


Implications for improving standards documents and professional development for practicing teachers:

• State standards documents should provide clear examples of how to integrate both content and process standards.

• Curricular units like BioKIDS, can help teachers identify well-integrated examples of content and process standards by including supports in teacher curriculum materials.

• Professional development workshops can offer opportunities for elementary teachers to evaluate district resources, textbook activities, and online lessons to recognize and evaluate evidence of weak and strong connections between content and process standards in these documents.

Conclusions & Implications

Michigan state standards documents mention the need to work with both content and science process standards: “The skills and content addressed in these expectations will, in practice, be woven together into a coherent, science curriculum.” However, this statement does little to support teachers in actually meeting this goal while planning to teach.

The lack of attention to how engaging students in particular science processes supports their understanding of scientific content concepts was also prevalent in the semi-structured interviews.