

# Applying a Cognitive Theory of Learning to Teachers' Knowledge Development

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## Introduction

This poster presents evidence of teacher learning following participation in *targeted professional development*, an approach designed to support teachers as they use technology enhanced science modules in their inquiry instruction. The modules were developed at the center for Technology Enhanced Learning in Science (TELS). Teachers receive support during iterative cycles of planning, enactment and reflection as they implement the modules in their classrooms. Targeted support provides the *type* of support that teachers need *when* they need it. This approach insures successful module implementation and supports teacher learning.

Targeted professional development is based on the *knowledge integration theory* (Linn & Hsi, 2000, Linn, et al., 2006). Knowledge integration emphasizes the links between new and existing ideas as evidence of teacher learning (Davis, 2004; Davis & Varma, in preparation). When new ideas are encountered, teachers re-evaluate and re-organize their knowledge to incorporate the new ideas. As they do this, they form links among the ideas in their repertoires. Teachers who participate in targeted professional development should develop an integrated understanding of inquiry instruction, student learning and technology-enhanced modules.

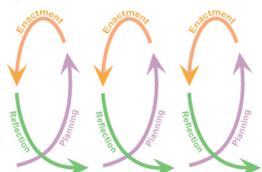


Figure 1: Targeted professional development model.

## Method

Middle and high school teachers enacting TELS modules participated in 26-item interview. Twenty-six teachers participated in year one and 36 teachers participated in year two. Interviews were transcribed verbatim and coded for content and evidence of knowledge integration.

## Results

During year two, more teachers show evidence that they are reflecting on student learning. Figure 2 (a) shows that in

year two more teachers used the on-line assessment tools to measure student learning. Figure 2 (b) shows that they are engage in interactive, formative assessment that allows them to change their teaching practice to meet the learning needs of their students.

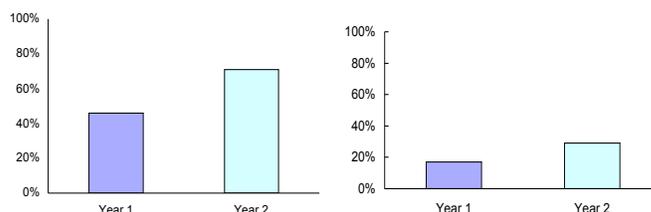


Figure 2: (a) Percentage of Teachers Using On-line Assessment Tools. (b) Percentage of Teachers Engaging in Interactive Assessment

After teachers develop more expertise with technology-enhanced instruction, they begin to focus on how it specifically impacts student learning. Case study comparisons show that some teachers have multiple links in their knowledge about teaching, student learning, and assessment while others have isolated ideas. A teacher with a more integrated understanding of their teaching practice, student learning and assessment reflected on her practice by saying, "I graded as we went along so I could anticipate problems and clarify things because it was good for me to know what they were putting in there and guide them and give them a chance to go back and fix their answers." - Middle School Life Science Teacher. The following response reveals a more isolated understanding with no links between ideas. "The kids that got it all done, I gave them most all the credit, simply because they actually did it." - High School Physics Teacher.

## Discussion

This research documents the development of teacher knowledge using a cognitive framework that shows the content and the quality of their knowledge structures. The knowledge integration framework shows the nature of teachers' ideas about teaching, assessment, and student learning. Ongoing research is examining the relationship between teachers' knowledge integration and student learning data.

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