# Designing an Online Learning Environment for New Elementary Science Teachers: Supports for Learning to Teach

Elizabeth A. Davis, Julie Smithey & Debra Petish
University of Michigan ~ 610 E. University Ave., 1323 SEB ~ Ann Arbor, MI 48109-1259
Tel: (734) 647-0594, Fax: (734) 763-1368
Email: [betsyd, jsmithey, dpetish] @umich.edu

Elementary teachers have a tremendous impact on their students' future learning. Yet because of the high demands put on them, elementary teachers often demonstrate weak subject matter knowledge in science (Anderson & Mitchener, 1994) and lack confidence in teaching science (Cochran & Jones, 1998). Likewise, prospective and new science teachers face many challenges, including that they may hold little pedagogical content knowledge (van Driel, Verloop, & de Vos, 1998). Thus new elementary science teachers need support, and it is critical to understand how best to provide that support. In our extended white paper (available at http://www.umich.edu/~betsyd) we present a design narrative describing CASES (Curriculum Access System for Elementary Science; available at http://cases.soe.umich.edu). CASES, a technology-mediated learning environment supporting new elementary science teachers as they learn to teach inquiry-oriented science more effectively, incorporates inquiry-oriented unit plans that are intended to be educative for teachers, as well as a personal online journal and an online teacher community discussion space. CASES is grounded in three main design principles that we present here.

CASES' *Guidance on Demand* principle states that designers of learning environments for teachers should transform an instructional resource into a learning environment through guidance-on-demand by incorporating educative curricula features such as hints about learners, instructional representations, science content, and science inquiry as well as prompts for productive reflection-on-action. Providing learners with guidance on demand allows learners to request the guidance they want at the time they want it, allowing a "just in time" approach to providing help. Second, our *Images of Inquiry* design principle states that designers of learning environments for teachers should provide useful images of inquiry by incorporating multiple representations of inquiry, in narrative, graphical, and tabular form, and grounded in the curriculum materials themselves. It is important in any learning environment to provide learners with multiple representations of what the learner is intended to understand, and a main goal of CASES is for teachers to develop an improved understanding of what it means to teach through scientific inquiry. Finally, CASES' *Social Supports* design principle states that designers of learning environments for teachers should provide social supports for learning by incorporating a supportive community grounded in the study of practice and images of role models struggling with and solving new teachers' typical problems. Teacher communities provide opportunities for expertise development as well as identity development. When a community has access to diverse perspectives, distributed expertise can develop. Thus social supports are essential for teacher learning.

Our ongoing work investigates how preservice and new teachers use these supports and others, so we can continue to refine these design principles. Such research informs the field's understanding of strategies for supporting new teachers as well as our understanding of new teachers' cognition and development more broadly.

## References

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