

Knowing and Learning in Mathematics and Science

A traditional certification program typically includes, early on, a general-purpose educational psychology course. While similarly placed in the FSU-Teach program, the Knowing and Learning course was developed as a significant alternative to such an all-inclusive, all-things-to-all-people course. Rather than pursue very general claims about knowing and learning across disciplines and ages and rather than being based on only one formal perspective (educational psychology), FSU-Teach's Knowing and Learning course is intended to focus on knowing and learning in secondary mathematics and science as understood from a multidisciplinary perspective. The course stands on the premise that formal research on knowing and learning in mathematics and science has emerged, in itself, as a robust line of inquiry and design. This line of inquiry has tended to be situated relative to classroom practice and draw on significant insights from many fields of inquiry, including psychology, anthropology, critical literacy, sociology, biology, linguistics, neuroscience, philosophy, developmental theory, artificial intelligence, and the domains of mathematics, science, and computer science proper. Some now call this integration of domains a "learning science" perspective.

This course is not simply a general survey of theories of mathematical knowing and learning. Instead, the primary goal of Knowing and Learning is to provide students with the opportunity to identify theories and employ these theories to guide their own practice. FSU-Teach is committed to the idea that practice and theory build on each other. Any teaching practice is guided by some theory of how people learn. If students are not aware of this, they are likely to adopt teaching practices without considering the full implications of theory behind them. FSU-Teach wants its students to be thoughtful and reflective practitioners.

Course Procedures: Knowing and Learning

The Knowing and Learning course typically starts with students examining ideas of what it means for an individual to know or understand something. Students then take a close look at domain-specific understanding in science and mathematics and the different ways of looking at students' ideas. The course then broadens to consider learning as a social activity. Issues of student identity, agency, and participation are emphasized as learning is considered in this broader incarnation. Finally, the view of learning expands beyond the classroom to consider how instruction either increases opportunities and justice for all students or perpetuates the privileges of a select group, particularly the way that standardized testing does or does not enhance opportunities. This expansion to the group or classroom as the unit of analysis and design is intended to lay the foundation for the focus of the next course in the FSU-Teach sequence, Classroom Interactions.

The Knowing and Learning field experiences typically consist of a number of different rounds of one-on-one interviews with learners who are engaged in a problem-solving activity. Students typically interview a number of children, peers, and experts about how they would approach specific problems in mathematics and science extracted from the research literature. Students record and transcribe the interviews and analyze the

problem-solving activities.

Course Objectives: Knowing and Learning

Students Will Be Able To:

Articulate various standards for knowing science and mathematics and articulate the implications of these standards for assessment, especially standardized assessment

Describe how knowing and learning are structured and how what people know changes and develops

Describe various paradigms for evaluating science and mathematics understanding

Describe the links between knowing and developing in learning theory and the content and evolution of scientific ideas

Complete three mini clinical interviews with an expert/novice pairing on a topic

Express informed opinions on current issues and tensions in education, especially as they relate

Evidence (Student Products)

Meaningful contributions to class discussions
Comments posted about analysis of readings
Analysis of clinical interviews
Written examinations

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Comments posted about analysis of readings
Analysis of clinical interviews
Written examinations

Meaningful contributions to class discussions
Comments posted about analysis of readings
Written examinations

Meaningful contributions to class discussions
Comments posted about analysis of readings
Analysis of clinical interviews
Written examinations

Report including transcription and analysis of clinical interviews
Rubric given to students before clinical interview to clarify what will be assessed

Meaningful contributions to class discussions
Comments posted about analysis of

to mathematics and science
instruction

readings
Analysis of clinical interviews
Written examinations