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The Power of Schemas: Math Teachers on Teaching

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The Power of Schemas
Math Teachers on Teaching

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Basis for Research

• Common Core
  • Problem-solving
• Critical thinking
• Student-centered pedagogy
• Challenge of transitioning from traditional to student-centered practices in mathematics classroom

On Teaching Mathematics

“...no attempt is made to show the student any of the ways he can put what he is learning to practical use.” (Crawley, 1896, p. 155)

“Too much focus is on learning procedures without any connection to meaning, understanding or application...” (National Council of Teachers of Mathematics, 2014, p. 2)
Educational Reform Research
- Lack of skills
- Extrinsic Influences

Application of schema theory to educational reform

Schemas
- Cognitive Anthropology definition
  - Schemas are an amalgam of the experiences that shape our thinking and influence the way we interpret a situation and make meaning of it. (D'Andrade, 1987; Strauss & Quinn, 1997/2001)

Schemas
- Schemas are shared, largely tacit understandings
  - Example: Teacher as Authority
  - Stereotypes
    - What does a teacher look like?
Research Questions

For novice mathematics teachers, what are their shared schemas of
• teacher traits?
• student-centered methods?
• teacher-centered methods?
How do the schemas interface with each other?

Research Participants

• 5 novice mathematics teachers
• Same dual major program: mathematics and education
• Intensive student-centered training
• Classroom experience began in first year
• Support system
Discourse Analysis
- Sequential interviews, everyday conversation (Seidman, 2013)
- Traditional educational roots
- University student-centered pedagogy

Post-Interview: coded and analyzed transcripts, extracted and categorized participants’ metaphors and reasoning (Quinn, 2005)

Shared Schemas
- Role of Teachers: Authority, Motivator, Caretaker, Competent, Different
- Teacher-centered/Traditional
- Student-centered
- Interaction between schemas
  - Authority as law vs. authority as facilitator
  - Implies traditional authority= bad; student-centered authority= good

Value Statements
“Today I was lame . . . Today I just lectured”
- Causal statement reflecting deeper reasoning
- Participants felt guilt when using traditional teaching methods
Value Statements

“Well, for teacher-centered, traditional [methods], you pretty much need the students to shut up.”

- Participants expressed judgement of traditional teaching

“...he was very traditional, but I would say he was a good teacher.”

- Cognitive Friction
- Contradictory schemas activated in the same context

Reconciling Discrepant Schemas

- Options for discrepant schemas (Strauss, 2001)
  - Choose one, reject the other
  - Select parts from each and integrate into one
  - Ambivalence with no working compromise

- All participants integrated schemas to different degrees
  - Balance between teacher- and student-centered
  - Unique hybrid teaching schema
Unique Individual Teaching Schema

“I think the best way to teach is a little bit of both.”

“Right now, I’m not completely committed [to student-centered], but my belief is that you should do it as much as you can.”

Conclusion

• Schemas are not easily created or altered
• Schemas are a clue to intrinsic barriers to educational reform
• Conflicting schemas can coexist
  • Teachers create their own individual teaching schemas to accommodate discrepant schemas
• Schema theory may account for differences in teaching practices and difficulty in educational reform