

What's the probability of teaching statistics?

Raymond C. Johnson and Susan Thomas



Background

The Common Core State Standards (CCSS), now adopted by 41 states, include more statistics content in the middle school grades than previous standards. If the CCSS are to be implemented as designed, we need to better understand how and why teachers might change their practice to include the new content.

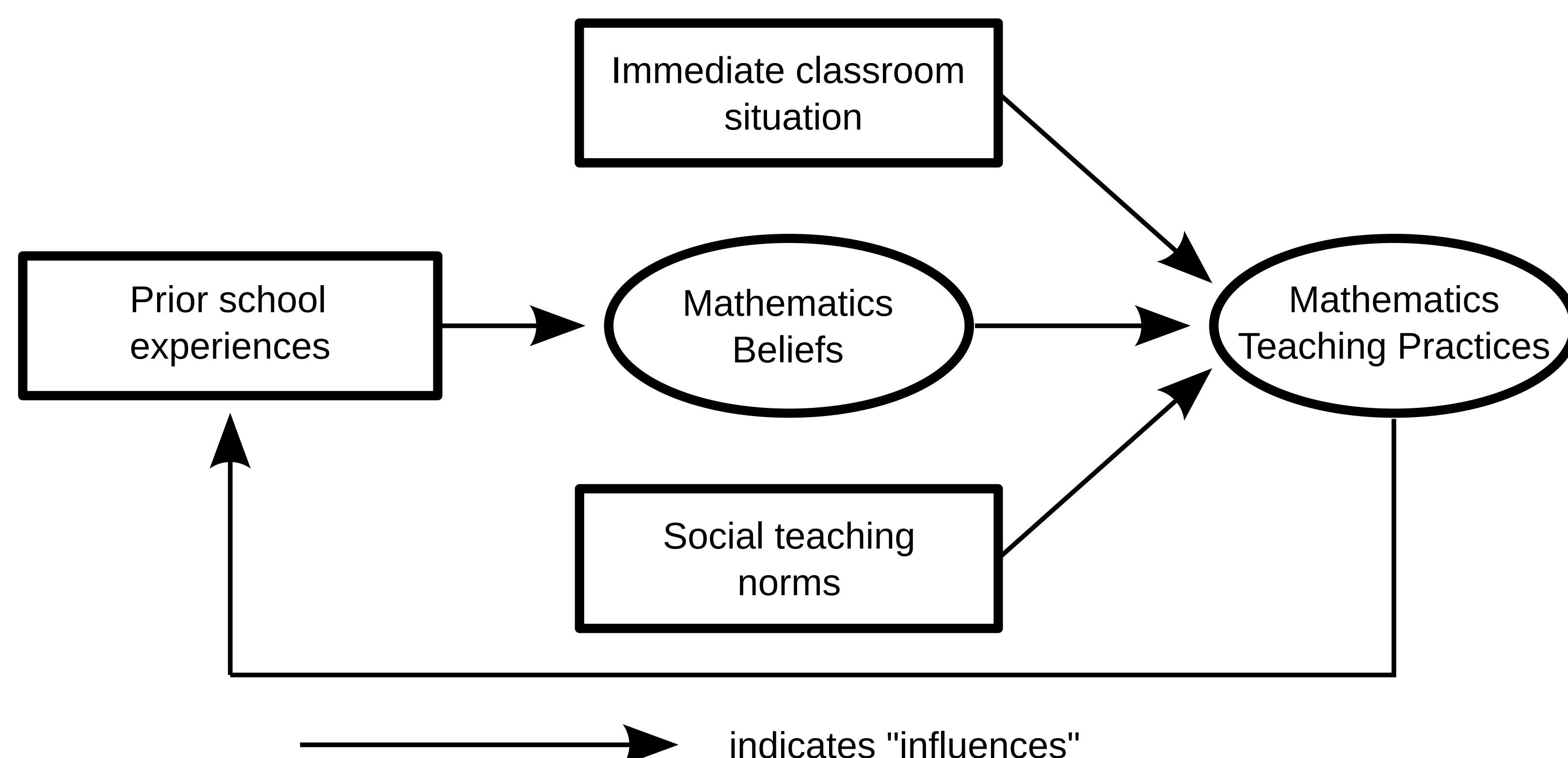
Research Question

How do middle school mathematics teachers' experiences and beliefs, social teaching norms, and immediate classroom situations affect the potential adoption of the statistics content of the Common Core State Standards?

Participants

This study involved two middle school math teachers from a small, high-performing charter school along Colorado's Front Range. Carl, the Pre-Algebra teacher, came to teaching after earning a graduate degree in engineering and having a career in industry. Francis, the Algebra teacher, was trained to be a teacher but also has had a career in industry. Each teacher took at least two statistics classes in college and both have taught 4-8 years.

Anne M. Raymond's (1997) Model of Mathematics Beliefs and Teaching Practices



Prior school experiences: as a student, prior teachers, teacher preparation program, prior teaching experiences

Immediate classroom situation: the students, the mathematics topic at hand, time constraints

Social teaching norms: the school setting, the curriculum, coteachers, parents of students

Mathematics teaching practice: mathematical tasks, discourse, environment, evaluation

Key Findings and Evidence

Teachers' opinions about the importance of statistics vary.

Francis: "They're not going to have to have a lot of statistics as they're taking calculus." (2/7)

Carl: "I think that having a society that understands significance, you know, voting-wise or knowing demographics...we're applying statistics all the time." (2/7)

Carl: "I would rather that we actually had a stats unit. You know, like a real unit." (2/14)

Teachers' comfort with and knowledge of statistics influences their decision to teach it.

Carl: "I've taken, one...two...I think three graduate-level stats courses. [...] It would be neat to have a little project where you could have something based on exit polls or national elections, something [students] can understand." (2/14)

Francis: "I never studied this kind of thing, you know. [...] It just makes me feel stupid, and I'm not stupid. I was talking to my Pre-Calculus students this morning about the polar form of a conic. But I read that [a CCSS standard] and I feel dumb." (3/25)

Teachers question the motivations to include more statistics in standards.

Francis: "Why do people feel like it's important for 6th graders to understand the spread of a data set?" (3/25)

Carl: "I'm not trying to say it's right or wrong, but, you know, [I think this comes from] trying to understand that we're a mixed population and that kind of thing." (3/25)

Francis: "I think the standards were written with a science bias. When [the NCTM Standards] were written, the NSF had a say in that because it was their money." (2/7)

The positive and negative results of standardized testing motivate teachers to change their practice.

Carl: "I'm interested to see what the CSAPs have with the new math standards. I really am. I'm interested to see how we score based on stuff like this. We might say 'Wow, we really need to step it up in statistics,' because our kids don't understand samples or that kind of thing." (2/14)

Francis: "I came in and looked at the data and said, 'Whoa! Our CSAPs are low in statistics. What can I cut out?' I cut some stuff out so I could get a week to [probability and statistics]. I have a week with all that and our scores went up." (3/25)

Approach

Each teacher was interviewed twice individually. The first interview addressed experiences with statistics as a student to understand each teacher's "apprenticeship of observation" (Lortie, 1975) and how college coursework or pre-service teaching experiences influenced the beliefs formed by that apprenticeship (Grossman, 1991). The second interview focused on the statistics content of the CCSS. A third interview was conducted with both teachers and researchers as a group and addressed grade-by-grade transitions in the CCSS. Each teacher was also observed 2-3 times teaching classes. Curriculum maps, handouts, and school philosophy materials were collected as artifacts. The data were coded with a focus on statistical experience, comfort, and a willingness to use standards.