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Study examines professional learning's potential to change how teachers think about student learning

▶ AT A GLANCE

Professional development on learning trajectories in mathematics has potential for transforming how teachers talk about their students as learners.

▶ THE STUDY

Wilson, P., Sztajn, P., Edgington, C., Webb, J., & Myers, M. (2017). Changes in teachers' discourse about students in a professional development on learning trajectories. *American Educational Research Journal, 54*(3), 568-604.

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▶ WHAT THE STUDY SAYS

Teacher discourse patterns about students' learning in mathematics reflect teachers' beliefs and expectations about student learning. These beliefs have the capacity to limit or enhance a teacher's instructional agency. This study focused on professional development as a vehicle for changing teacher thinking and examines discourse patterns as a viable indicator of how teachers think about student learning changes over time. How teachers think about students as learners affects teachers' expectations of and their interactions with students. This study demonstrates that professional development has some potential to transform teacher discourse patterns.

STUDY DESCRIPTION

Researchers examined how teachers' discourse patterns as measured by speech acts and storylines changed over a yearlong, 60-hour professional development program. The study demonstrates that some storylines about students as learners of mathematics can be transformed or altered through professional development, while other positions are harder to change and may require more deliberate, direct actions guided by defined norms for how to talk about students as learners.

While some teacher storylines changed over time, the study's findings suggest that teachers add new understanding of how students learn mathematics to what they already understand rather than completely transforming their understanding.

QUESTIONS

Researchers sought to examine changes as a result of professional development in teacher discourse about students as learners. They posed two questions to guide the research study:

1. "Did teachers' public actions about students as mathematics learners change during the yearlong professional development on one learning trajectory?"
2. "If there were changes in teachers' speech actions, in what ways, and to what extent, did these changes also result in changes to existing positioning triads in the public, collective space of the professional development?" (p. 579)

METHODOLOGY

The researchers applied an explanatory sequential mixed methods design to answer the research questions. Using two theoretical frameworks, Vygotsky Space and Positioning Theory, both based on Vygotsky's theory of learning, they applied a method to analyze teacher discourse in professional development that extends beyond attendance and participation.

Their analysis of teacher discourse integrates both the words spoken as

▶ WHAT THIS MEANS FOR PRACTITIONERS

Researchers used best practices in professional learning as defined by Learning Forward's study *Professional Learning in the Learning Profession: A Status Report on Teacher Development in the United States and Abroad* (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009) to design the professional learning program. They emphasized collective learning, sustained over time, focused on content and content-specific pedagogy, and active participation, all attributes embedded in Learning Forward's Standards for Professional Learning (Learning Forward, 2011).

This study sheds light on two standards particularly well. The first is the **Outcomes** standard. Changing beliefs is a challenging professional learning outcome, yet one that impacts educator behaviors and potentially student opportunity to learn.

This study takes on the task of changing how teachers think about their students as learners and the cognitive behaviors that lead to student learning. It emphasized that learning is more than a body of knowledge and a set of skills. It defines the outcome for professional learning in terms that are deeper and often difficult to measure and yet significant for those involved in professional learning.

The second standard this study illuminates is the **Data** standard. It provides a way to measure change in teacher learning within the context of discourse such as what occurs in collaborative learning teams, professional learning communities, or other collective learning experiences. Examining speech actions, acts, storylines, and position triads as insights into changes in teacher thinking offers new possibilities for those interested in either summative or formative evaluation of the effectiveness of professional learning.

As researchers note, changing how teachers understand student thinking and how they learn mathematics unleashes potential for how they consider their own efficacy to teach mathematics and how their instructional actions will influence students' learning.

REFERENCES

Darling-Hammond, L., Wei, R.C., Andree, A., Richardson, N., & Orphanos, S. (2009). *Professional learning in the learning profession: A status report on teacher development in the United States and abroad.* Dallas, TX: National Staff Development Council.

Learning Forward. (2011). *Standards for Professional Learning.* Oxford, OH: Author.

well as the meaning behind the words to characterize an individual teacher's storyline, an explanation for how students learn. The analysis yields a measure of change in teacher thinking, and thus a measure of teacher learning.

Researchers engaged 22 elementary teachers from a single suburban school district in the Southeast. The school serves 600 diverse students. Teachers participated in a professional development course that included a 30-hour summer extended learning experience, monthly meetings, and a follow-up summer session in which teachers engaged in analyzing videos of classroom instruction, student clinical interviews, and student work samples on the equipartitioning learning trajectory.

Equipartitioning is the set of cognitive behaviors through which students learn to construct equal-sized parts or groups. Learning trajectories explain the progression in student thinking that occurs as students are learning about fundamental mathematical concepts and principles.

Drawn from the Learning Trajectory Based Instruction project, equipartitioning is one of the fundamental mathematics learning trajectories. During the yearlong program, teachers focused on 12 tasks to examine student learning and to construct their understanding of how students learn equipartitioning.

ANALYSIS

Researchers recorded each professional development session. In Phase 1 of the research, they quantitatively analyzed teachers' speech actions to determine if changes occurred over time. A speech action is what is spoken in the public domain within professional development discussion.

A speech action becomes a speech act when it is taken up by others

Researchers examined 322 speech actions that led to collective discourse, studied the discourse segments that followed the speech actions, and hypothesized what storylines emerged as principles of conventions in the discourse.

in a conversation and subsequently influences others' speech acts. From speech acts, shared narratives and storylines evolve.

Researchers hypothesize that when teachers engage in discourse with one another, they bring their individual narratives and positions into the public discussion. Changes in teachers' discursive patterns in public environments is a representation of their learning.

Data analysis for Phase 1 focused on 21 professional development learning tasks designed to engage teachers in discussion about students as learners of mathematics. They narrowed the study to 55 transcripts and 41 videos of teacher discussions and used multiple coders and checks for interrater reliability to analyze the discussions.

Coding focused on categories of speech actions — those that occurred in the public discussions — that explained students as learners of mathematics. The categories included fixed or innate ability, student age/grade level, luck, and amount of effort. The coded speech actions were then mapped to the sequence of the professional development to depict how speech actions changed over time.

Researchers hypothesized that speech actions that incorporated the learning trajectory would increase over time as the professional development unfolded and those without the learning trajectory would decrease over time.

In Phase 2, researchers engaged in extended qualitative analysis of teacher discourse in the public, collective environment of professional development. They examined 322 speech actions that led to collective discourse, studied the discourse segments that followed the speech actions, and hypothesized what storylines emerged as principles of conventions in the discourse. Researchers used constant comparison to summarize the storylines.

Researchers offer several examples. For instance, if a teacher says, "I didn't expect a 3rd grader to know that," the storyline might be that student ability in mathematics depends on age or grade level. The teacher position is that, from experience, a teacher knows what to expect of students at a certain age or grade level.

Student position is that their performance meets teachers' expectations based on their age or

grade. Researchers hypothesized that professional development would alter teachers' storylines from the ones they commonly hold about students as learners of mathematics to ones grounded in the learning trajectory they were studying.

RESULTS

Teachers' adherence to the four storylines of ability, age/grade, effort, and luck persisted through the year. There was a moderate statistically significant relationship between speech acts related to age/grade and ability and time.

Teachers continued to use speech actions related to age/grade, ability, effort, and luck throughout the year, although the speech acts coded as age/grade and ability changed to include more language and meaning of the learning trajectory as teachers engaged in more professional learning.

Phase 2 analyses of specific discussion episodes with age/grade and ability storylines provide further insight into the changes occurring in age/grade and ability speech acts as teachers engaged in more professional development. For example, age/grade speech acts began to include acknowledgement of students' prior experiences and opportunity to learn. Over time, teachers began to use a storyline that identified student age/grade as well as the influence of prior experiences, opportunities to learn, and other influences on students as learners of mathematics.

Changes in ability storylines over time shifted from characterizing students' ability as a fixed entity, that is, "She is a math genius" or "He is below level" to one that continued to incorporate the characterizations of who the student is as well as the language of the learning trajectory.

Unlike the changes described in the age/grade storylines, the meaning

Over time, teachers began to use a storyline that identified student age/grade as well as the influence of prior experiences, opportunities to learn, and other influences on students as learners of mathematics.

of the ability storylines did not change. While teachers included language of the learning trajectory into their public speech acts, they did not incorporate the meaning of the learning trajectory and continued to use the storyline that students as learners of mathematics were products of the teacher's perception of the students' fixed ability. Researchers note that the ability storyline is altered, yet not transformed.

A third finding emerged from the results of the Phase 1 and 2 analyses. It is that teachers may learn to use a learning trajectory for student thinking without reconceptualizing students as learners. This is evident in the changes that occurred in the ability storyline in Phase 2. Teachers integrated the learning trajectory into their speech acts, yet did not change how they viewed their students' ability to learn mathematics.

Researchers expected that leveraging professional development about learning trajectories to explain the cognitive behaviors or thinking students apply in learning mathematics would change teachers' discourse patterns about their students as learners of mathematics.

Further, by transforming teachers' storylines, researchers anticipate their instructional efficacy would change.

This study underscores the complexity of professional development required to produces changes in teachers' pre-existing storylines.

LIMITATIONS

Several limitations are noteworthy. The sample size is small and in a single school. While researchers have conducted parallel studies on the same constructs in other settings, the size and context of this study limit the implications for other subjects and contexts.

From the perspective of the design of the professional development, researchers identify changes they would integrate into future professional development, such as including more norms for how to talk about students as learners and more direct approaches.

From a technical aspect, discussions about the statistical analyses used in the Phase 1 analyses need further explication. Results of analyses are difficult to decipher because they lack sufficient explanation. Authors provide some examples of their coding scheme, speech acts, storylines, and positioning triads, yet more would enhance the explanation of each. ■