

Mathematics Professional Development: Uptake and Impacts on Classroom Practice

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Abstract : Although studies of teacher professional development (PD) are prevalent, surprisingly most have only produced incremental shifts in teachers' learning and their impact on students. There is a critical need to understand what teachers take up and use in their classroom practice after attending PD and why we often do not see greater changes in learning and practice. This paper is based on a mixed methods efficacy study of the Learning and Teaching Geometry (LTG) video-based mathematics professional development materials. The extent to which the materials produce a beneficial impact on teachers' mathematics knowledge, classroom practices, and their students' knowledge in the domain of geometry through a group-randomized experimental design are considered. Included is a close-up examination of a small group of teachers to better understand their interpretations of the workshops and their classroom uptake. The participants included 103 secondary mathematics teachers serving grades 6-12 from two US states in different regions. Randomization was conducted at the school level, with 23 schools and 49 teachers assigned to the treatment group and 18 schools and 54 teachers assigned to the comparison group. The case study examination included twelve treatment teachers. PD workshops for treatment teachers began in Summer 2016. Nine full days of professional development were offered to teachers, beginning with the one-week institute (Summer 2016) and four days of PD throughout the academic year. The same facilitator led all of the workshops, after completing a facilitator preparation process that included a multi-faceted assessment of fidelity. The overall impact of the LTG PD program was assessed from multiple sources: two teacher content assessments, two PD embedded assessments, pre-post videotaped classroom observations, and student assessments. Additional data were collected from the case study teachers including additional videotaped classroom observations and interviews. Repeated measures ANOVA analyses were used to detect patterns of change in the treatment teachers' content knowledge before and after completion of the LTG PD, relative to the comparison group. No significant effects were found across the two groups of teachers on the two teacher content assessments. Teachers were rated on the quality of their mathematics instruction captured in videotaped classroom observations using the Math in Common Observation Protocol. On average, teachers who attended the LTG PD intervention improved their ability to engage students in mathematical reasoning and to provide accurate, coherent, and well-justified mathematical content. In addition, the LTG PD intervention and instruction that engaged students in mathematical practices both positively and significantly predicted greater student knowledge gains. Teacher knowledge was not a significant predictor. Twelve treatment teachers self-selected to serve as case study teachers to provide additional videotapes in which they felt they were using something from the PD they learned and experienced. Project staff analyzed the videos, compared them to previous videos and interviewed the teachers regarding their uptake of the PD related to content knowledge, pedagogical knowledge and resources used. The full paper will include the case study of Ana to illustrate the factors involved in what teachers take up and use from participating in the LTG PD.

Keywords : geometry, mathematics professional development, pedagogical content knowledge, teacher learning

Conference Title : ICMEELS 2019 : International Conference on Mathematics Education and Learning Sciences

Conference Location : Sydney, Australia

Conference Dates : January 30-31, 2019