2014

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Mathematics Academies 2011-2013

Cohort 1 Evaluation Study

We examine the quality and impacts of professional development (PD) provided to the first cohort of participants in the Mathematics Academies Initiative, a collaboration of the Office of Special Programs, RESAs, and Carnegie Learning, Inc. Cohort 1, which initially included 119 members (primarily special educators) focused on proportional reasoning in 2011-2012. In 2012-2013 the 77 returning participants worked on developing algebraic thinking.

Method of study. This mixed methods study used three instruments each year. Post-PD and end-of-year surveys collected perceptual information regarding the quality of various aspects of the academies; and changes in knowledge, attitudes, and practices related to mathematics and mathematical instruction. The Learning Mathematics for Teaching assessment (LMT) measured changes in mathematics content knowledge and instructional capacity.

Findings. For both years of Cohort 1, the Carnegie Learning trainers received the highest ratings of all the quality measures. Reaffirming these findings, the vast majority of comments about trainers were positive. Survey participants also gave excellent ratings for the overall quality of the PD, and high ratings for the academy materials—although not quite as high as the other ratings. Participants improved their attitudes and dispositions toward mathematics and mathematics teaching—especially their enjoyment of it, their sense of possessing the competence and knowledge they need to teach their students, and their confidence. Further, results also suggest many of the attendees implemented the skills and knowledge they gained as a direct result of the math academies. The Year 1 pre/post LMT data, revealed statistically and practically significant mathematics content and pedagogical knowledge gains for proportional reasoning, which substantiated self-reported gains. However, Year 2's algebraic thinking LMT did not yield statistically significant results and as a result, increases in knowledge or pedagogy reported by teachers could not be verified. An analysis of the design of the Mathematics Academies Initiative provided additional credence for its potential effectiveness in improving instructional practice—that is, the academies were structured to include four of five recommended research-based elements: (a) content and pedagogy focus; (b) coherence; (c) active learning; (d) sufficient duration and timespan. A fifth element, collective participation, was not part of Cohort 1's experience.

Limitations of study. The study was based on self-reported information, which has an innate risk of response bias. The study lacked a knowledge/pedagogy test for the high school teachers. There was no method available for linking gains made by Cohort 1 participants to the mathematics performance of their students.

Recommendations include (a) continue offering academy activities that have elements of effective PD; (b) encourage special education directors to recruit participants from counties unrepresented in Cohort 1; (c) review academy content and classroom examples to ensure their appropriateness for special education students and environments; (d) promote collective participation by recruiting coteaching pairs or teams from the same school or district; (e) continue to develop the algebra content knowledge and instructional skills of middle school special educators; and (f) explore ways to investigate if any correlation exists between the Mathematics Academies Initiative and gains in math among special education students.

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The Year 1 pre/post Learning Mathematics for Teaching assessment data, revealed statistically and practically significant mathematics content and pedagogical knowledge gains for proportional reasoning, which substantiated self-reported gains. However, the Year 2 algebraic thinking LMT did not yield statistically significant results.

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