ACME: Austin Collaborative for Mathematics Education, Annual Report, 1998-99

Executive Summary

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The *Austin Collaborative for Mathematics Education* (ACME) is a systemwide initiative to improve mathematics education in all elementary and middle school classrooms in the Austin Independent School District (AISD). This initiative, funded by the National Science Foundation (NSF) and the district, provides long-term, high quality professional development to build the instructional capacity of over 2000 AISD mathematics teachers. ACME professional development supports teachers as they implement the district's curriculum resources of *Investigations in Number, Data, and Space and Connected Mathematics* (CMP), which are aligned with the state standards for mathematics education in the Texas Essential Knowledge and Skills (TEKS) and the national standards set by the National Council of Teachers of Mathematics (NCTM). These standards focus on broadening the topics taught at all grade levels, developing children's mathematical thinking, and deepening children's conceptual understanding through concrete experiences (Russell, 1998). The standards contrast with traditional mathematics education characterized by rote memorization and computation practice.

District staff design ACME professional development to help teachers grow as a community of learners and to deepen their knowledge of mathematics content, pedagogy, and classroom management of standards-based mathematics instruction. AISD administrators expect every elementary and middle school mathematics teacher, including general education, special education, bilingual, and English as a Second Language (ESL) teachers, to participate in a coordinated series of ACME professional development activities. These activities include two years of summer institutes and follow-up days during the academic year.

To promote districtwide change in mathematics education, the ACME project bolsters leadership and the development of school cultures in which communities continually improve mathematics teaching and learning. ACME staff provide institutes for campus administrators to build knowledge of standards-based mathematics curriculum resources and instruction and to help campus leaders develop strategies for supporting teachers in implementation. ACME staff also work with other organizational structures in AISD that promote teacher leadership (e.g., curriculum specialists) to support the continuous improvement of mathematics education on campuses. In addition, the ACME project has customized professional development for teacher leaders so that they may facilitate sessions and support their peers on the campus level in a variety of ways, including peer coaching, demonstration teaching, and information sharing. To garner parent participation in the mathematics curriculum, the project staff provides schools with technical support (e.g., pamphlets and videos in English and Spanish) as well as assistance with organizing parent education and involvement (e.g., parent math nights). Additionally, the project staff enlists support from AISD's administrative leaders.

The purpose of this evaluation is to describe ACME professional development in its second year of implementation and to document changes since its inception. In particular, the evaluation focuses on (a) the roles and teamwork of ACME professional development facilitators, (b) teachers' experiences in ACME professional development, (c) effects on teachers' knowledge and skills, and (d) implementation of ACME.

Data were gathered through questionnaires completed by teachers and principals; interviews with teachers, ACME staff, and district administrators; observations of ACME professional development and of 50 mathematics lessons in AISD elementary and middle school classrooms; and examination of district documents.

ACME Professional Development Facilitators

Five categories of facilitators provided ACME professional development in the 1998-1999 school year and summer of 1999. The core ACME team provided the bulk of support to teachers and direction for the initiative. District mathematics staff supported the initiative by giving feedback to the core ACME team about the day to day realities of implementation and by facilitating ACME summer institutes. Facilitators from Michigan schools who piloted CMP in their classrooms provided summer institutes to middle school mathematics teachers. A consultant with Marilyn Burns Education Associates facilitated several sessions for a cadre of 30 elementary and middle school teachers. Elementary teachers who had participated in the cadre modeled lessons from Investigations for participants at ACME summer institutes.

Responsibilities of ACME team

The core ACME team provided districtwide leadership for the initiative. The main responsibilities of the ACME team were to design and implement ACME professional development, create resources for teachers such as assessment and planning tools, and organize materials for professional development. They developed collegial relationships with AISD teachers and administrators who participated in ACME professional development to support implementation. In addition, ACME team members provided campus support to eight pilot elementary schools, which involved modeling lessons, meeting with grade level teams, co-teaching, and mentoring teachers. Although some of these interactions were brief encounters that contained moral and professional support for implementation, the ACME team developed strategies that combined observation and professional conversations about children's thinking and pedagogy to help teachers improve their skills in standards-based instruction.

Teamwork

The ACME team addressed their own professional development as facilitators by attending conferences, sharing knowledge with team members through collaboration, and bridging on the expertise of others. Generally, team members improved their skills as facilitators. The ACME team reported that teamwork and collaboration were their primary source of support. The fuel for this teamwork was (a) a shared vision of reform in mathematics education through high quality professional development for teachers, meaningful mathematics for children, and the transformation of teaching culture into systemic, professional collaboration and (b) strong team leadership with a drive to constantly improve the quality of the work. The ACME team also received support from ample funding, a network of district specialists, and central office administrators, although support from campus administrators was mixed. ACME facilitators have become less defensive to the opposition to the initiative and more responsive to the needs of teachers who participate in professional development than before.

Recommendations for ACME professional development facilitators:

- Continue to develop team support through collaboration and the drive to improve the work of ACME.
- Continue to enlist the support of campus administrators for standards-based mathematics education.
- Continue to address teachers' needs through responsiveness, but evaluate priorities.

Teachers' Experiences in ACME Professional Development

Opportunities for Teachers

A key characteristic of ACME professional development was that facilitators designed sessions to address teachers' needs by providing sessions, for example, on how to plan lessons and model teaching investigations. This approach made teachers feel that facilitators improved follow-ups by listening to teachers. Teachers considered opportunities to share with their colleagues on campus and across the district to be an asset of ACME professional development. Some teachers had lively discussion about the implementation of standards-based curriculum resources, pedagogy, and mathematics content. Participating in ACME professional development also provided the opportunity for teachers to discuss standards-based pedagogy, content knowledge, and ways to foster children's thinking with ACME facilitators. Teachers also had opportunities to discuss and voice their concerns about district policies and practices concerning mathematics education at ACME sessions.

Teachers' Engagement in ACME Activities

The engagement of teachers in ACME professional development activities was not 100%. In observations, one-fourth to one-third of the tables had teachers who were not actively involved in the activities. Teachers who do not actively engage may be disgruntled or reluctant to participate in an initiative that they do not endorse. Some may be reticent in large groups, especially concerning topics new to them. Within ACME professional development sessions, facilitators may tackle low teacher engagement by communicating flexibility and expectations. Flexibility can create a context in which participants feel welcome to engage when they are ready and in whatever formats with which they feel comfortable. Facilitators' communicating the expectation that teachers will engage in activities within the session by asking probing questions and redirecting colleagues is another strategy for increasing what teachers take from sessions.

Other ACME Professional Development

Two professional development formats, campus support and teacher cadre, were offered to a small proportion of teachers who highly valued the opportunities. Teachers appreciated the mentoring and opportunities to talk with experts in standards-based instruction that campus support warranted. Although these interactions may pull teachers out of the isolation of teaching, it is important to note that reflective practice is necessary to improve instruction optimally. At teacher cadre meetings, teachers skilled in standards-based instruction could form professional relationships and engage in reflective discussions with similarly skilled colleagues. One shortcoming of these two professional development formats was that they touched few teachers in the district.

Recommendations for teachers' experiences in ACME professional development:

- Continue to provide high quality professional development in which teachers have opportunities to share with colleagues and experts in standards-based mathematics education.
- Address teachers' inactivity in professional development by asking engaging questions and communicating the expectation that teachers will participate.
- Continue to develop strategies of campus support that promote meaningful discussions and reflection about standards-based pedagogy that will help teachers improve instruction.

Effects on Teachers' Knowledge and Skills in Standards-Based Mathematics

Classroom Observations of Mathematics Instruction

Mathematics lessons were rated using the Classroom Observation Protocol (HRI, 1999b) on an 8-point scale ranging from ineffective to effective standards-based instruction (see definitions of ratings on p. 18 of report). Statistical analyses revealed less variability in the distribution of observation ratings and a trend of more effective instruction for trained teachers (i.e., 20 or more hours of ACME professional development) than for untrained teachers (i.e., less than of ACME professional development). However, number of professional development hours for teachers was not correlated with the observation ratings, which may be due to the different skills in standards-based instructions teachers have before they begin ACME. Features distinguishing effective and ineffective instruction were mathematics content knowledge and classroom culture.

Improving Teachers' Knowledge of Mathematics Content

ACME facilitators helped teachers improve their mathematics content knowledge by designing engaging problems for adult learners to solve that push teachers' understanding to higher levels. The ACME team also designed activities in which teachers develop their own computational strategies, analyze mathematics concepts in students' work, and encounter various topics such as measurement, algebra, and geometry infused throughout professional development activities. Although the ACME team tailored professional development activities to improve content knowledge, teachers did not have words to describe the content that they gained, especially teachers in elementary schools. Moreover, fewer teachers reported improvements in their mathematics content knowledge than did improvements in pedagogy and in the use of instructional materials. Assessment of the mathematics content knowledge that teachers gain in ACME professional development is lacking.

Improving Teachers' Knowledge of Pedagogy

To help teachers improve their knowledge of standards-based pedagogy and understand children's thinking, the ACME team launched various conversations in professional development. Facilitators modeled open-ended questioning strategies and asked teachers to talk about the approach, led book studies about pedagogy, discussed the instructional strategies and children's thinking in videos of AISD teachers skilled in standards-based instruction, and welcomed educators to reflect on their own teaching. The team also designed performance assessment rubrics and helped teachers learn how to implement them. These activities may be impacting teachers' knowledge of pedagogy. Teachers reported more standards-based instruction in their classrooms than in the previous academic year and articulately discussed the strategies. However, pedagogical knowledge does not necessarily transfer to pedagogical skills. Classroom observations of mathematics lessons taught by teachers who participated in ACME professional development reflected a range of skills in standards-based instruction.

Teachers' Learning How to Use the Instructional Materials

In the 1999-2000 academic year, all mathematics teachers will have their own standards-based curriculum resources, kit of manipulatives, and copies of student sheets because the AISD board of trustees agreed to fund these needs of teachers. ACME professional development activities that helped teachers learn how to use these materials included: (a) engaging in a scavenger hunt through the resources; (b) exploring games and the underlying mathematical concepts; (c) discussing investigations in follow-up sessions to teach in subsequent months; and (d) observing classroom teachers model teach lessons from the resources. What teachers valued about ACME professional development were the instructional materials and support for learning how to use them. Over half of the teachers surveyed reported that participation increased their ability to implement high quality instructional materials, although some teachers found the resources repetitive and not meaningful.

Recommendations for improving teachers' knowledge and skills in standards-based mathematics:

- Focus on helping teachers learn more mathematics content knowledge; determine standards with which teachers are uncomfortable, set goals for tackling those concepts in professional development, and assess how well those goals were met.
- Continue to help teachers gain standards-based pedagogical knowledge; set up peer coaching networks on campuses to provide teachers observation and feedback on their instructional strategies.
- Continue to actively engage teachers with instructional materials and to have classroom teachers model lessons.

Implementation of ACME Professional Development

The ACME professional development model is on course such that all teachers of elementary and middle school grade levels will have the opportunity to participate by the Spring of 2002 when the NSF grant terminates. Attendance at summer and follow-up institutes in 1999 was less than 100%, with 80% to 90% of the teachers expected to attend participating in the first week and 75% participating in the second week of the institutes. High turnover in the district (i.e., about 60 new elementary teachers and about 20 new middle school teachers each year) and teachers' changing grade levels from year to year influenced the ACME staff to repeat institutes for all grade levels every summer. Because some new hires and other teachers missed summer institutes that they were targeted to attend, ACME staff held brief one-day overviews about standards-based mathematics in the first month of school. This professional development system appears to reach a majority of AISD mathematics teachers, not all.

Recommendations for sustaining professional development in standards-based mathematics:

- Establish summer institutes, follow-up during the academic year, and overviews for new hires at all grade levels that will continue after the NSF grant ends.

Want to read the full report? Click here to download the entire ACME report in .pdf format.