

AN INVESTIGATION OF AN AFTER SCHOOL MATH TUTORING PROGRAM: UNIVERSITY TUTORS + ELEMENTARY STUDENTS = A SUCCESSFUL PARTNERSHIP

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Because of No Child Left Behind and the pressure of high stakes testing, many school districts are looking for ways to raise test scores and gain or maintain adequate yearly progress. A successful after-school math tutoring program, a partnership between a rural school district and the local university, is summarized in this article. Keys to this program's successful implementation are related to those found in research. Strengths of the program were found to outweigh its challenges. With a long term commitment from the district, an organized program structure, and university tutors part way through their teacher training, the district reported successful achievement by children, and satisfaction from adult participants – including school district teachers and tutors - and children's parents.

"I never used to like math but now it is my favorite subject since I have been going to math tutoring. Now I understand it." "It is really cool." "I liked that it helped me to bring up my math grade and the best thing is that it was fun!" "I liked everything, especially my tutor and the snacks."

These quotes are typical of elementary school students in an after-school math tutoring program, a school district and university partnership. Serving 3rd through 6th graders, the program is in its 9th year and enjoys support from parents, teachers, students, the school district, and universi-

ty teacher educators.

Research on math tutoring programs indicates three overlapping categories: tutoring programs, mentoring programs, and university and school partnerships (Bogan, 1997; Cavanaugh et al. 1997; Heron, Welsch, & Goddard 2003; Hock et al. 2001; Konish 1999; McCluskey et al. 2004; Meyer 1997). Whether gains in achievement are moderate or profound, the keys to success in achievement point to (a) preparation for the mentors, (b) a long-term commitment, and (c) specific program goals. Although many experiments are successful, others (Zuelke and Nelson, 2001; McCluskey et al., 2004) resulted in

achievement losses, but only when (a) a relationship is short-term (from a lack of commitment on the part of the mentor or tutor) or (b) the management of the program is disorganized.

The need for successful educational initiatives such as tutoring for lower-performing students has become increasingly important due to the demands of No Child Left Behind and its emphasis on improving standardized test scores. Teachers, administrators, and researchers are seeking ways to help struggling students increase mathematics achievement. The strategy described here provided prospective teachers with in-school tutoring of real students, a strategy consistent with a goal of integrating theory and practice (NCTM, 1991) through experience.

As this program was in a small, rural community, the measures taken serve to illustrate the elements of a successful program. This experience may help stimulate thinking on how your school or district might implement a program that improves achievement and attitudes, but is adapted to your needs and situation.

The After-School Tutoring Program

Background. The school district and university are located in rural Pennsylvania. The school district includes four elementary schools, one junior high school, and one senior high school. Research informs us that a key to success is a long-term commitment to tutoring. In 1996, a growing recognition for the need to provide math support to elementary students resulted in the acquisition of a small grant to purchase mathematics games and manipulative materials to support after-school

tutoring at one of the elementary schools. Tutors were recruited through the local university, teachers recommended students at-risk of failing mathematics, and the Instructional Support Teacher coordinated tutoring activities with two classroom-teacher volunteers.

The initial program received a boost when the superintendent of schools realized the value of the program and expanded it to all four elementary buildings through a grant used to pay teachers and to purchase more materials. Currently, the Instructional Support Teacher functions as the overall Program Coordinator and the district provides funding for two teachers per elementary building. Elementary children in grades 3-6 are chosen to participate based on math scores below the 30th percentile on the standardized test used by the state of Pennsylvania, the results of the Stanford 9 Achievement Tests, and classroom teachers' recommendations. The ratio of elementary students to university tutors remains about two students to each tutor.

The level of staffing and support from the district shows a long-term commitment to an organized program. Further, extra materials were important as a means to reinforce math skills and to provide a rich variety of activities.

Weekly Schedule. The program operates one day a week for 10 weeks in the fall and 10 weeks in the spring. Each session lasts for 90 minutes immediately after the regular school day, starting with a 15-minute snack time. Homework is next, usually lasting about 30-45 minutes. As time allows, skill reinforcement, on a topic chosen by the classroom teacher, is implemented by the tutor. Then students and

tutors participate in a less structured game time when educational games, like board games, reinforce math concepts. Computer labs offer a popular choice to play math-related games. At the end of the session, children are picked up by a parent or guardian to go home for the day.

In interviews, supervising teachers felt that snack time was important, giving students a chance to unwind and providing tutors an opportunity to interact informally before tutoring. Game time at two of the four schools was restricted, either 45 or 60 minutes into tutoring, which seemed to solve a problem of children becoming overly excited during games or claiming they had no homework.

Communication between tutors and classroom teachers. Each child has a folder that contains an information sheet for classroom teachers to guide tutoring with assigned homework and skill areas to be practiced. Additionally, teachers provide information on upcoming math topics so tutors can come more fully prepared. During snack time, tutors review the day's assigned work, and at the end of each session, provide comments back to the classroom teacher on the same sheet of paper. This organization works well except when a teacher's absence results in no homework or no skills lesson being assigned. In these cases, tutors usually spend homework time on prior skills reinforcement and perhaps more game time.

Formal Assessments. Two assessments are administered as a pre-/post-test: (a) a math inventory (either the Brigance Math Inventory or the Scott Foresman math text inventory) and (b) the Aiken's Attitude Survey to assess changes in students' feelings.

Over the course of a year, the inventory assessment has shown gains by 72% or better of students, while improvement in attitude assessment was reported for over 50%. For the last academic year, 86% (73 out of 85 students) increased their inventory scores, 11% decreased, and 5% stayed the same. Of course, math inventory gains are also influenced by classroom instruction. For the attitude assessment given the last academic year, 53% of students (45 out of 85) increased their scores (indicating a positive change), even as several supervising teachers reported that some children had gotten tired of filling out the same attitude survey multiple times.

Key People. As reported earlier, research indicates that program organization is vital. Unanimously, supervising teachers believe that organizational success of the program is largely due to having a Program Coordinator who is in charge of (a) recruiting and training tutors, checking their qualifications, and assigning tutors to specific schools, (b) training and supporting supervising teachers, (c) coordinating the calendar with university instructors, (d) copying materials, (e) writing the year-end summary reports for the district, and (f) acting as a liaison between the district and the university.

Two *Supervising Teachers* per building have many roles as facilitators: serving as liaisons between classroom teachers and tutors, disciplining elementary students when necessary, giving teaching suggestions and ideas to tutors, modeling both manipulative use and the asking of high-level questions to enhance students' abilities to solve problems, and providing primary tutoring when university tutors are

absent. Organizational roles include completing paperwork (including attendance and managing students' folders) and matching students with tutors (reassigning when necessary due to absences and personality conflicts). All supervising teachers are regular classroom or special education teachers in their schools.

University Tutors either fulfill mathematics methods coursework or are recruited as volunteers primarily from elementary education majors. Consequently, tutors are partially through their teacher training, are motivated, and we believe, provide better quality experiences for children than tutors without such training. Research cited earlier echoes the need for training, and also points to the need for a long-term relationship. Tutors stay with their assigned elementary students throughout each day's activities, and over the course of a semester. Children were observed to form a bond with their university tutors, and vice versa. Thus, attempts to keep children with the same tutor are an important aspect of the experience.

Parents. In district reports, parents expressed support with comments such as, "It seems to have improved his math and has eliminated the stress at home of trying to explain his homework to him." "I think the tutoring program was excellent. The tutoring really helped my daughter. She went from a C to a B, then to an A. She really enjoyed it." With working and single parents, and grandparents or guardians raising children, after-school programs are becoming more prominent in order to alleviate some of the stress on families associated with the burden of schoolwork (Parkay & Stanford, 2001). As one super-

vising teacher noted during her interview, this was one day in the week where children did not have the tension of homework at home and where parents did not have the pressure of trying to help their child with math they themselves may feel uncomfortable tackling. Thus, homework completion, along with skills reinforcement, is a specific goal of this program.

Benefits to the Elementary Students

Regular classroom teachers expressed approval of the tutoring program through district-summary reports that included the following comments: "It provided students challenged by math the opportunity to receive one-on-one instruction in areas directly related to my classroom instruction." "My students enjoyed the After School Math Tutoring Program. They NEVER complained and were anxious to share what they did and the math games that they played." Reinforcing formal assessments given to students, the vast majority of teachers reported an increase in achievement, a positive change in attitude toward mathematics, increased participation in math class, and higher rates of students completing their homework in a timely manner. As one teacher stated, "It [the program] builds their self confidence and gives them extra reinforcement of the concepts."

Supervising teachers reported seeing children who were more motivated, excited, and interested in math. These teachers also reported seeing children act more confidently by taking risks. An interesting insight into this phenomenon was made by one teacher who indicated that the attention by a young adult every week allowed

the children to feel better about sharing math experiences and to open up to higher levels of thinking about math. Another teacher suggested that children see that other students are having the same difficulties with math that they are, and so, do not feel alone.

Benefits for Teacher Training

"I have learned so much by working with the students and trying different ways of presenting material."

"The tutoring program gave me the opportunity to practice the teaching skills that I learned in my [math methods] class." "Mrs. G. and Mrs. C. [the teacher supervisors] provided helpful advice for when I teach in my own classroom." "I really enjoyed the opportunity. It gave me the extra experience of working in a school setting and that is so important. This was a meaningful and rewarding program." Sample of tutors' comments.

In addition to reinforcing a positive working relationship with the local schools and district, tutoring can provide a valuable field experience for a mathematics methods course. At this university, student-tutors conduct interviews and lead activities that reinforce course content, as well as address specific needs of their tutees. A rich source of interview activities can be found in mathematics methods textbooks and in auxiliary materials for elementary mathematics methods courses (e.g., Smith et al. 2001). Additionally, some instructors model good-teaching practices by leading specific activities where tutors work direct-

ly with the children.

No matter what the assigned activity during tutoring, follow-up discussions are conducted at the next regular class meetings giving university students a chance to talk about their experiences and ask additional questions. Discussion is enhanced with a weekly journal. Through discussions, journals, and informal observation, tutors demonstrate a Reflective and Analytic level of pedagogical awareness (Nardi, Jaworski, & Hegedus 2005)--an articulation of pedagogical approaches, reflection, and recognition of teaching issues--that allows their instructors to naturally and authoritatively reinforce mathematics methods that are already a part of the regular curriculum.

Observations of Supervising Teachers.

The field-experience approach explained above was noticed and appreciated by the program's supervising teachers who liked to see tutors practicing what they were learning in the university classroom. Moreover, they saw a need for such an approach to motivate the tutors (who seemed to have fewer absences) and make the experience more meaningful for the children. Other more practical reasons may also be operating: tutors with extra activities provided a break from the routine of games provided by the tutoring program.

Other benefits reported by supervising teachers for the university tutors were opportunities to: (a) work with a few individuals--seeing personalities and common difficulties with learning--before facing an entire class, (b) practice learning and classroom management techniques, (c) learn from their mistakes in a more relaxed atmosphere, (d) learn how difficult it can

be to get concepts and skills across to children, and (e) interact with professional classroom teachers.

Program Challenges

We found challenges in implementing the program, but relatively few compared to the strengths of the program. The pool of potential tutors varied from one semester to another, affecting the number of children who could be accommodated. Absences caused last-minute reshuffling of children or tutors, causing occasional discontinuity or dissatisfaction from tutors or children. Reshuffling often meant tutors adapting to different grade levels, abilities, or math content within a small group of children.

For tutors from math methods classes, university instructors tailored course content to accommodate the tutors' needs and the demands of class time spent in the field. Some instructors assigned specific tutoring activities. Others presented activities to both tutors and children that would normally be done in class.

Although some challenges were found, the overall program appeared strong. Little dissatisfaction was reported by the district or from supervising teachers (whose interviews were confidential). Formal and informal feedback from children and tutors was positive leading the authors to conclude that program strengths outweighed challenges.

Keys to Success

Research points to the importance of program organization and long-term commitment, tutor training and long-term relationship with tutees, and specific pro-

gram goals. The following implementations appear to have contributed to this program's success: (1) an overall program coordinator, (2) maintaining a 2:1 or better child-tutor ratio, (3) scheduling less-structured snack and game times, (4) recruiting tutors whose efforts are reinforced as part of university coursework, (5) keeping children with the same tutor, and (6) strong support from the district.

As the NCTM (2000) has observed, "Effective teaching requires continuing efforts to learn and improve. These efforts include learning about mathematics and pedagogy, benefiting from interactions with students and colleagues, and engaging in ongoing professional development and self-reflection." As we have discussed, the after-school tutoring program in this district provides just such experiences for prospective teachers, and through feedback received from children, their parents, classroom teachers, and supervising teachers, the program was effective as a learning environment as well.

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