The Effects of an After-School Tutoring Program on the Academic Performance of At-Risk Students and Students with LD

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ABSTRACT

Improving the educational outcomes for students who are at risk for academic failure is an important issue for educators and policymakers. Recently, before- and after-school tutoring programs have been identified as having the potential to turn academic failure into academic success. Two studies were conducted to determine the efficacy of an after-school tutoring program. Results of the studies showed that at-risk students and students with learning disabilities who were failing classes could earn average or better grades on quizzes and tests if they had the support of trained adult tutors. Additionally, researchers found that tutors could teach strategies during their tutoring sessions and that students could learn the strategies while they worked on their class assignments. Finally, researchers found that some students continued to be successful after tutoring ended, indicating that they were able to use the strategy they had learned in a generative fashion.

For a variety of complex individual, instructional, and societal reasons, some children and adolescents experience difficulty attaining the academic and social competencies required for successful participation in school and society. As a result, they face the possibility of being undereducated, underemployed, and underprepared to participate successfully in the 21st century (Blackorby & Wagner, 1996; Mack & Wiltrout, 1998; Murry, Goldstein, & Edgar, 1997; Sitlington & Frank, 1990). Sizer (1996) feared that society's failure to address the needs of these children dooms many of them to join the ranks of teenagers "who mindlessly wander around the malls and live shamelessly off other people" (p. 146).

In response to this serious challenge, parents, educators, and policymakers are searching for ways to increase the academic and social competence of students. Increasingly, these groups and the popular press are advocating after-school tutoring programs in which skilled teachers, paraeducators, or other adults provide one-to-one support as one way to reduce the gap between what students are expected to know and to be able to do in the 21st century and what they actually know and are able to do (e.g., Adler, 1998; Farr, 1998; Hancock, 1994; Hock, Schumaker, & Deshler, 1998; Kaufmann & Adema, 1998; Pressley & McCormick, 1995; Tollefson, 1997).

Nevertheless, assuming that all after-school tutoring programs will result in the development of skilled and independent learners may be overly optimistic. Indeed, some forms of tutoring may be more harmful than helpful. For example, Carlson (1985) suggested that subject-matter tutoring for special education students by special education teachers may be unethical because students rarely acquire the skills necessary to become independent thinkers and learners through such tutoring. In fact, some such students demonstrate little skill growth and become dependent on their tutors for success (Ceprano, 1995; Keim, McWhirter, & Bernstein, 1996). Other researchers have reported mixed results. Some report that tutoring works sometimes and under certain conditions (e.g., Cohen, Kulik, & Kulik, 1982; Lepper, Drake, & O'Donnell-

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Johnson, 1997; McArthur, Lewis, & Bishay, 1996; Merrill, Reiser, Merrill, & Landes, 1995). Others have reported that one-to-one tutoring has been an extremely effective intervention (Bloom, 1984; Graesser, Bowers, & Hacker, 1997; Slavin, 1990). In short, the beliefs about efficacy of tutoring are mixed.

Closely related to the controversy concerning the effectiveness of tutoring is the disagreement about the efficacy of tutoring in before- and after-school programs. Unfortunately, much of the literature on after-school tutoring programs is descriptive in nature (Cunningham, 1997; Hancock, 1994; Hock et al., 1998; Kaufman & Adema, 1998; Kirk, 1997; Pressley & McCormick, 1995). In studies in which data are reported, control conditions often were not used (e.g., Farr, 1998; Tollefson, 1997). In other studies, researchers reported student performance gains that were minimal or nonexistent (Tucker et al., 1995). For example, Farr (1998) found that the grades of students tutored in physical science classes showed no significant change after students received tutoring in an after-school program. That is, there was no significant difference between grades earned on science assignments before tutoring and those earned after tutoring. In sum, the literature on both the efficacy of tutoring and the efficacy of before- and after-school tutoring programs is inconclusive.

Tutoring Models

The sometimes contradictory results related to tutoring and after-school tutoring programs may stem from several problems. First, there is the problem of defining the tutoring model. Some researchers describe tutoring as the ideal teaching situation because it involves one-to-one instruction in content and skills selected and presented by the tutor (Bloom, 1984; Slavin et al., 1991). They claim that one-to-one tutoring presents an excellent opportunity for a highly skilled teacher to teach skills, strategies, and content knowledge to a single student (Slavin, Karweit, & Madden, 1989; Wasik & Slavin, 1990). They also claim that the opportunity presented by one-to-one tutoring can optimize the impact of a variety of validated instructional practices and techniques, such as direct instruction (McArthur, Stasz, & Zmuidzinas, 1990), tutor modeling of thinking and problem-solving behaviors (Hock, Schumaker, & Deshler, 1995), scaffolding of support as students practice skills and strategies (Lepper et al., 1997; Merrill et al., 1995; Simmons, Fuchs, Fuchs, Mathes, & Hodge, 1995; Vadasy, Jenkins, Antil, Wayne, & O'Connor, 1997), and provision of immediate, positive, and corrective feedback (Merrill et al., 1995). Tutoring in which the dominant nature of the tutoring activities is aligned with the practices described previously and that primarily targets instruction in literacy skills (e.g., reading, writing, math, listening, speaking) has been referred to as "instructional tutoring" (Hock, 1998).

The label *tutoring* has also been used to describe educational practices that are quite different from the instructional tutoring model described previously. Carlson (1985), for example, described a tutoring model that can be labeled *assignment-assistance tutoring*. In assignment-assistance tutoring, a tutor meets with either an individual or a small group of two to six students who have difficulty independently completing their course assignments. The major goal of assignment-assistance tutors is to help each student with the assignments or tasks the student brings to the tutoring sessions. Thus, assignment-assistance tutoring is generally a model in which a tutor provides small-group or one-to-one homework assistance.

Another tutoring model combines elements of both instructional and assignment-assistance tutoring. In this model, called *strategic tutoring*, strategies for learning how to learn and perform are taught to students while they receive help with class assignments (Hock et al., 1995). That is, strategic tutors combine the elements of assignment-assistance tutoring (i.e., help with pressing homework demands) with elements of instructional tutoring (i.e., direct instruction in skills and strategies). For example, if a student has to complete a number of math homework problems and prepare for math quizzes and tests, the tutor can quickly guide the student to use the MATH strategy (Hock, 1999). The MATH strategy is a problem-solving strategy that includes the following steps: (a) mapping out or determining what needs to be solved; (b) analyzing the problem by comparing with sample problems in the textbook; (c) taking action to solve the problem; and (d) having a look back to check the answer. The tutor models the steps of the strategy and provides guidance as the student applies the strategy to his or her homework problems. Finally, the tutor cues the student to use the strategy during upcoming math quizzes and tests. In this fashion, tutors not only teach a strategy that helps students successfully complete class assignments, but, more important, teach students a strategy that the students can use independently whenever they encounter similar assignments.

Thus, one factor that may contribute to the controversy regarding the effectiveness of tutoring might relate to a previous lack of clear distinction among instructional tutoring, assignment-assistance tutoring, and strategic tutoring and the failure of researchers and authors to recognize that distinction as they write about and investigate the effects of tutoring.

Tutoring Outcomes

Another problem possibly connected with the controversy over the effectiveness of tutoring is related to major differences in targeted student outcomes. In the instructional tutoring model, tutors expect that students will acquire new knowledge, become proficient in not-yet-mastered skills, and learn new skills (Hock et al., 1995; Madden, Slavin, Karweit, Dolan, & Wasik, 1993; Simmons et al., 1995). Thus, the intended outcome of one-to-one instructional tutoring is the development of skills and knowledge. In contrast, the assign-

ment-assistance tutoring model focuses on the task at hand. That is, in this model, tutors provide help with homework and focus on helping the student complete each assignment and meet the academic demands in his or her classes (Carlson, 1985). In the strategic tutoring model, tutors expect students to learn skills and strategies that support independent learning and apply those skills and strategies to current classroom assignments (Hock et al., 1995).

These different focuses of tutoring models make it difficult to determine the relative efficacy of the tutoring programs. For example, if meeting the goals of completing homework or reviewing content for tests and quizzes is a valued outcome, then assignment-assistance tutoring that produces these outcomes might be considered effective. If the valued outcomes of tutoring are an increase in literacy skills and content knowledge, then instructional tutoring that supports the attainment of these outcomes might be considered effective. If the intended goals of tutoring are increased strategy knowledge, completion of current assignments, and application of learned strategies to authentic tasks, then strategic tutoring that produces these outcomes might be considered effective. Thus, another factor that contributes to the controversy over the effectiveness of tutoring is related to the outcome measures used in tutoring studies.

Tutor Training

Not only are the type of tutoring model adopted and the targeted outcomes key to the efficacy of tutoring, so, too, is tutor training. Regardless of what outcomes drive the tutoring model or whether tutors are adults or peers, tutor expertise and development of tutor instructional skills are thought to be key to improving the nature of tutoring interactions and the positive effects of tutoring on tutored students at the elementary (Fuchs, Fuchs, Bentz, Phillips, & Hamlett, 1994; Gaskins & Roeger, 1995; Greenwood & Delquadri, 1995; Madden et al., 1993; Simmons et al., 1995), secondary (Warren & Fitzgerald, 1997), and postsecondary (Ceprano, 1995; Condravy, 1995; Graesser et al., 1997; Semb, Ellis, & Araujo, 1993) levels. In fact, some researchers at the elementary level have emphasized the importance of and their commitment to tutor training by including up to 65 hours of training even for tutors who are certified reading teachers or special education teachers (e.g., Slavin et al., 1991). Thus, teaching tutors how to effectively tutor students is thought to be an important element in tutoring programs.

The importance of tutor training becomes evident when the nature of traditional tutor interactions is examined. For example, research has shown that novice tutors, including peer and adult tutors, do not automatically engage in the instructional methods that make one-to-one tutoring instructional and effective with a variety of students in a variety of educational contexts (Fuchs et al., 1994; Hock et al., 1995; Kohler & Greenwood, 1990). Additionally, research has shown that novice tutors do not actively engage the tutee in the tutoring session, model thinking processes, diagnose errors, anchor learning, provide corrective feedback, or use sophisticated teaching strategies, all of which are advocated in some form by individuals who have written about effective tutoring practices (e.g., Graesser et al., 1997; Jenkins & Jenkins, 1985; McArthur et al., 1990).

Indeed, some novice tutors engage in activities that may be detrimental to the development of skilled learners and problem solvers. For example, some tutors complete assignments for students (Hock et al., 1995), show impatience with and ridicule their tutees (Jenkins & Jenkins, 1985), and provide the answer before the tutee has an opportunity to discover it (Fuchs et al., 1994). Therefore, teaching tutors how to tutor effectively may be an important component of effective tutoring programs (Condravy, 1995; Fitch & Semb, 1992; Fuchs et al., 1994; Graesser & Person, 1994; Graesser et al., 1997; Hock et al., 1995; Jenkins & Jenkins, 1985), and poor tutor training may have resulted in negative results in previous studies.

Because major questions persist concerning the efficacy of tutoring in general and concerning after-school tutoring programs specifically, the purpose of this article is to extend the research on effective after-school tutoring programs and one-to-one tutoring. Two research studies were conducted. The first study was designed to test the overall viability of the strategic tutoring intervention and was limited in scope. Local school officials wanted some indication that strategic tutoring would positively affect student classroom performance before agreeing to conduct research on a wider scale. The second study was broader in scope and included additional research questions. Specifically, the studies addressed the following questions: (Studies 1 and 2) Does the tutoring provided during an after-school program significantly affect the performance of at-risk students and students with learning disabilities (LD) on quizzes and tests administered in junior high general education classes?; (Studies 1 and 2) Can after-school tutoring have an impact on the semester grades of students?; (Study 2) Do tutors incorporate strategic teaching behaviors during their tutoring sessions?; (Study 2) Do students who participate in a strategic tutoring program increase their knowledge about strategies that can be applied to academic tasks?; and (Study 2) Does tutoring that incorporates strategic teaching behaviors aid in the development of independent learners?

STUDY 1

Method

Participants

Students. From a pool of 24 junior high students attending an after-school study club, school counselors and

special education teachers identified eight at-risk students. Students were considered to be at risk if they were currently failing two or more academic courses. (Unless the students were served in special education, the school did not provide additional achievement data.) All eight at-risk students were invited to participate in the study. The three at-risk students whose parents/guardians agreed to allow their children to participate in the study were selected. Their parents/guardians were asked to sign permission forms stating their agreement and support for their children's participation in the study. Student 1 was a female in eighth grade and considered to be at risk for academic failure by the school's counselor and grade-level instructional team. She attended the after-school study club 3 days per week. Student 2 was a male, age 13 years 5 months, in the seventh grade, with identified LD in math and written language. According to school records, he had a full-scale IQ score of 103, a performance score of 106, and a verbal score of 100. On the Woodcock-Johnson Achievement Test–Revised, he earned the following subtest scores: 40th percentile in Reading Comprehension; 6th percentile in Basic Math; 10th percentile in Math Concepts; and 39th percentile in Written Expression. Special education services were being provided to this student in his inclusive English classroom. The student attended the after-school study club 1 to 3 days per week and received help primarily with math homework from one of the tutors. Student 3 was a seventh grader and also considered at risk for academic failure, particularly in math, where she had earned low test and quiz grades. She received assistance with her math assignments from a tutor during the after-school study club. All the students in the study asked for help with their basic algebra I assignments.

Tutors. Eight university tutors were employed by the district. Three of the tutors were able to tutor at least 3 days per week and were invited to participate in the study. All were undergraduates who were already working in the after-school study club. The mean age of the tutors was 20.3 years. Typically, the tutors met with students 2 or 3 afternoons each week, for about 45 minutes per session. Observations of the tutoring sessions prior to training in strategic tutoring showed that the tutors would sit at a table with a group of four to six students and provide individual help with homework assignments as requested by students. They had been taught how to tutor by the staff of the university department that sponsored volunteer tutoring support to local schools.

Setting

The study took place in a junior high school serving Grades 7 through 9, with a student population of approximately 650 students. The school was located in a small midwestern city with a population of approximately 85,000. Seventeen percent of the students were minorities. Twenty-two percent of the students qualified for free or reduced-cost lunch. The after-school study club took place in the library and was available to all students in the school. Two teachers supervised the study club, and eight college tutors provided tutoring services. Before this study, these services could best be described as assignment-assistance tutoring. That is, students received help from tutors in completing homework assignments. No skills or strategies were directly taught to the tutored students. Throughout a given semester, approximately 40 students participated in the study club. Average daily attendance was about 15 students. Students typically asked for and received tutoring help with math and English assignments.

Design

A multiple-baseline design (Baer, Wolf, & Risley, 1968) with a follow-up condition was used to determine the effectiveness of strategic tutoring on the academic performance of students in tutored algebra I classes. Baseline, strategic tutoring, and follow-up math test and quiz scores were graphed for each student in each tutored class.

Measures

Data were collected during the fall and spring semesters of the 1997–1998 school year. Three measures were used. The first measure was the score earned on chapter quizzes and the second was the score earned on chapter tests. Teachers used chapter quiz and test materials provided by the publisher of the course textbook. Quizzes covered material found in specific sections of the chapter. For example, quizzes 1.1, 1.2, and 1.3 contained questions similar to the questions found on the chapter 1 test. The scores were derived from the tests and quizzes given to the students by their general education math teachers. They were not controlled for difficulty or prior knowledge of the students. These scores were obtained from teacher grade books. The third measure was semester grades in math. These grades were obtained from photocopies of the students' semester report cards.

Procedure

Each student met after school with his or her assigned tutor individually two to three times per week in the library, for approximately 30 minutes per session. The student shared with the tutor his or her assignment(s), and the tutor applied strategic tutoring methods and taught strategies appropriate for the assignment. Tutoring lasted 4 to 12 weeks, depending on the student's assignments.

Tutor Training. The three selected tutors completed a 2-hour strategic tutoring workshop. During the workshop, tutors were presented with an overview of the strategic tutoring model, watched videotapes of strategic tutoring sessions, and practiced strategic tutoring during role-play activities.

Each tutor was then scheduled to meet with one of the students in the study, assigned a tutoring table in the after-school study club area, and instructed to apply all that he or she had learned about strategic tutoring to a tutoring session with a student. The project research assistant, herself an experienced and highly proficient strategic tutor, evaluated at least two tutoring sessions led by each tutor and provided individualized corrective feedback to the tutor after each observation. Due to the small number of participants and the school district's desire to focus on student outcomes, researchers targeted fidelity to the instructional model and measures of interobserver agreement for a later study.

Strategic Tutoring. The tutoring model used during Study 1 was strategic tutoring. In this model, strategies for learning how to learn and perform are taught to students while they receive help with current class assignments (Hock et al., 1995). In strategic tutoring, the tutor guides a student through four instructional phases. First, the tutor assesses the student's current approach to the task at hand and determines whether the student's approach or strategy is efficient and effective. If the strategy the student currently uses is ineffective or inefficient, then the tutor co-constructs a new strategy with the student. The newly constructed strategy will likely include elements of the student's current strategy that have been combined with the tutor's strategy. When a new strategy has been constructed, the tutor systematically teaches the strategy to the student by modeling how to use it, checking the student's understanding of the strategy, and scaffolding support as the student applies the new strategy to actual assignments. Finally, the tutor helps the student plan for independent application of the strategy in general education classrooms. In this fashion, tutors not only teach a strategy that helps students complete class assignments successfully but, more important, teach students a strategy that can be used independently whenever students encounter similar assignments. (For more about strategic tutoring, see Hock, Deshler, & Schumaker, 2000; Hock et al., 1995; and Hock, Schumaker, & Deshler, 1998.)

Results

Results for the students are shown in Figure 1. Individual student performance is discussed in the following sections.

Student 1

Student 1's baseline scores indicated that she was earning a mean of 46% of all possible points available for tests and a mean of 45% for all quizzes (see Figure 1). There was little difference between quiz and test scores during baseline. During baseline, her scores showed wide scatter. For example, on one quiz Student 1 earned a score of 31% and on another quiz she earned a score of 96%. Thus, in addition to having a very low baseline mean score, she showed inconsistency in her performance. Student 1 failed math during the first (baseline) semester.

After participation in the strategic tutoring program, Student 1's mean test score was 70% and her mean quiz score was 80%. The wide scatter evident during baseline decreased markedly. Student 1 attended tutoring sessions on a regular basis and met with her tutor approximately three times per week throughout the semester. She reported that she enjoyed working with her tutor a great deal.

Tutoring services for this student ended 4 weeks before the end of the school year. After that, her mean quiz score maintained at the 78% level (no additional math tests were administered in the math class). Student 1 passed math the second semester, with a grade of C.

Student 2

Student 2 earned a mean of 54% of the points possible for tests and a mean of 58% for quizzes during the baseline period (see Figure 1). There was little difference between his quiz and test scores during baseline, although the scores can be categorized as highly erratic and scattered. He earned a semester grade of D–.

After the strategic tutoring intervention, Student 2's mean score was 86% for tests and 84% for quizzes. As with Student 1, the wide scatter evident during baseline decreased markedly. Student 2 attended tutoring for only 4 weeks during the semester. After the initial 4-week period, he stated that he no longer wanted to stay after school for study club, and he did not attend the remaining tutoring sessions.

After strategic tutoring support ended, Student 2's mean score on quizzes declined to 57%, about equal to his mean score during baseline. He earned a semester grade of C.

Student 3

After Student 3 was selected to participate in the study and while she was waiting to participate in strategic tutoring, she began to earn higher baseline scores on her math quizzes and tests. Although her overall mean baseline score was low (59%), her last 7 of 17 mean baseline scores were 73%. Her mean baseline score was 59% for tests and 61% for quizzes. She earned a grade of D for the semester.

Strategic tutoring was implemented after Student 3's baseline scores had stabilized. After tutoring began, Student 3's mean score for tests was 87% and her mean score for quizzes was 91%. The score scatter evident during baseline decreased (see Figure 1). She attended tutoring sessions on a regular basis and met with her tutor about three times per week throughout the second semester. Her teacher administered only two chapter tests during the second semester.

During the follow-up condition, Student 3's mean math score for quizzes declined slightly, to 76%. This mean score was higher than baseline but lower than during the strategic tutoring condition. Thus, she was able to perform in math independently and successfully and did not evidence the wide scatter present during baseline. Her grade in math for the second semester was a B–.

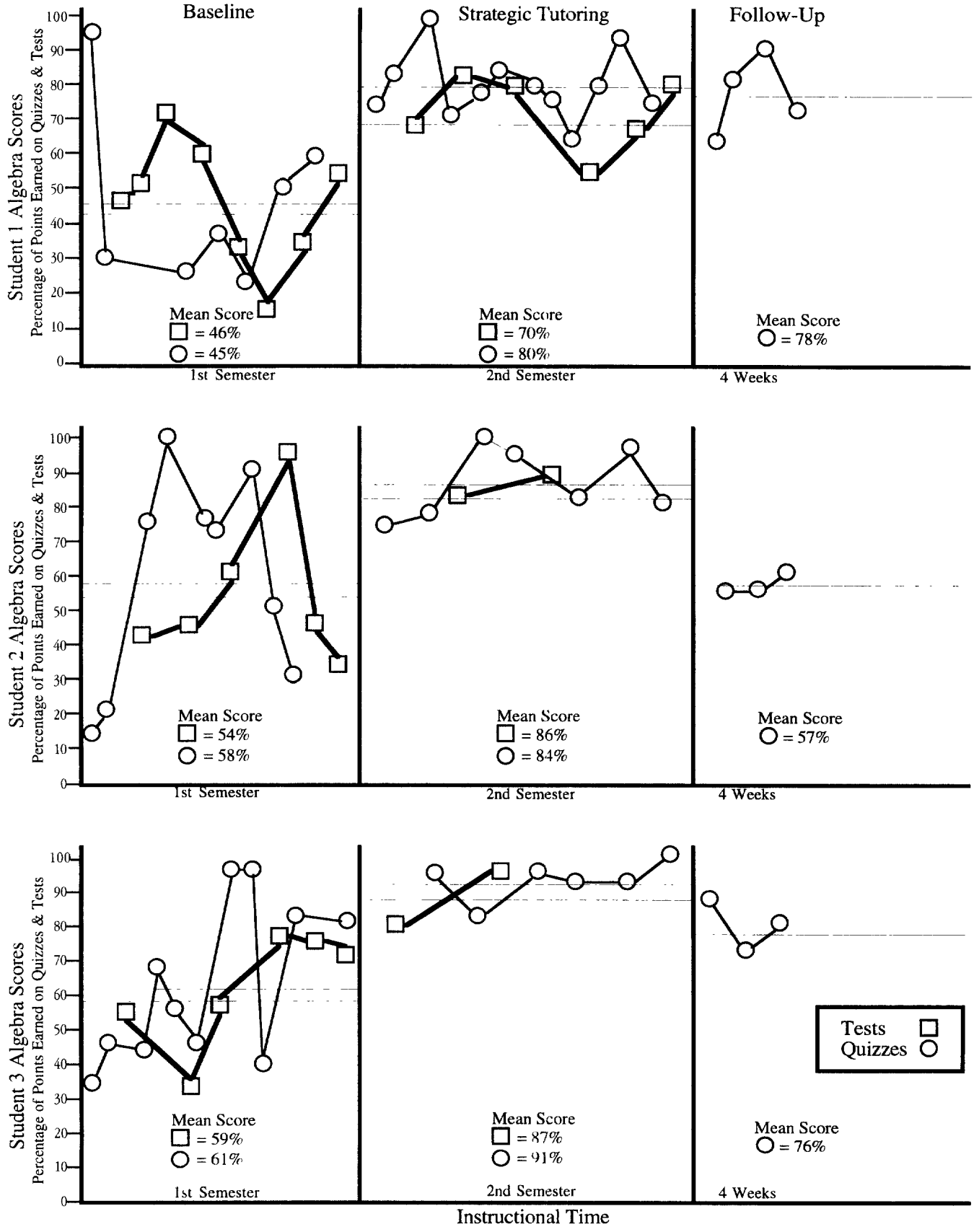

FIGURE 1. Student performance on tests and quizzes for Study 1.

Effect Size

Effect sizes for strategic tutoring were obtained by using a variation of Cohen's *d* (Hedges & Olkin, 1985). The difference between the mean baseline score (obtained from the last three measures) and the mean treatment score (also derived from the last three measures) was divided by the pooled standard deviation (Swanson & Hoskyn, 1998). Effect sizes were 4.14, 1.44, and 3.78 for Students 1, 2, and 3, respectively (mean effect size = 3.12). Effect sizes for single-subject designs tend to be higher than effect sizes for control group experimental studies (Swanson & Hoskyn, 1998).

Discussion

Strategic tutoring was effective in improving the quiz and test performance of students enrolled in a junior high algebra I class. In general, students improved their semester grades from Fs and Ds to Cs and Bs. The two students who participated in strategic tutoring for all but the last 4 weeks of the semester were able to maintain their performance and eliminate wide score scatter, even when tutoring support was no longer available. This finding may be significant because both students were able to independently and successfully perform in their math class. The student who participated in strategic tutoring for only 4 weeks was unable to perform at a passing level independent of the tutor. Developing independent proficiency as a learner through strategic tutoring seems to require some duration of the instruction such that the student masters the strategy being taught. It may also require commitment on the part of the student to apply learned strategies.

The effect size comparison between mean baseline scores and mean treatment scores indicated dramatic, socially significant, and robust gains for all students. For example, the student with the smallest gain between baseline and treatment improved from earning 60% of all possible points to earning 87% on math quizzes and tests. His quarterly grades improved from the D– range to the B+ range. Additionally, all three students improved the consistency of their performance on quizzes and tests. That is, the wide scatter evident during baseline decreased markedly during treatment. In short, strategic tutoring had a positive effect on student quiz and test grades and on overall course grades.

STUDY 2

Method

Participants

Students. Students were selected to participate in the study based on the recommendations of the school's counseling and teaching staff members. The school's staff members gave the researchers a list of names of eight at-risk students they felt were in need of tutorial support due to low or failing grades. Six of the students agreed to participate in the study, and their parents signed consent forms.

Five of the students were male, and one was female. Three boys were in eighth grade and two were in seventh grade. The girl was in ninth grade. One student, Student 5, was diagnosed as having LD in the math domain. According to school records, he had a full-scale IQ score of 106, a performance score of 102, and a verbal score of 110. On the Woodcock-Johnson Achievement Test–Revised, Student 5 earned the following subtest scores: 41st percentile in Reading Comprehension; 38th percentile in Basic Math; 29th percentile in Math Concepts; and 20th percentile in Written Expression. The other students were considered to be at risk for academic failure by their counselors and grade-level instructional team. (No additional achievement data for these students were made available to the researchers.) All the students were earning Ds and Fs in at least two classes. Five of the students requested tutorial assistance for math courses (transition math or basic algebra I), and one student asked for help with his biology assignments. Two of the students had attended a "strategies class" all year, in which a teacher and paraprofessional were available to help with class assignments. The strategies class operated much like a study hall, and 14 students were enrolled in it. Three other students had attended the after-school study club, where university students provided assignment-assistance tutoring. One student had not attended the strategies class or the after-school study club.

Tutors. Six tutors, who had not participated in Study 1, participated in the study. Four were university undergraduates employed by the school to serve as tutors in the after-school study club. Two tutors worked in the university's student-athlete tutoring program. The athletic department paid the tutors and supported their participation in the study. Tutors ranged in age from 20.2 years to 56.8 years, with a group mean age of 38.6 years. The athletic department tutors were experienced in strategic tutoring before the start of the study.

Setting

The study took place in the same junior high and setting as Study 1. The program was located in the school library and was open Monday through Thursday, for about 45 minutes each school day. A teacher and counselor who worked at the school supervised the after-school program.

Design

A multiple-baselines-across-students design (Baer et al., 1968) with a follow-up condition was used to determine the effectiveness of strategic tutoring on the academic performance of students in tutored classes. Baseline, strategic tutoring, and follow-up test and quiz scores were graphed for each student in each tutored class.

Measures

Quiz and Test Scores. Data were collected during the fall and spring semesters of the 1998–1999 school year. Baseline and postintervention measures of student performance on quizzes and tests in tutored courses and semester grades were obtained from teacher grade books. As in Study 1, classroom teachers used chapter quiz and test materials provided by the publisher of the course textbook.

Strategy Knowledge. A pretest/posttest measure of student strategy knowledge was obtained by interviewing students about the current strategies they used. For example, if the task for which the student requested tutoring help was an algebra I assignment, the tutor would say, "Before we begin working on your assignment, tell me everything you currently do when you solve algebra problems." The student's answer was recorded and evaluated with a checklist that listed the key elements of a strategy for solving math problems. For example, the checklist for evaluating math problem-solving strategies included mapping out or determining what needed to be solved; analyzing the problem by comparing with sample problems; taking action to solve the problem; and checking the answer (Polya, 1957; Schoenfeld, 1992). The checklist was modified for the student who requested tutoring help with his biology textbook assignments. In this case, points were awarded for reading the chapter questions, skimming and scanning to find key words, reading and paraphrasing the information surrounding the key words, and checking the answer. A student was awarded one point for each step of his or her strategy that matched a step of one of the strategies previously described. Thus, students could earn up to four points for their responses on the pretest and posttest measures of strategy knowledge.

Interscorer Reliability. Interscorer reliability was assessed on the strategy knowledge measures. The primary scorer asked the student to specify the steps of the strategy he or she currently used for the task at hand. Then she wrote the student's response verbatim. A second researcher independently scored all of the student's responses by using the checklist. The two observers' records were compared item by item. An agreement was scored if both observers indicated that a strategy element was present or if both indicated that it was absent. To calculate the percentage of agreement, the number of agreements was divided by the number of agreements plus disagreements and multiplied by 100. Overall, the total percentage of agreement was 96%.

Tutoring Fidelity. Due to the unpredictable nature of student-centered tutoring, an a priori decision was made to measure tutoring fidelity by observing two actual tutoring sessions, recording all instances of strategic tutoring behavior from both sessions, and combining the scores on one checklist score sheet.

The first and fourth tutoring sessions for each tutor were observed by the project research assistant and evaluated by using a variation of the Strategic Tutoring Checklist (Hock et al., 1995). The Strategic Tutoring Checklist listed five instructional behaviors: (a) assessing the task at hand and the student's strategy knowledge; (b) creating a strategy with the student; (c) modeling the strategy for the student; (d) checking the student's understanding of the strategy; and (e) guiding the student in applying the strategy to his or her assignment. Tutors could earn up to five points on the checklist if they included all the targeted tutoring behaviors in their tutoring interactions over the two sessions.

Scores on the checklist measure were determined by combining the scores for both tutoring sessions. For example, one tutor earned three out of five possible points by assessing, creating, and modeling during the first tutoring session. He then earned an additional point during the fourth session for engaging in guided practice. Thus, his score on the checklist was calculated by adding the score from the first session to the score for the fourth session, for a total score of four out of five possible points. Tutors were not awarded additional points for engaging in the same tutoring behavior during both tutoring sessions.

Procedure

The students were divided into two cohorts, with Students 1, 3, and 5 in the first cohort and Students 2, 4, and 6 in the second. The students in the first cohort were aligned with students in the second cohort: Student 1 was aligned with Student 2, Student 3 with Student 4, and Student 5 with Student 6. Students 1, 3, and 5 received the strategic tutoring intervention after stable baseline scores were obtained. When the test and quiz scores of Students 1, 3, and 5 improved and baseline scores were stable for Students 2, 4, and 6, those students received the strategic tutoring treatment (see Figures 2, 3, and 4).

Tutors were assigned to students based on the content expertise of the tutors, the subject matter needs of the students, and the opportunity to match tutor and student schedules. Students were scheduled to attend the after-school program two to three times per week and spent approximately 30 minutes of the study club session engaged in strategic tutoring activities.

Tutoring sessions were structured so that tutors responded to the immediate academic needs of their students. That is, the students approached their tutors and asked for help with specific assignments or problems. The tutors responded by using the instructional methodology associated with strategic tutoring whenever possible and appropriate. For example, one student wanted help answering math homework problems. The tutor assessed the student's approach to the task, guided the construction of a strategy for solving the problems with the student, modeled how to use the strategy, and then helped the student apply the strategy to the current

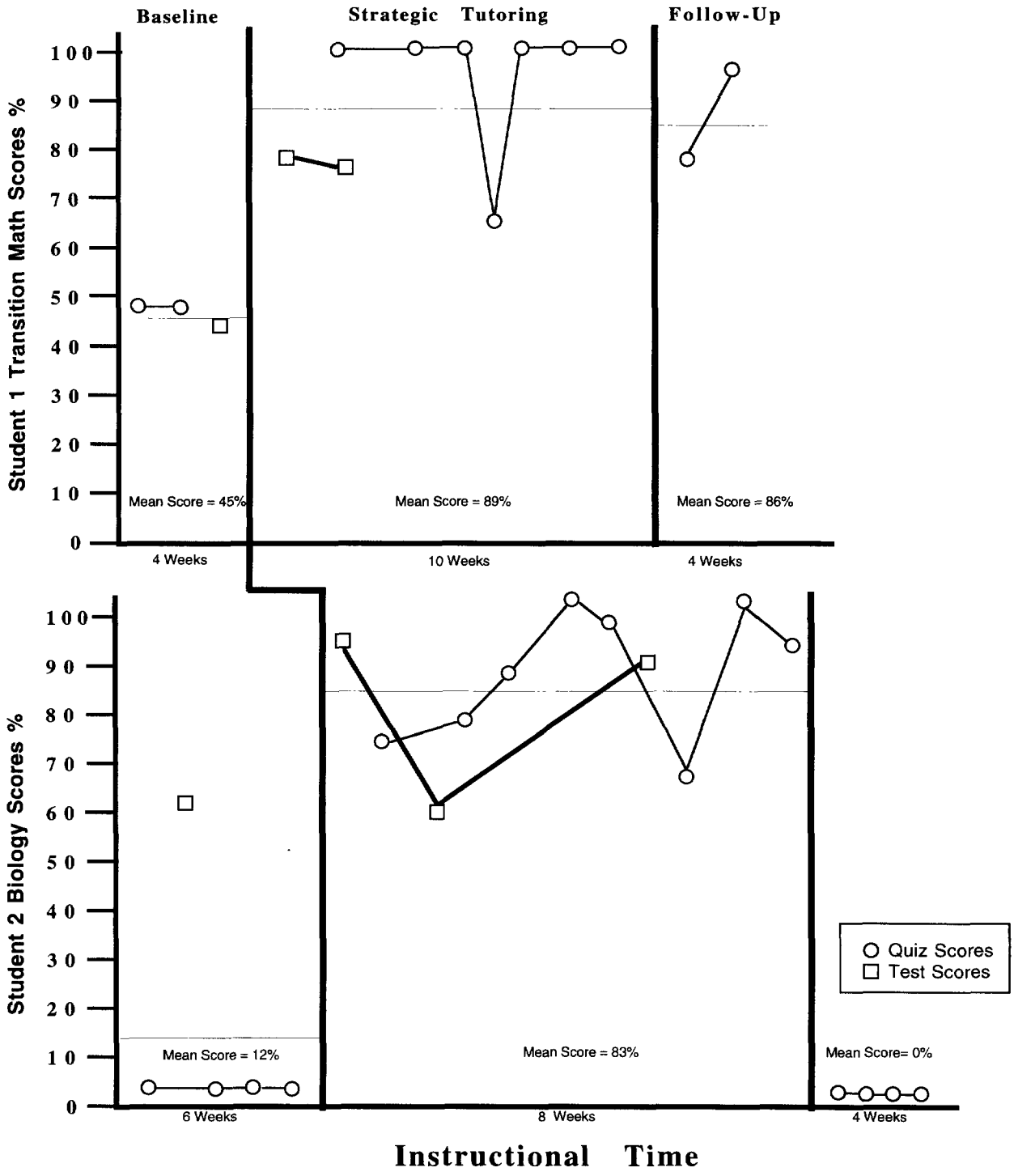

FIGURE 2. Student 1 and Student 2 performances on tests and quizzes for Study 2.

assignment. In another case, the student told the tutor that her math teacher had taught the class a strategy for determining the order of operations, and she just needed help if she became stuck. The tutor provided guided support as the student applied the strategy to the assignment. In still another situation, the student came to tutoring very upset with her performance in math and did not want to do any math assignment work. The tutor treated the session as a mentoring opportunity and proceeded to guide the student through a goal-setting and action-planning activity. Thus, tutors were

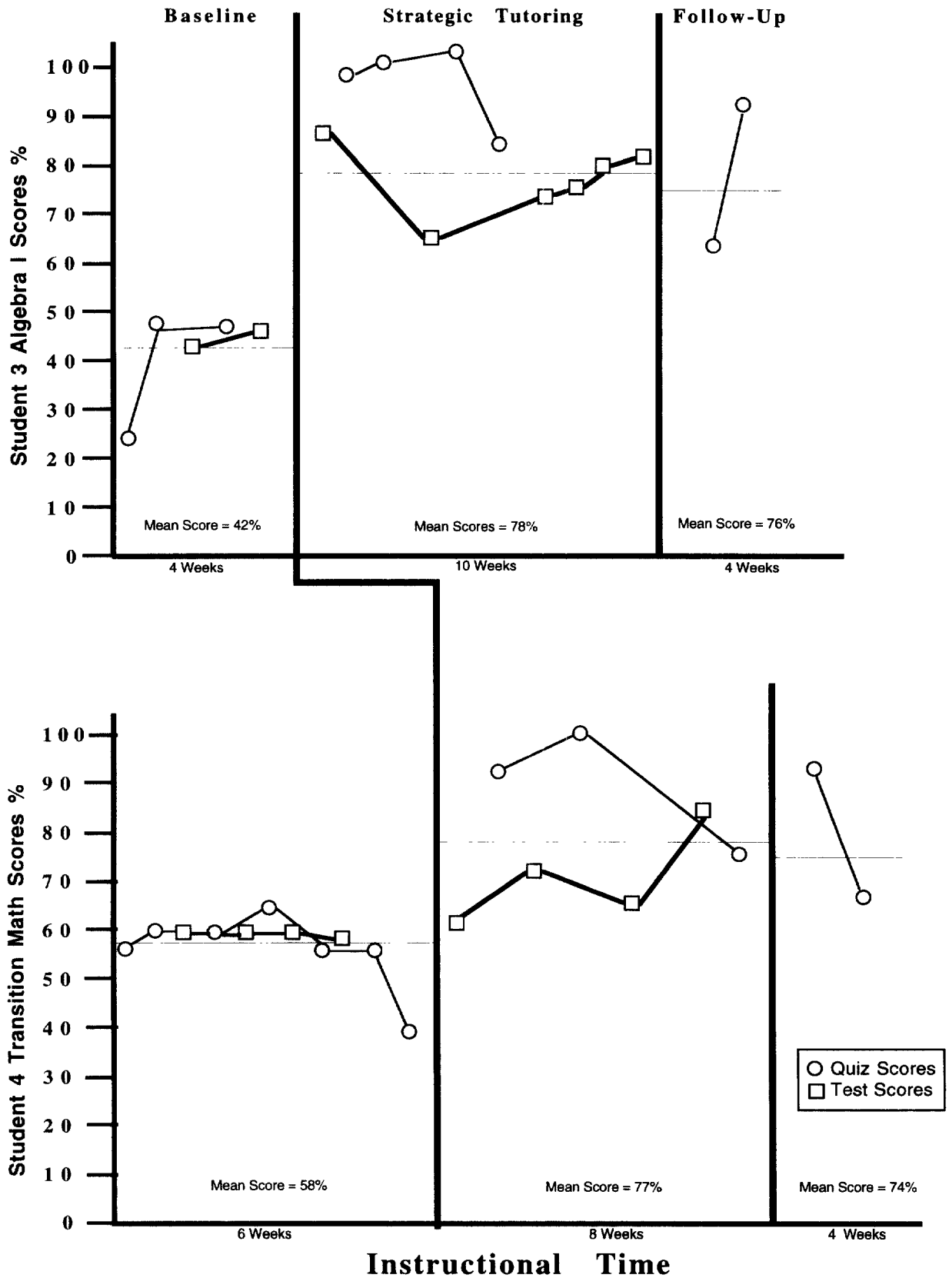

FIGURE 3. Student 3 and Student 4 performances on tests and quizzes for Study 2.

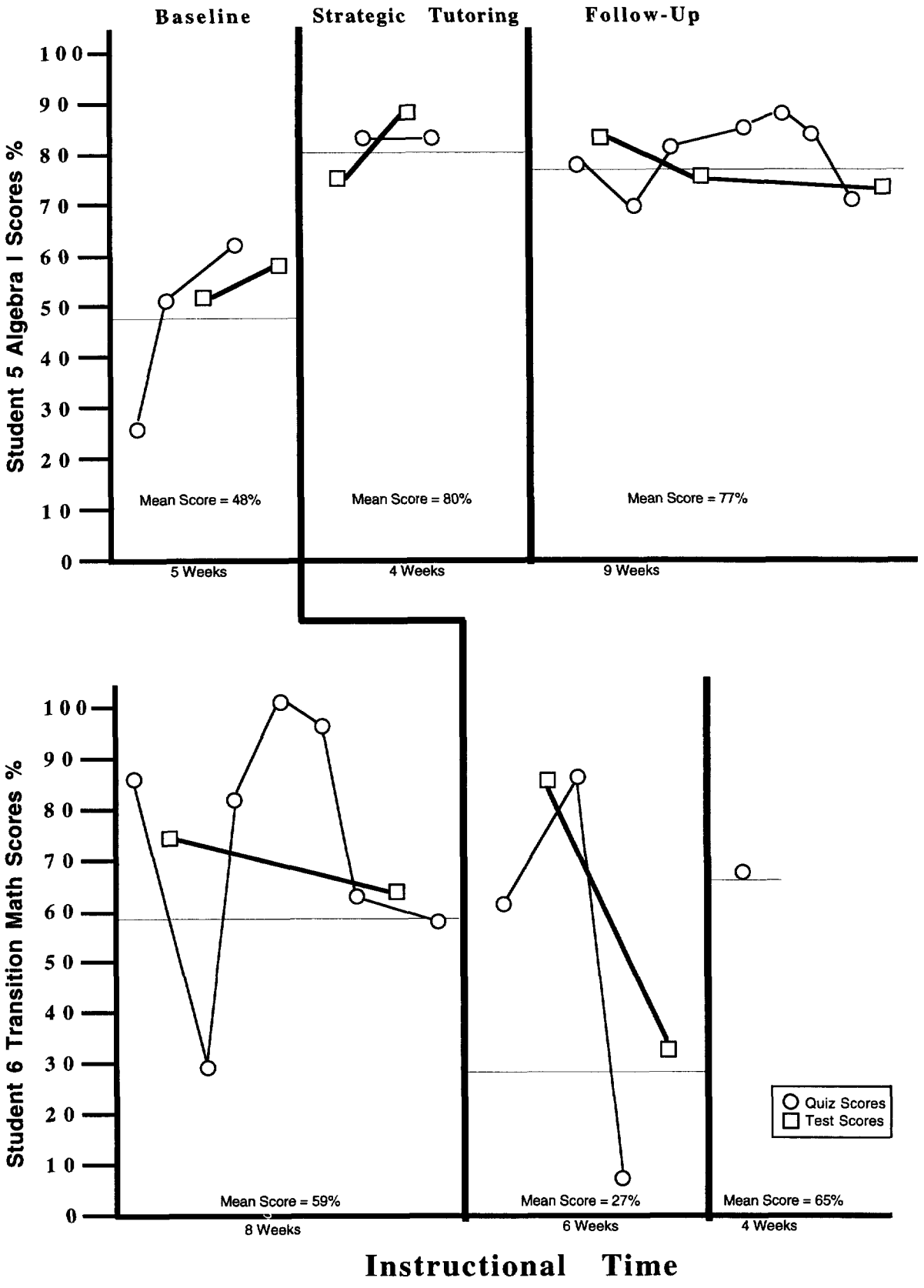

FIGURE 4. Student 5 and Student 6 performances on tests and quizzes for Study 2.

often forced to find "teachable moments" in which to engage in the instructional process relative to strategic tutoring.

Tutors used the same instructional methodology with all students for all subjects and taught the students a similar general problem-solving strategy. Additionally, all tutored courses were similar in format (weekly quizzes and biweekly tests). Therefore, course variables (i.e., algebra, transition math, biology) were not controlled in the study.

Tutor Training. Tutor training procedures for Study 2 were the same as those used during Study 1. That is, tutors participated in the 2-hour workshop and they received feedback on actual tutoring sessions after the first and fourth tutoring sessions. The project research assistant observed the tutoring behaviors of all tutors, scored the behaviors by using a version of the Strategic Tutoring Checklist, which listed all the behaviors required in a strategic tutoring session, and provided individual feedback to the tutors.

Strategic Tutoring. Tutors in Study 2 followed the same tutoring procedures that were used during Study 1. Tutors taught strategies appropriate to the task at hand while they provided students help with current class assignments.

Results

Students

Quiz and Test Scores. During the baseline period, the students as a group earned a mean score of 50.31% on tests and quizzes. They earned a mean score of 80.26% after strategic tutoring. Student 6 had lower scores during the tutoring condition than during baseline; the other students had higher scores during the tutoring condition than during baseline. Additionally, four of the six students maintained their performance 4 to 5 weeks after strategic tutoring support ended (see Figures 2, 3, and 4).

The semester grades students earned during baseline were Fs and Ds. The grades students earned for the semester in which strategic tutoring was provided were all in the C range, with the exception of Student 6, who earned an F for both the baseline and treatment semesters because of low or missing scores on tests and quizzes, low homework grades, and excessive absences.

Strategy Knowledge. Knowledge of specific strategies (e.g., the MATH strategy) increased from a mean pretest score of 15% of points possible to a mean posttest score of 85%. In general, on the pretest students displayed little specific knowledge of strategies appropriate to the task at hand. After instruction, the students named most of the behaviors related to the strategy they had been taught. Student 6 refused to complete both the strategy knowledge pretest and the posttest and was excluded from this data set. Additionally, student strategies seemed more useful and focused. For example, one student's math strategy for doing word problems changed from "taking notes in class and using them if I don't remember" to organizing math assignments in a folder and using a logical problem-solving strategy for tackling algebra problems.

Students 1, 3, 4, and 5 were able to maintain a mean level of performance equal to their treatment performance after tutoring support ended (see Figures 2, 3, and 4). Student 2 did not maintain his performance level; he earned scores of 0% on the four remaining biology quizzes and tests. His classroom teacher indicated that he missed school every day that there was a test scheduled and received failing grades because he did not take the quizzes and tests. Student 6 earned a mean score of 65% after tutoring ended, which was actually an improvement over scores earned during strategic tutoring.

Effect Size

Effect sizes for student performance were obtained by using the same methods as described for Study 1. Effect sizes ranged from −.89 to 10.72, with a mean effect size of 3.12.

Tutor Fidelity

An analysis of the tutoring fidelity measure indicated that tutors sometimes assessed the task at hand, created strategies, modeled strategies, checked student understanding of strategies, and guided the application of strategies to the student's assignments during tutoring sessions. Specifically, over the course of two tutoring sessions, tutors engaged in a mean of 80% of the behaviors listed on the checklist. However, only one tutor included all five behaviors. Two tutors included all behaviors except checking for understanding, and two other tutors included all behaviors except modeling. The final tutor failed to include assessment and creating strategies. However, this tutor worked with the student whose math teacher taught strategies in the math class and expected students to use the strategies on assignments, so there was little need to create strategies during tutoring sessions because the student had already received good strategies from her teacher.

Discussion

Consistent with researchers who found one-to-one instruction in skills, strategies, and content to be largely effective (e.g., Bloom, 1984; Graesser et al., 1997; Slavin, 1990; Slavin et al., 1989; Wasik & Slavin, 1990), we found that strategic tutoring was effective in improving the academic performance of five of the six students participating in the study. These students improved their performance on quizzes and tests from failing and below-average scores to average and above-average scores. Additionally, these students improved their semester

grades from Fs and Ds to Cs. On the other hand, one student (Student 6) did not improve his performance, but actually earned lower scores while receiving strategic tutoring than during baseline. Thus, strategic tutoring was ineffective for this student, and he eventually failed the course for the semester. When the student was asked by the tutor and project research assistant what could be done to help him improve his performance, the student reported that he was not going to complete school and that he would be joining his parents to work in the family business. He saw no need to further his education beyond eighth grade. Consequently, he saw little reason to attend school, and his attendance was very poor. The tutor was unable to provide intensive, ongoing instruction or gain the student's commitment to put forth effort to earn passing grades and learn how to become an independent learner.

In addition to the increase in student test and quiz performances for the five students, these students' knowledge of specific strategies also increased markedly. After strategic tutoring, most of the students were able to describe useful strategies that addressed the demands they faced in the tutored course. These strategies were very different from the strategies they described before the strategic tutoring intervention. The acquisition of useful strategies is one indicator of independent learner status (Pressley, Borkowski, & Schneider, 1989).

An important element of intervention research is fidelity to the treatment model. A measure of tutor fidelity to the strategic tutoring routine in Study 2 showed that tutors included most of the key elements of strategic tutoring over a series of two tutoring sessions. Thus, tutor training that included knowledge acquisition, modeling, role-play practice, and feedback/coaching of actual tutoring sessions was effective in teaching tutors to include many of the behaviors associated with strategic tutoring during tutoring sessions. However, some tutors did not include key tutoring behaviors in either of the two tutoring sessions observed during the study. For example, two tutors did not model strategies for their students, an important instructional behavior. Whether an increase in the quality of tutoring would have positively affected student performance during and after the study is unknown. More tutor practice, coaching, and feedback may be necessary before tutors are skilled enough to include all strategic tutoring behaviors during their tutoring interactions. (See Hock et al. 1995, for more information on training strategic tutors.)

The ultimate goal of strategic tutoring is to develop independent and proficient learners. Four of the students in Study 2 were able to maintain a high level of performance several weeks after strategic tutoring services were no longer available. Thus, some indication was obtained of strategic tutoring's effectiveness with regard to the development of independent learners. This finding must be tempered with the knowledge that end-of-year classroom demands may be different from the academic demands experienced earlier in the semester. Additionally, students who did not maintain satisfactory performance in the tutored class attended school irregularly or were not committed to putting forth academic effort.

Effect sizes were large in all but one case. Large effect sizes indicated robust increases in performance on tests and quizzes in the general education classrooms. However, the negative effect size gain for Student 6 (–.89) may indicate that strategic tutoring requires a level of commitment from the student. Thus, when student commitment is missing, strategic tutoring may not positively affect student quiz and test performance.

There are several limitations to the current studies. First, although single-subject research designs are an effective measure of individual growth, the generalizability of the findings may be limited because all students attended the same school and limited numbers of students participated. Second, whether strategic tutoring is more effective than other instructional tutoring programs is unknown. Third, one goal of strategic tutoring is to support the development of independent learners who are proficient in the application of strategies to unique tasks. In these studies, whether students actually used the strategies they learned in tutoring sessions with assignments in their general education classes is unknown. Fourth, most students asked for tutorial assistance with math assignments. Therefore, the effectiveness of strategic tutoring in content areas other than transition math, algebra I, or biology is unknown. Finally, although most students seemed pleased with their tutors and strategic tutoring, no measure of student, tutor, and teacher satisfaction was obtained. Thus, whether students and tutors endorse strategic tutoring is unknown.

Those considering implementing after-school tutoring programs should note several findings relative to these studies. First, the core purpose of the after-school tutoring program should be clearly defined. The program's core purpose (e.g., assignment assistance, instructional or strategic tutoring) will determine, in large measure, the outcomes attained by students. Second, tutors—who are expected to teach students the knowledge, skills, and strategies necessary for learner independence—need to receive well-designed, professional development opportunities. Good instruction does not automatically happen in one-to-one tutoring. Finally, strategic tutoring is ineffective for students who do not attend classes or tutoring sessions regularly. Students in these studies who were tutored for short periods of time (i.e., 4 weeks or less), who did not attend class and take quizzes and tests, or who did not want to work with tutors were unable to attain independence or earn passing grades. Meeting the needs of these students would require additional intervention beyond tutoring in after-school programs. Recognizing that strategic tutoring is not effective under these conditions is important as educators strive to meet the needs of diverse learners.

Educators are searching for effective methods that improve opportunity and the quality of life for at-risk students

and students with LD. Strategic tutoring has been found to be effective in increasing the academic performance of some at-risk students and students with LD on quizzes and tests in general education classes. The impact of this success is important in the effort to close the gap between failure and success for these learners. More important is the finding that some students can learn to be more strategic in their approach to learning and continue to experience a measure of success in general education classes even when tutorial support is terminated. Thus, strategic tutoring seems to be a promising practice in meeting the academic needs of some at-risk learners. ■

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