Peer Tutoring in Math Computation with Constant Time Delay

DESCRIPTION: This intervention employs students as reciprocal peer tutors to target acquisition of basic math facts (math computation) using constant time delay (Menesses & Gresham, 2009; Telecsan, Slaton, & Stevens, 1999). Each tutoring 'session' is brief and includes its own progress-monitoring component--making this a convenient and time-efficient math intervention for busy classrooms.

Grades: K - 12

MATERIALS:

Student Packet: A work folder is created for each tutor pair. The folder contains:

- 10 math fact cards with equations written on the front and correct answer appearing on the back. NOTE: The set of cards is replenished and updated regularly as tutoring pairs master their math facts.
- Progress-monitoring form for each student. (See sample *Math Tutoring: Score Sheet* attachment at the bottom of the page)
  Pencils.

PREPARATION: To prepare for the tutoring program, the teacher selects students to participate and trains them to serve as tutors.
Select Student Participants. Students being considered for the reciprocal peer tutor program should at minimum meet these criteria (Telecsan, Slaton, & Stevens, 1999, Menesses & Gresham, 2009):

- Is able and willing to follow directions
- Shows generally appropriate classroom behavior
- Can attend to a lesson or learning activity for at least 20 minutes
- Is able to name all numbers from 0 to 18 (if tutoring in addition or subtraction math facts) and name all numbers from 0 to 81 (if tutoring in multiplication or division math facts)
- Can correctly read aloud a sampling of 10 math-facts (equation plus answer) that will be used in the tutoring sessions. (NOTE: The student does not need to have memorized or otherwise mastered these math facts to participate—just be able to read them aloud from cards without errors)
- [To document a deficit in math computation] When given a two-minute math computation probe to complete independently, computes fewer than 20 correct digits (Grades 1-3) or fewer than 40 correct digits (Grades 4 and up) (Deno & Mirkin, 1977).

NOTE: Teachers may want to use the attached *Reciprocal Peer Tutoring in Math Computation: Teacher Nomination Form* (see attachment at the bottom of the page) to compile a list of students who would be suitable for the tutoring program.

Train the Student Tutors. Student tutors are trained through explicit instruction (Menesses & Gresham, 2009) with the teacher clearly explaining the tutoring steps, demonstrating them, and then having the students practice the steps with performance feedback and encouragement from the teacher. The teacher also explains, demonstrates, and observes students practice the progress-monitoring component of the program. (NOTE: Teachers can find a handy listing of all the tutoring steps in which students are to be trained on the attached form *Peer Tutoring in Math Computation with Constant Time Delay: Integrity Checklist* (see attachment at the bottom of the page). This checklist can also be used to evaluate the performance of students to determine their mastery of the tutoring steps during practice sessions with the teacher.)

When students have completed their training, the teacher has each student role-play the tutor with the teacher assuming the role of tutee. The tutor-in-training works through the 3-minute tutoring segment and completes the follow-up progress-monitoring activity. The teacher then provides performance feedback. The student is considered

to be ready to tutor when he or she successfully implements all steps of the intervention (100% accuracy) on three successive training trials (Menesses & Gresham, 2009).

INTERVENTION STEPS: Students participating in the tutoring program meet in a setting in which their tutoring activities will not distract other students. The setting is supervised by an adult who monitors the students and times the tutoring activities. These are the steps of the tutoring intervention:

Complete the Tutoring Activity. In each tutoring pair, one of the students assumes the role of tutor. The supervising adult starts the timer and says 'Begin'; after 3 minutes, the adult stops the timer and says 'Stop'.

While the timer is running, the tutor follows this sequence:

- Presents Cards. The tutor presents each card to the tutee for 3 seconds.
  Provides Tutor Feedback. [When the tutee responds correctly] The tutor acknowledges the correct answer and presents the next card.
- [When the tutee does not respond within 3 seconds or responds incorrectly] The tutor states the correct answer and has the tutee repeat the correct answer. The tutor then presents the next card.
- Provides Praise. The tutor praises the tutee immediately following correct answers.
- Shuffles Cards. When the tutor and tutee have reviewed all of the math-fact carts, the tutor shuffles them before again presenting cards.
- Continues to the Timer. The tutor continues to presents math-fact cards for tutee response until the timer rings.

Assess the Progress of the Tutee. The tutor concludes each 3-minute tutoring session by assessing the number of math facts mastered by the tutee. The tutor follows this sequence:

- Presents Cards. The tutor presents each card to the tutee for 3 seconds.
- Remains Silent. The tutor does not provide performance feedback or praise to the tutee, or otherwise talk during the assessment phase.
- Sorts Cards. Based on the tutee's responses, the tutor sorts the math-fact cards into 'correct' and 'incorrect' piles.
- Counts Cards and Records Totals. The tutor counts the number of cards in the 'correct' and 'incorrect' piles and records the totals on the tutee's progress-monitoring chart.

Switch Roles. After the tutor has completed the 3-minute tutoring activity and assessed the tutee's progress on math facts, the two students reverse roles. The new tutor then implements steps 2 and 3 described above with the new tutee.

Conduct Tutoring Integrity Checks and Monitor Student Performance. As the student pairs complete the tutoring activities, the supervising adult monitors the integrity with which the intervention is carried out. At the conclusion of the tutoring session, the adult gives feedback to the student pairs, praising successful implementation and providing corrective feedback to students as needed. NOTE: Teachers can use the form *Peer Tutoring in Math Computation with Constant Time Delay: Integrity Checklist* (see bottom of page) to conduct integrity checks of the intervention and student progress-monitoring components of the math peer tutoring.

The adult supervisor also monitors student progress. After each student pair has completed one tutoring cycle and assessed and recorded their progress, the supervisor reviews the score sheets. If a student has successfully answered all 10 math fact cards three times in succession, the supervisor provides that student's tutor with a new set of math flashcards.

Attachments

- Reciprocal Peer Tutoring in Math Computation: Teacher Nomination Form [2]
- Reciprocal Peer Tutoring in Math Computation: Integrity Checklist [3]
- Reciprocal Peer Tutoring in Math Computation: Score Sheet [4]

References

- Deno, S. L., & Mirkin, P. K. (1977). Data-based program modification: A manual. Reston, VA: Council for Exceptional Children.
- Menesses, K. F., & Gresham, F. M. (2009). Relative efficacy of reciprocal and nonreciprocal peer tutoring for students at-risk for academic failure. School Psychology Quarterly, 24, 266–275.
- Telecsan, B. L., Slaton, D. B., & Stevens, K. B. (1999). Peer tutoring: Teaching students with learning disabilities to deliver time delay instruction. Journal of Behavioral Education, 9, 133-154.