Math Computation: Student Self-Monitoring of Productivity to Increase Fluency

Description: The student monitors and records her or his work production on math computation worksheets during time-drills—with a goal of improving overall fluency (Maag, Reid, R., & DiGangi, 1993). This intervention can be used with a single student, a small group, or an entire class.

Grades: 2-12

MATERIALS:

- Student self-monitoring audio prompt: Tape / audio file with random tones or dial-style kitchen timer
- Math computation worksheets containing problems targeted for increased fluency
- *Student Speed Check!* recording form (attached)

Preparation: To prepare for the intervention the teacher:

1. **Decides on the Length and Frequency of Each Self-Monitoring Period.** The instructor decides on the length of session and frequency of the student's self-monitoring intervention. NOTE: One good rule of thumb is to set aside at least 10 minutes per day for this or other interventions to promote fluent student retrieval of math facts (Gersten et al., 2009). *For example, Mrs. Rilke, a 3rd-grade teacher, decides that her student, Roy, will monitor his productivity on math computation worksheets on a daily basis for 10 minutes per session.*
2. **Selects a Math Computation Skill Target.** The instructor chooses one or more problem types that are to appear in intervention worksheets. *For example, Mrs. Rilke decides to target two math computation problem-types for Roy: Addition—double-digit plus double-digit with regrouping and Subtraction—double-digit plus double-digit with no regrouping.*
3. **Creates Math Computation Worksheets.** When the teacher has chosen the problem types, he or she makes up sufficient equivalent worksheets (with the same number of problems and the same mix of problem-types) to be used across the intervention days. Each worksheet should have enough problems to keep the student busy for the length of time set aside for a self-monitoring intervention session. *For example, when designing a worksheet, Mrs. Rilke decides to include 15 problems per sheet for her 3rd grade student, to keep Roy busy for the 10 minute daily intervention period. The teacher then goes to the free math worksheet generator at www.interventioncentral.org [2] to create and print off 25 equivalent math worksheets for use across all intervention days (5 days per week for five instructional weeks).*
4. **Determines How Many Audio Prompts the Student Will Receive**. This time-drill intervention relies on student self-monitoring triggered by audio prompts. Therefore, the teacher must decide on a fixed number of audio prompts the student is to receive per session. NOTE: On the attached *Student Speed Check!* form, space is provided for the student to record productivity for up to five audio prompts per session. *In our example, Mrs. Rilke selects five audio prompts per session.*

5. **Selects a Method to Generate Random Audio Prompts.** Next, the teacher must decide on how to generate the audio prompts (tones) that drive this intervention. There are two possible choices:
   (Choice A) The teacher can develop a tape or audio file that has several random tones spread across the time-span of the intervention session, with the number of tones equaling the fixed number of audio prompts selected for the intervention (see previous step). For example, the instructor may develop a 10-minute tape with five tones randomly sounding at 2 minutes, 3 minutes, 5 minutes, 7 minutes, and 10 minutes.
   (Choice B) The instructor may purchase a dial-type kitchen timer. During the intervention period, the instructor turns the dial to a randomly selected number of minutes. When the timer expires and chimes as a student audio prompt, the teacher resets the timer to another random number of minutes and repeats this process until the intervention period is over. Of course, the teacher must ensure that the student receives the same fixed number of audio prompts (e.g., 5) across each intervention session and that all audio prompts are delivered by the conclusion of the timed intervention session. Before each intervention session, the teacher may want to preselect several random time intervals. For example, on a given day, the instructor who wants to include five timer prompts in a 10 minute intervention session may decide to ring the timer at 2 minutes, 3 minutes, 5 minutes, 7 minutes, and 10 minutes. This sequence would then be changed for the next session.
6. **Trains the Student in the Procedures to Self-Monitor Productivity.** The teacher meets with the student to train him or her in the steps of the intervention (described in the next section).

INTERVENTION STEPS: Sessions of the productivity self-monitoring intervention for math computation include these steps:

1. **[Student] Set a Session Computation Goal.** The student looks up the total number of problems completed on his or her most recent timed worksheet and writes that figure into the 'Score to Beat' section of the current day's *Student Speed Check!* form.
2. **[Teacher] Set the Timer or Start the Tape.** The teacher directs the student to begin working on the worksheet and either starts the tape with tones spaced at random intervals or sets a kitchen timer. If using a timer, the teacher randomly sets the timer randomly to a specific number of minutes. When the timer expires and chimes as a student audio prompt, the teacher resets the timer to another random number of minutes and repeats this process until the intervention period is over.
3. **[Student] At Each Tone, Record Problems Completed.** Whenever the student hears an audio prompt or at the conclusion of the timed intervention period, the student pauses to:
   -circle the problem that he or she is currently working on
   -count up the number of problems completed since the previous tone (or in the case of the first tone, the number of problems completed since starting the worksheet)
   -record the number of completed problems next to the appropriate tone interval on the *Student Speed Check!* form.
4. **[Teacher] Announce the End of the Time-Drill Period.** The teacher announces that the time-drill period is over and that the student should stop working on the worksheet. NOTE:

If a tape or audio file is being used to deliver audio tones, it can contain an announcement stating that the intervention period has ended.

5. **[Student] Tally Day's Performance.** The student adds up the problems completed at the tone-intervals to give a productivity total for the day. The student then compares the current day's figure to that of the previous day to see if he or she was able to beat the previous score. If YES, the student receives praise from the teacher; if NO, the student receives encouragement from the teacher.

Attachments

- *Student Speed Check!* Form [3]

References

- Gersten, R., Beckmann, S., Clarke, B., Foegen, A., Marsh, L., Star, J. R., & Witzel,B. (2009). *Assisting students struggling with mathematics: Response to Intervention RtI) for elementary and middle schools* (NCEE 2009-4060). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sci ences, U.S. Department of Education. Retrieved from http://ies.ed.gov/ncee/wwc/publications/practiceguides/ [4]
- Maag, J. W., Reid, R., & DiGangi, S. A. (1993). Differential effects of self-monitoring attention, accuracy, and productivity. *Journal of Applied Behavior Analysis, 26*, 329-344.