The Effects of Cover, Copy, and Compare and Flash Card Drill on Correct Rate of Math Facts for a Middle School Student with Learning Disabilities*

Jennifer Hayden

and

T. F. McLaughlin
Gonzaga University

We examined the effectiveness of the cover, copy, and compare drill and practice procedure to that of card practice on the correct and errors responses of write math facts. A with a middle school student with learning disabilities served as the participant. The cover, copy, and compare procedures did improve correct rate but produced only a small change in errors. The frequency of correct responses increased and errors declined and remained at 0.0 occurrences after flash card practice with another peer. We discussed the applicability of cover, copy, and compare procedure as well as flash card practice with middle school students.

DESCRIPTORS:

A solid foundation in math facts is a prerequisite to most employment in our globally competing world. Potential employers are interested and frequently hire employees with sound math skills. Sound math skills are built on a fluent mastery of math facts. Math is like an inverted pyramid of higher ordered skills. Building fluent math tool skills is a prerequisite for learning and mastering higher order math skills. Higher order math skills are sought and handsomely paid in today's competitive job market.

Learning multiplication facts is a basic part of the math curriculum. Students with learning disabilities often use counting strategies such as finger counting and using multiplication matrices, to solve basic mathematical problems (e. g. Lerner, 1999; Skinner, Turco, Beatty, & Rasavage, 1989). These strategies typically a fluency blockers in computing math problems/ Fluency blockers can dramatically diminish the performance of mathematical functions and the requirements of many math related tasks (Skinner et al., 1989; Skinner & Schock, 1995).

Calculation skills is one predictor of school success (Lloyd, 1978; Haring, Lovitt, Eaton, & Hansen, 1978). For example, Lloyd (1978) found that poor academic performance, as early as the third grade, predicted later school failure and increased the risk of later dropping out of school. Building fluency (i.e. accuracy plus speed), math skills should improve the likelihood of a student's future academic and social success (Miller & Heward, 1992).

Immediately recalling of math facts is superior to using counting strategies, and allows students to respond with less effort and more skill across settings (Pieper, 1981). For example, many of the math skills need to be performed at a certain rate or speed in order to be functional (Heward, 1994; Johnson & Layng, 1994; McLaughlin & Skinner, 1996; Miller & Heward, 1992). The use of finer counting strategies may be acceptable for learning addition and subtraction, but are insufficient for multiplication and division and more complex problem types (Silbert, Carnine, & Stein, 1996). Further, individuals with deficiencies in math skills may also be excluded from certain vocational and career options (Skinner & Smith, 1992). In addition, automatically recalling basic number facts allows the student to devote more attention to more complex mathematical procedures (Binder, 1994; Johnson & Layng, 1994).

Two essential components of increasing fluency are a) providing many opportunities to respond, and b) immediate corrective feedback (Skinner et al., 1989). Practice and review has also been viewed as critical for the maintenance of skills over time (Silbert et al., 1996). The copy, cover, and compare procedure (Murphy, Hern, McLaughlin, & Williams, 1990) or cover, copy, and compare procedure (McLaughlin & Skinner, 1996; Skinner et al., 1989; Skinner, Belfiore, & Pierce, 1992; Skinner, Turco, Beatty, & Rasavage, 1989) meets these criteria and has been successfully used to improve student performance in spelling (McLaughlin,

*Preparation of this project was in partial fulfillment of the requirements for EDSE 410--Precision Teaching, a component of the Department of Special Education at Gonzaga University. Requests for reprints should be addressed to Jennifer Hayden, Department of Special Education, Gonzaga University, Spokane, WA 99258-0001 or e-mail tmclaughlin@soe.gonzaga.edu.

Reiter, Mabee, & Byram, 1991; Noland, McLaughlin, & Sweeney, 1994; Pratt-Struthers, Bartalamay, Williams, & McLaughlin, 1989; Pratt-Struthers, Struthers, & Williams, 1983; Schermerhorn & McLaughlin, 1997; Struthers, Bartalamay, Bell, & McLaughlin, 1994), geography (Skinner et al., 1992) and mathematics (Bolich, Kavon, McLaughlin, Williams, & Urlacher 1995; Lee & Tingstrom, 1994; Ozaki, Williams, & McLaughlin, 1996; Skinner et al., 1989; Stading, Williams, & McLaughlin, in press). Effective teaching allows for individualization, frequent collection of data, and rapid and easy modification of procedures (Binder, 1994). Copy, cover, and compare procedures are highly adaptable, and typically produce impressive outcomes (McAuley & McLaughlin, 1992; McLaughlin & Skinner, 1996). One draw back that has been noted by teachers who have implemented the cover, copy, and compare student self-drill and practice procedure has been the tracking of which problems of works to add or remove from the procedure.

The propose of this study was compare the use of cover copy, and compare to flash card drill to increase the correct rate and decrease errors see to write math facts with a single middle school student with learning disabilities. In addition, a comparison between cover, copy, and compare and in class flash card drill was carried out.

METHOD

Participants and Setting

The participant of the study was a 15-year-old student enrolled in a self-contained special education math class, attended a medium sized middle school in the Pacific Northwest, matched the state and Federal definition for learning disabilities in math. The student was 3 years below grade level and he had been receiving a failing grade in math at the beginning of this research. All sessions took place in the students' special education classroom.

Dependent Variables and Measurement Procedures

The dependent variables were number of correct and error digits per minute. The first author used timed practice sheets to collect data for both digits correct and errors per minute. Data were collected from two to three times a week for approximately 10 to 15 minutes per session. A sample probe sheet that was used can be seen in Figure 1. Each probe sheet contained 135 movements and were composed of single digit multiplication problems consisting of problem sets of x 1 random.

Baseline. The student was provided with the practice sheets. The Baseline consisted of two one-minute timings on separate days to establish correct and error rate. Also, these timings provided the problem sets that would be used in the cover, copy, and compare procedure. In addition, the participant's tool rate for see to write digits was also taken.

Cover, copy, and compare. Cover, Copy, and Compare mandates, an academic stimulus, a response, an evaluation procedure, and an error correction procedure. In the present report, the student copied the problem and solution, covered the problem and answer, and wrote the problem and product from memory. The student completed this self-drill and practice procedure. After the student wrote the problem and its solution correctly for three consecutive trials, it was removed and another problem added. Since the error rate was so low, only three problems were kept for three consecutive data days. The student was timed for 1 minute on the appropriate probe sheet. At the end of the session, the student was timed on this appropriate practice sheet.

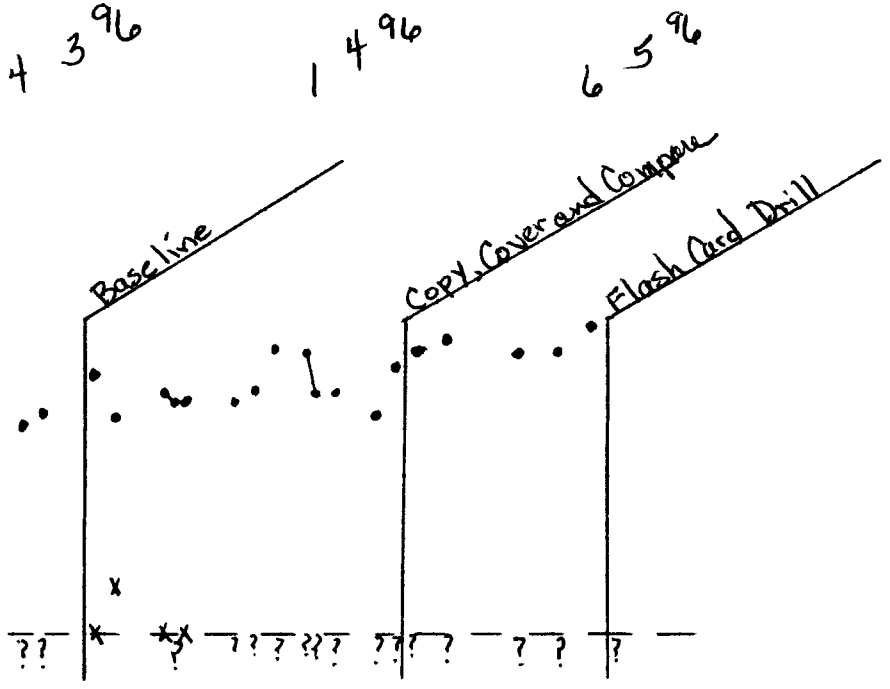
Flash card drill. During this phase the participant and a peer engaged in flash card drill prior to completing their 1-minute practice sheet in math (See Figure 1). Flash cards were made form 3" by 5" note cards with the problems on one side and the problem and solution on the other. After flash card drill the standard cover, copy, and compare procedure was used. Data were collected from the students practice sheets for three school weeks (six data days).

RESULTS

The overall outcomes can be seen in Chart 1. During baseline the participant wrote from 22 to 28 corrects (M = 25.0) with 0.0 errors per minute. The implementation of the cover, copy, and compare procedure correct rate per minute improved (M = 34.2; range 25 to 42). However, error rate per minute increased (M = 1 range 0 to 2). There was an increase in correct rate and a decrease in errors during flash card drill.(See Chart 1). Overall, correct increased to an average of 41.8 per minute (range 27 to 50) with errors remained at 0.0 per minute.

DISCUSSION

The results of the study indicate that math facts can be increased for a student with learning disabilities by copy, cover, and compare and flash card drill. There were strengths and limitations in the present case report. A strength of the research



McLaughlin McLaughlin McLaughlin Terry 15 Write Digits
Gonzaga University Sp. Ed Resource Jennifer H. Jennifer H McLaughlin

was the fact that an undergraduate student could implement, manage, and assess project. However, there were several limitations in the present case study. First, data were not able to be collected each day due to schedule conflicts between the first author and her university classes.. Data collection could have been carried out over a longer period of time. A six week analysis with five data days in one condition (cover, copy, and compare) and six in the other (flash card drill) may not be long enough to allow the effects of either intervention to be evident. Also having data collection and practice each day allows for more feedback which has been shown to improve student performance in math (Skinner, Shapiro, Turco, Cole, & Brown, 1992) and in reading (McLaughlin, 1992). However, the use of a tool rate assessment allowed one to make the judgment that the participant did approximate his tool rate (43.25) on three data days during flash card drill. The use of either intervention did not require additional training of staff and could be employed with little disruption to the ongoing classroom routine.

To resolve the issue as to which is more effective, flash card drill or cover, copy, and compare, additional data will have to be gathered. An analysis where one of the three procedures (baseline, cover, copy, and compare, or flash card drill) are employed for one session and then withdrawn and another procedure employed would have yielded an alternating treatments design (Kazdin, 1982). This would have allowed for a more rigorous analysis. In the present analysis there was an increase correct rate during flash card drill as well as a reduction of errors to zero. But due to the short periods of time in this phase, caution is urged.

REFERENCES

Binder, C. (1994). Measurably superior instructional methods: Do we need sales and marketing? In R. Gardner III, D. M. Sainato, J. O. Cooper, T. E. Heron, W. L. Heward, J. W. Eshelman, & T. A. Grossi (Eds.), *Behavior analysis in education: Focus on measurably superior instruction* (pp. 21-41). Pacific Grove, CA: Brooks/Cole.

Bolich, B., Kavon, N., McLaughlin, T. F., Williams, R. L., & Urlacher, S. (1995). Effects of a copy, cover, compare procedure and a token economy on the retention of basic multiplication facts by two middle school students with ADD/ADHD. *B. C. Journal of Special Education*, 19(2), 1-10.

Haring, N.G., Lovitt, T. C., Eaton, M.D., & Hansen, C.L. (Eds.). (1978). *The fourth R: Research in the classroom.* Columbus, OH: Merrill Publishing Co.

Heward, W. L. (1994). Three "low" tech strategies for increasing the frequency of active student response during group instruction. In R Gardner III, Sainato, D., Cooper, J. O., Heron, T., Heward, W. L., Eshleman, J., & Grossi, T. A. (Eds.) *Behavior analysis in education: Focus on measurable superior instruction* (pp. 283-320). Pacific Grove, CA: Brooks/Cole.

Johnson, K. R., & Layng, T. V. (1994). The morning side model of generative instruction. In R. Gardner III, D. M. Sainato, J. O. Cooper, T. E. Heron, W. L. Heward, J. W. Eshelman, & T. A. Grassi (Eds.). Behavior analysis in education: Focus on measurably superior instruction (pp. 173-197). Pacific Grove, CA: Brooks/Cole.

Kazdin, A. E. (1982). *Single case designs: Methods for clinical and applied settings.* New York: Oxford.

Lee, M. J., & Tingstrom, D. H. (1994). A group math intervention: The modification of cover, copy, and compare for group application. *Psychology in the Schools*, 31, 133-145.

Lerner, J. (1999). *Learning disabilities theories, diagnosis, and teaching strategies (6th ed.).* Boston: Houghton Mifflin Co.

Lloyd, D. N. (1978). Prediction of school failure from third-grade data. *Educational and Psychological Measurement*, 38, 1193-1200.

McAuley, S. M., & McLaughlin, T. F. (1992). Comparison of add-a-word and compu spell programs with low-achieving students. *Journal of Educational Research*, 85, 362-369.

McLaughlin, T. F. (1992). Effects of written feedback on reading with behaviorally disordered students. *Journal of Educational Research*, 85, 312-316.

McLaughlin, T. F. , Mabee, W. S. , Reiter, S., & Byram, B. (1991). An analysis and replication of the add-a-word program with mildly handicapped middle school students. *Journal of Behavioral Education*, 1,

413-426.

McLaughlin, T. F., & Skinner, C. H. (1996). Improving academic performance through self-management: Cover, copy, and compare. *Intervention in School and Clinic*, 32, 113-118.

Miller, A. D., & Heward, W. L. (1992). Do your students really know their math facts? Using daily time trials to build fluency. *Intervention in School and Clinic*, 28(2), 98-104.

Murphy, J., Hern, C., McLaughlin, T. F., & Williams, R. L. (1990). The Effects of the copy, cover, and compare approach to increasing spell ing accuracy with learning disabled students. *Contemporary Educational Psychology*, 15, 378-386.

Noland, E., McLaughlin, T. F., & Sweeney, W. J. (1994). The effects of precision teaching and add-a-word spelling on spelling performance of an adult graduate student. *Journal of Precision Teaching*, 11(2), 14-18.

Ozaki, C., Williams, R. L., & McLaughlin, T. F. (1996). Effects of copy/cover/compare drill and practice procedures for multiplication facts mastery with a sixth grade student with learning disabilities. *B. C. Journal of Special Education*, 20(2), 67-76.

Pieper, E. (1981). A technique for discovering LD adolescents' strategies for solving multiplication facts. *The Pointer*, 27(2), 40-41.

Pratt-Struthers, J. P., Bartalamay, H. R., Williams, R. L., & McLaughlin, T. F. (1989). Effects of the add-a-word spelling program on spell ing in creative writing: A replication across two classrooms. *B. C. Journal of Special Education*, 13, 151-158.

Pratt-Struthers, J. P., Struthers, T., & Williams, R. L. (1983). The effects of the add-a-word system on spelling accuracy during creative writing. *Education and Treatment of Children*, 6, 277-283.

Schermerhorn, P., K., & McLaughlin, T. F. (1997). Effects of the add-a-word spelling program on test accuracy, grades, and retention of spelling words with fifth and sixth grade regular education students. *Child & Family Behavior Therapy*, 19(1), 23-35.

Silbert, J., Carnine, D., & Stein, M. (1996). *Direct instruction mathematics (3rd ed).* Englewood Cliffs, NJ: Prentice-Hall.

Skinner, C. H., Belfiore, P. J., & Pierce, N. (1992). Cover, copy, and compare: Increasing geography accuracy in students with behavior disorders. *School Psychology Review*, 21, 73-81.

Skinner, C. H., Turco, T. L., Beatty, K. L., & Rasavage, C. (1989). Cover, copy, and compare: A method for increasing multiplication performance. *School Psychology Review*, 18, 412-420.

Skinner, C. H., & Schock, H. H. (1995). Assessing mathematics skills. In A. Thomas, A. & J. Grimes, (Eds.) *Best practices in school psychology* (pp. 731-740). Washington DC: The National Association of School Psychologists.

Skinner, C. H., Shapiro, E. S., Turco, T. L., Cole, C. L., & Brown, D. K. (1992). A comparison of self and peer-delivered immediate corrective feedback on multiplication performance. *Journal of School Psychology*, 30, 101-116.

Skinner, C. H, & Smith, E. S. (1992). Issue surrounding the use of self-management interventions for increasing academic performance. *School Psychology Review*, 21, 202-210.

Skinner, C. H., Turco, T. L., Beatty, K. L., & Rasavage, C. (1989). Cover, copy, and compare: A method for increasing multiplication performance. *School Psychology Review*, 18, 412-420.

Stading, M., Williams, R. L., & McLaughlin, T. F. (in press). Effects of a copy, cover, and compare procedure on multiplication facts mastery with a third grade girl with learning disabilities in a home setting. *Education and Treatment of Children.*

Struthers, J. P., Bartalamay, H., Bell, S., & McLaughlin, T. F. (1994). An analysis of the add-a-word spelling program and public posting across three categories of children with special needs. *Reading Improvement*, 31, 28-36.