Extending Research on the Validity of Brief Reading Comprehension Rate and Level Measures to College Course Success

Robert L. Williams, Christopher H. Skinner, and Kathryn E. Jaspers

The University of Tennessee

Corresponding Author:
Dr. Christopher H. Skinner

Author Contact information:
Robert L. William, Christopher H. Skinner and Kathryn E. Jaspers
Department of Educational Psychology and Counseling
The University of Tennessee
Knoxville, TN 37996-3452
Phone: 865-974-8145

Emails:
Robert Williams: bobwilliams@utk.edu
Chris Skinner: cskinne1@utk.edu
Kathryn Jaspers: twenty8kate@hotmail.com

Abstract

Students in an undergraduate human development course (*N* = 215) participated in a brief assessment of their reading (comprehension level, reading speed, comprehension rate) and multiple-choice test-taking skills on the second day of class. Students first read a one-page, 400-word passage unrelated to the course and then answered 10 multiple-choice questions over the passage without referring back to the passage. To control for test-taking skills, students also answered 10 multiple-choice questions from an equivalent passage they did not read. Videotapes of student participation permitted individual assessment of time required to complete each phase. Subsequently, during the semester students took five 50-item multiple-choice exams over the major units in the course. Results showed that the brief reading comprehension measures predicted multiple-choice exam performance and that comprehension level accounted for most of the variance in exam performance. Discussion focuses on enhancing brief reading assessment procedures by including direct measures of comprehension.

Extending Research on the Validity of Brief Reading Comprehension Rate and Level Measures to College Course Success

Several measures predict success in college courses, including measures of critical thinking, generic vocabulary, background knowledge, and reading comprehension (Behrman & Street, 2005; Jackson, 2005; Williams & Eggert, 2002; Williams, Oliver, Allin, Winn, & Booher, 2003a; Williams, Oliver, Allin, Winn, & Booher, 2003b; Williams, Oliver, & Stockdale, 2004; Williams & Worth, 2002). Not all course activities require high-level critical thinking, an advanced vocabulary, or background knowledge, but virtually all course activities require student reading of course material (Behrman & Street, 2005). Thus, the current study focused on reading comprehension measures as predictors of success in a large undergraduate course.

Although reading comprehension is predictive of student success (Jackson, 2005), reading speed or fluency may also be related to comprehension levels, effort required to read, and reinforcement for reading (Skinner, Pappas, & Davis, 2005). Researchers have measured reading fluency by timing students' oral reading and scoring word accuracy. These data are then used to calculate words correct per minute (WCM), which has been shown to correlate with reading comprehension and other reading skills as measured via standardized, norm-referenced tests with strong psychometric properties (Deno & Merkin, 1977; Deno, Merkin, & Chiang, 1982; Fuchs, & Fuchs, 1992; Fuchs, Fuchs, Hosp, & Jenkins, 2001; Fuchs, Fuchs, & Maxwell, 1988; Hintze & Shapiro, 1997; Jenkins & Jewell, 1993). These studies provide support for several theories that suggest causal mechanisms for explaining the relationship between reading speed and comprehension.

Students who read rapidly and are not required to apply their attention or other cognitive resources (e.g., working memory) towards decoding words have more cognitive resources available to apply towards comprehension. Additionally, as time passes information may become inaccessible (e.g., fading from working memory). Thus, as they read, rapid readers may have access to more information from material read earlier than slow readers,

which may enhance their ability to synthesize information as they progress through passages (LaBerge & Samuels, 1974; Perfetti, 1992; Rasinski, 2004; Stanovich, 1986).

Reading, like many other skills, improves as people choose to spend more time engaged in the activity (Daly, Chafouleas, & Skinner, 2005; Stanovich, 1986). Even when slower readers are able to comprehend the material at the same level as rapid readers, rapid readers are more likely to choose to read the assigned work because it requires less time and effort and results in a higher rate of reinforcement (Billington, Skinner, Hutchins, & Malone, 2004; Skinner, 1998; Skinner, 2002; Skinner, Neddenriep, Bradley-Klug, & Ziemann, 2002; Skinner, Wallace, & Neddenriep, 2002). Additionally, fluent readers have more time to engage in other behaviors that may enhance learning (e.g., studying notes) and test performance (e.g., carefully considering all responses on a multiple choice exam) than those who require more time to read (Skinner et al., 2005).

Although the psychometric research base supporting WCM is strong, the correlations with broad reading skill development begin to decline as skills develop beyond the 4th or 5th grade level (Hintze & Shapiro, 1997; Jenkins & Jewell 1993; Neddenriep, Skinner, Hale, Oliver, & Winn, in press). Jackson's (2005) comparison of reading comprehension, oral reading fluency, and decoding showed that reading comprehension was the only significant predictor of college students' grade point average. Thus, reading comprehension, rather than the ability to read aloud both accurately and rapidly, may be the most essential reading skill for older students (Chall, 1983; Fuchs & Fuchs, 1992; Potter & Wamre, 1990; Shapiro, 2004; Skinner, Neddenriep et al., 2002). However, because college students are often given a limited amount of time to complete numerous assigned readings and exams, reading speed also may predict success in college courses.

Recently, researchers have developed and evaluated a measure of reading comprehension rate (Hale, Skinner, Williams, Neddenriep, & Dizer, in press; Neddenriep et al., in press; Skinner, 1998). Reading comprehension rate (RCR) is similar to WCM in that it takes into account reading speed, using time required to read the material in the

denominator. However, the numerator (number of words read aloud and accurately) is replaced with a measure of reading comprehension level (percent correct on comprehension questions). This RCR measure can be converted to a common metric, percent passage comprehended for each minute spent reading (Skinner, 1998).

Neddenriep et al. (in press) correlated reading comprehension level and RCR with broad reading cluster scores on the *Woodcock-Johnson III Tests of Achievement* (Woodcock, McGrew, & Mather, 2001). Results showed that silent reading comprehension level (percent comprehension questions correct) moderately correlated with 10th grade readers' broad reading scores (r = .40). When this measure was converted to a RCR measure, the correlation increased (r = .53). These results showed that altering the traditional comprehension level measure to a comprehension rate measure enhanced the ability to predict broad reading skills. Others have shown that RCR is a sensitive measure of subtle differences in reading comprehension occasioned by different intervention procedures (Freeland, Jackson, & Skinner, 1999; Freeland, Skinner, Jackson, McDaniel, & Smith, 2000; Hale et al., in press; Hale, Skinner, Winn, Oliver, Allin, & Molloy, 2005; McDaniel, Watson, Freeland, Smith, Jackson, & Skinner, 2001).

Researchers concerned with measuring reading fluency by assessing rate of aloud reading accuracy have suggested that measuring RCR (e.g., percent of passage understood for each minute spend reading) may provide a more direct measure of functional reading skills, especially in advanced readers (Skinner, 1998; Skinner, Neddenriep, et al., 2002). The current study was designed to extend the research on the validity of brief assessments of reading comprehension levels and rates by determining if these measures could predict a functional outcome for skilled readers (i.e., success in a large college course). We controlled for test-tasking skills (Stough, 1993) by requiring students to answer questions covering passages that they had not read. Analysis included performance on factual and inferential comprehension questions. Finally, we also examined the relationship between reading speed and comprehension.

Method

Participants

All students came from five sections of an undergraduate human development course required for entry into the teacher-education program at a major state university in the Southeastern United States. Three large sections had approximately 55 students per section and two small sections had approximately 25 students per section. Because a few students dropped the course, 210 students out of the original 215 ultimately completed all the measures related to the study. Approximately 25% of the students were males and 75% females. With respect to students' academic level, 3% were freshmen, 40% sophomores, 30% juniors, 17% seniors, and 10% graduate students.

Research Materials and Procedures

When students entered the classroom on the second day of the course, they found a packet of materials on their desk. After students sat down, they first displayed their name card on the desk immediately in front of them. Then they filled in selected demographic information (e.g., academic classification, sex, and course section) on the front sheet of the materials packet, but did not open the rest of the packet until instructed to do so. When instructed to turn to the second page of the packet, they saw the following information: On the following page, you will find a reading passage. When instructed, please turn to the passage and read it silently. Read at your normal rate—neither faster nor slower than usual. However, read carefully because you will be asked questions about the passage. Raise your hand and keep it raised for three seconds when you have finished reading the passage.

A 400-word passage taken from Spargo (1989) appeared on the third page of the packet. The selected passage, entitled "More Rare than Rubies," mainly dealt with the contemporary importance of rare heavy metals and the methods of prospecting for these metals (p. 43). The course did not deal with heavy metals; plus, students were unlikely to have much background information regarding heavy metals. After finishing the passage and raising their hand for three seconds, students then proceeded to the next page. This page

contained the following instructions:

On the following page, you will find comprehension questions based on the passage you just read. Try your best to answer these questions accurately. Do not refer back to the passage when answering the questions. When you have finished answering the questions, raise the packet of materials in your hand and keep it raised for three seconds.

The subsequent page contained ten multiple-choice questions, with three options per questions. Five of the questions were labeled “Recalling Facts” and five “Understanding the Passage.” The latter questions required inferences from the factual information in the passage. The bottom of this page repeated the instruction to raise the packet and keep it up for three seconds after completing the questions and before proceeding to the next page.

After turning to the next page, students read instructions related to answering questions over a passage they had not read:

On the following page, you will find comprehension questions based on a passage that you have not read. Try your best to answer these questions accurately. When you have finished answering the questions, raise your hand and keep it raised for three seconds.

The following page contained ten multiple-choice questions, with three options per question, based on passage entitled “Sewerage Disposal” from Spargo (1989, p.91). Five questions were factual and five were inferential. Again, the course did not deal with the information in this passage and students were unlikely to have much background information regarding the content in the passage. Thus, their performance would likely be based on chance or cues embedded in the questions themselves. The bottom of this page included instructions reminding the students to raise their hand and keep it raised for three seconds after completing the questions and before turning the page. The final page instructed the students to place their packet face down on the desk in front of them and wait for instructions regarding the next research activity.

In order to precisely calibrate how much time each student took to complete each phase of the data collection, we used multiple video cameras to record the hand/package

signals of every student in the classroom. The combination of students' positioning name cards on the desk in front of them and raising their hands and/or packets when they finished each phase of the data collection permitted precise determination of when each student began and ended each phase. In viewing the videotapes, research associates used stop watches to make time determination by the second.

In addition to the pre-course data collection, we administered five 50-item multiple choice exams (four options per item) over the five units in the course: physical development, cognitive development, psychological development, social development, and character development. Previous research (Wallace & Williams, 2003) on the exam items has indicated that about 26% of the items strictly assessed recall of factual information, 58% required use of factual information to make inferential judgments, and 16% did not exclusively fit either the factual or inferential category. All three item types differentiated between high and low performers on the course exam.

Results

Presentation of the results first highlights the relationship between reading and test-taking variables to performance on the course multiple-choice exams. Next, we present the results of our analysis of passage reading speed and comprehension. Finally, high and low performers on the exams were compared across reading and test-taking variables.

Exam Performance and Reading Measures

Table 1 shows that virtually all of the reading-comprehension variables correlated significantly with exam performance. RCR was calculated using two terms, total questions

Insert Table 1 About Here

correct in the numerator and reading time in the denominator. The significant negative correlation (i.e., r = -.19,; r^2 = .04) between passage reading time and exam performance suggests that reading speed is related to performance in college course work. However, the numerator, comprehension questions correct, accounted for more variance (r = .37; r^2 = .14) in exam scores than the denominator, reading time (r^2 = .04). Furthermore, much of

the variance in exam performance accounted for by reading speed is shared with the variance accounted for by the total reading comprehension level measure (total questions correct). Thus, when these two measures are combined, RCR correlated only slightly higher (r =.39; r^2 = .15) with exam performance than reading comprehension level (r = .37, r^2 = .14).

When number correct on the five factual items was compared with number correct on the inferential items as predictors of course exam performance, the inferential score accounted for 10% of the variance in exam scores (r =.31, r^2 = .10) and factual scores accounted for 4% of the variance (r =.21, r^2 = .04). The combination of the factual and inferential scores accounted for 14% of the variance in exam scores. Interestingly, this analysis showed that factual and inferential comprehension did not account for the same variance in exam score performance.

Comparisons of time taken to answer the questions across passages showed that students spent significantly, $t(214) = 13.18$, $p < .001$, more time answering the non-passage items (x = 167.84 seconds) than the passage items (x = 133.60 seconds) relative. These comparisons suggest that students attempted to apply their test-taking skills to answer the non-passage items. However, Table 1 also shows that none of the pre-course exam scores based on an unread passage correlated significantly with course exam performance. Even for the reading passage, time taken to answer the questions and rate of correctly answering the questions did not correlate significantly with performance on the course exams. Thus, test-taking skills were ruled out as a predictor of exam performance in the course and as a plausible rival hypothesis accounting for the relationship between reading variables and exam scores.

Passage Reading Time and Passage Comprehension Measures

Table 2 shows the correlations between the three passage-reading-comprehension measures (i.e., factual items correct, inferential items correct, and total correct) and passage

Insert Table 2 About Here

reading time. Results show a significant correlation ($p < .05$) between total questions correct and reading time ($r = -.161$). This small negative correlation between comprehension level and reading time explains why converting reading comprehension level to a rate measure (i.e., incorporating time to read) did not account for much more variance than reading comprehension alone. Table 2 also shows a significant correlation ($p < .05$) between inferential reading comprehension and reading time ($r = -.160$), but an insignificant relationship between factual questions correct and reading time ($r = -.073$). These results show that students who spent less time reading answered more inferential passage questions correctly than students who spent more time reading.

Mean Comparisons

Students scoring in the top and bottom 20% on the unit exam totals were compared on all the reading variables. Table 3 shows significant differences on the pre-course performance measures linked to the read passage, but not on those linked to the unread passage. Additionally,

Insert Table 3 About Here

the high and low exam performers did not differ in the time taken to answer the questions over the reading passage or in the rate of correctly answering these questions. Although the effect sizes for total reading comprehension and RCR were very strong, the effect size for RCR (2.00) was almost twice as great as for reading comprehension level (1.17). Thus, at the performance extremes on the course exams, high-performing students clearly differed from the low-performing on the reading comprehension measures, most especially RCR, but not on the test-taking variables. The ability to comprehend reading material, especially at a more rapid rate, apparently facilitated exam performance but test-taking pace and skills per se did not significantly predict exam performance.

Discussion

Neddenriep et al. (in press) found that brief RCR measures correlated with standardized measures of broad reading skill development in elementary and 10th grade students. We extended this research to college students and showed that RCR could predict performance on college exams, a more functional criterion measure than performance on standardized tests. Overall, relationships between the reading variables and performance on the course exams ranged from small to medium, but comparisons of high and low exam performers showed substantial differences on the reading variables but no significant differences on the test-taking pace and skill variables. These results suggest that the reading measures, not test-tasking skills, account for these relationships. These findings may have theoretical and applied implications.

RCR measures include both a measure of reading speed (denominator) and comprehension (numerator). Some theorists, both behavioral (e.g., Skinner, 1998; Skinner, Wallace et al., 2002) and cognitive (e.g., LaBerge & Samuels, 1974; Perfetti, 1992) have proposed causal models describing the relationship between reading speed or fluency and the development of reading skills that are functional (i.e., comprehension level and rate). These theories and the research base supporting these theories have caused educators, researchers, and policy makers to recommend that educators implement procedures to enhance reading speed (e.g., Adams, 1990; Daly, Chafouleas, & Skinner, 2005; National Assessment of Educational Progress, 2005; Rasinski, 2004). Several of our findings support these theories and recommendations. The time students spent reading the passage was negatively correlated (r = -.16) with passage comprehension (total questions correct). Thus, students who spent less time reading answered more questions correctly. Second, the significant correlation (r = -.19) between reading time and exam performance showed that more rapid reading is associated with higher performance on course exams. Compared to factual questions, inferential questions may require students to synthesize more information across the text. The significant negative correlation between reading time and inferential questions answered correctly supports the theory that slower readers may have had difficulty

synthesizing information across the passage because information dropped from working memory as time passed.

The current results support the relationship between reading speed and success in college courses. However, almost all of the variance in students' exam scores accounted for by the RCR measure can be attributed to the measure of reading comprehension (numerator), as opposed to reading time (denominator), embedded within the RCR measure. These results support previous researchers who have stressed the need to alter brief assessments of reading skills in advanced readers by incorporating direct assessment of reading comprehension level and rate (Jackson, 2005; Neddenriep et al., in press; Skinner et al., 2002). The current results extend the research base by suggesting that the direct assessment of comprehension, as opposed to speed, is most critical for predicting success in college courses.

Our results with college students are consistent with the Neddenriep et al. (in press) finding that RCR better predicted overall reading skill than reading comprehension level in 10th-grade students. However, our results differed in that RCR correlated only slightly higher ($r = .39$) with exam scores than reading comprehension level ($r = .37$), whereas Neddenriep et al. found greater differences between the predictive ability of silent reading comprehension level ($r = .40$) and silent RCR ($r = .53$). Several differences between the current study and the Neddenriep et al. study may account for the stronger support for RCR in the Neddenriep study. The current study included a sample of college students, as opposed to 10^{th}-grade students. A group of college students is likely to have less variability in their reading skills than a group of 10^{th}-grade students, thus reducing the predictive potential of reading scores for college students. Also, the criterion variable differed across the two studies, with Neddenriep et al. using a standardized measure of broad reading ability and the current researchers using exam scores in a college class. Additional studies are needed to determine if RCR is a more significant indicator of overall reading skills, but reading comprehension alone may be sufficient to adequately predict classroom performance.

The current results showed that correctly answering inferential questions over what one has just read was more predictive of exam performance than correctly answering factual questions. A majority of the items on the course exams required some degree of inference about course information (Wallace & Williams, 2003), suggesting that test-text overlap may have enhanced the correlations. Perhaps some of the predictive potential was that both the pre-course assessment and the in-course examinations used a multiple-choice format. However, one must keep in mind that performance on the pre-course multiple-choice questions linked to an unread passage was not predictive of course exam performance. Regardless, additional research is needed to determine if reading comprehension question type (fact versus inference, multiple choice versus essay) influences the predictive validity of reading comprehension measures across various criteria measures (e.g., multiple-choice exams, essay exams, standardized reading achievement tests, test of critical thinking).

Individually administering lengthy standardized measures of reading comprehension at the beginning of courses may strengthen the relationships between reading skill assessment and exam performance. However, given that time typically is at a premium in large undergraduate courses, devoting a significant amount of time to pre-course assessment would be a questionable use of class time. Group administration of the reading comprehension measures used in the current study required much less time (the student requiring the most time needed 13.92 minutes) to get a sense of how well students were likely to do on major course exams across the semesters. Actually, it appears quite remarkable that an activity requiring less than 15 minutes for the slowest-working student could generate data predictive of performance on course exams spanning an entire semester. Regardless, it is very easy to group administer and score comprehension level, but more difficult and time consuming to collect reading speed data (i.e., taping all group members, viewing the tapes, and recording each students' time spent reading). Our results suggest that collecting data on reading speed may not be necessary, as including reading time results in only a small increase in predictive power. Future research may find that they can efficiently

strengthen the predictive power associated with group administration of silent reading comprehension level measures by using longer passages, passages with more questions, and/or or multiple passages with the median scores used as the predictor (Skinner et al., 2002).

The findings of the current study challenge a claim often advanced by our students who do poorly on the multiple-choice exams in the target course. Anecdotally, a rather common claim among these students is that they understood the material really well but the tests did not allow them to demonstrate their understanding. An extension of this claim is that the course exams primarily measure skill in taking multiple-choice tests rather than understanding of course content. However, the purest measure of test-taking skills in the current study (answering multiple-choice questions over a passage not read) was not related to performance on the multiple-choice exams in the course, even at the extremes of exam performance. In contrast, the ability to answer multiple-choice questions over a passage just read was predictive of exam performance.

Summary

Skinner (1998) indicated that reinforcement for reading is typically contingent upon comprehension (i.e., the function of reading is comprehension). The most commonly used brief measure of oral reading fluency is WCM (Daly et al., 2005). Although WCM correlates with reading comprehension, using correlates to indirectly measure anything requires a level of inference that may lead to questionable outcomes. For example, educators may attempt to apply procedures that enhance aloud reading speed but do not necessarily enhance reading comprehension. Thus, a more direct measure of functional reading skills is a measure of silent reading comprehension level and/or rate (Skinner et al., 2002). In addition to conducting additional studies designed to investigate and enhance the psychometric properties of silent reading comprehension measures (e.g., validity, reliability, sensitivity), researchers should continue to use these measures to assess the effects of interventions designed to enhance silent reading comprehension, the most direct measure of functional

reading skills.

References

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print.* Cambridge, MA: Massachusetts Institute of Technology.

Behrman, E. H., & Street, C. (2005). The validity of using a content-specific reading comprehension test for college placement. *Journal of College Reading and Learning, 35*(2), 5-21.

Billington, E. J., Skinner, C. H., Hutchins, H., & Malone, J. C. (2004). Varying problem effort and choice: Using the interspersal technique to influence choice towards more effortful assignments. *Journal of Behavioral Education, 13,* 193-207.

Chall, J. S. (1983). *Stages of reading development.* New York: McGraw-Hill.

Daly, E. J., Chafouleas, S., & Skinner, C. H. (2005). *Interventions for Reading Problems: Designing and Evaluating Effective Strategies*. New York: The Guilford Press.

Deno, S. L., & Merkin, P. K. (1977). *Data-based problem modification: A manual.* Reston, VA: Council for Exceptional Children.

Deno, S. L., Merkin, P. K., & Chiang, B. (1982). Identifying valid measures of reading. *Exceptional Children, 49,* 36-45.

Freeland, J., Jackson, B., & Skinner. C. H. (1999, Nov). *The effects of reinforcement on reading rate of comprehension.* Paper presented at the twenty-sixth annual meeting of the Mid-South Educational Research Association. Point Clear, AL.

Freeland, J. T., Skinner, C. H., Jackson, B., McDaniel, C. E., & Smith, S. (2000). Measuring and increasing silent reading comprehension rates via repeated readings. *Psychology in the Schools, 37,* 415-429.

Fuchs, L. S., & Fuchs, D. (1992). Identifying a measure for monitoring student reading progress. *School Psychology Review, 21,* 45-58.

Fuchs, L. S., Fuchs, D., Hosp, M. K., & Jenkins, J. R., (2001). Oral reading fluency as an indicator of reading competence: A theoretical, empirical, and historical analysis. *Scientific Studies of Reading, 5,* 239-256.

Fuchs, L. S., Fuchs, D., & Maxwell, L. (1988). The validity of informal reading comprehension measures. *Remedial and Special Education,* 9(2), 20-28.

Hale, A., Skinner, C. H., Williams, J., Neddenriep, C. E., & Dizer, J. (in press). Comparing comprehension following silent and aloud curriculum-based measurement reading across elementary and secondary students. *Behavior Analysis Today.*

Hale, A. D., Skinner, C. H., Winn, B. D., Oliver, R., Allin, J. D., & Molloy, C. C. M. (2005). An investigation of listening and listening-while-reading accommodations on reading comprehension levels and rates in students with emotional disorders. *Psychology in the Schools, 42,* 39-52.

Hintze, J. M., & Shapiro, E. S. (1997). Curriculum-based measurement and literature-based reading: Is curriculum-based measurement meeting the needs of changing curricula? *Journal of School Psychology, 35*, 351-375.

Jackson, N. E. (2005). Are university students' component reading skills related to their text comprehension and academic achievement? *Learning and Individual Differences, 15,* 113-139.

Jenkins, J. R., & Jewell, M. (1993). Examining the validity of two measures for formative teaching: Reading aloud and maze. *Exceptional Children, 59,* 421-432.

LaBerge, D., & Samuels, S. J. (1974). Toward a theory of automatic processing in reading. *Cognitive Psychology, 6,* 293-323.

McDaniel, C. E., Watson, T. S., Freeland, J. T., Smith, S. L., Jackson, B., & Skinner, C. H. (May 2001). *Comparing silent repeated reading and teacher previewing using silent reading comprehension rate*. Paper presented at the Annual Convention of the Association for Applied Behavior Analysis: New Orleans.

National Assessment of Educational Progress (NAEP) (2005). *The nation's report card: Reading 2005.* Retrieved on August 24, 2006, from http://nces.ed.gov/nationsreportcard/pdf/main2005/2006451.pdf

Neddenriep, C. E., Skinner, C. H., Hale, A. D., Oliver, R., & Winn, B. D. (in press). An investigation of the concurrent validity of reading comprehension rate: A direct, dynamic measure of reading comprehension. *Psychology in the Schools*.

Perfetti, C. A. (1992). The representation problems in reading acquisition. In P. B. Gough, L. C. Ehri, & R. Treiman (Eds.) *Reading acquisition* (pp. 145-174). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.

Potter, M. L., & Wamre, H. M. (1990). Curriculum-based measurement and developmental reading models: Opportunities for cross-validation. *Exceptional Children, 57*, 16-25.

Rasinski, T. V. (2004). Creating fluent readers. *Educational Leadership, 61* (6), 46-51.

Runyan, M. K. (1991). The effect of extra time on reading comprehension scores for university students with and without learning disabilities. *Journal of Learning Disabilities, 24,* 104-108.

Skinner, C. H. (1998). Preventing academic skills deficits. In T. S. Watson & F. Gresham (Eds.). *Handbook of child behavior therapy: Ecological considerations in assessment, treatment, and evaluation* (pp. 61-83). New York: Plenum.

Skinner, C. H. (2002). An empirical analysis of interspersal research: Evidence, implications and applications of the discrete task completion hypothesis. *Journal of School Psychology, 40,* 347-368.

Skinner, C. H., Neddenriep, C. E., Bradley-Klug, K. L., & Ziemann, J. M. (2002). Advances in Curriculum-Based Measurement: Alternative rate measures for assessing reading skills in pre- and advanced readers. *Behavior Analyst Today, 3*, 270-281.

Skinner, C. H., Pappas, D. N., & Davis, K. A. (2005). Enhancing academic engagement: Providing opportunities for responding and influencing students to choose to respond. *Psychology in the Schools*, *42,* 389-403

Skinner, C. H., Wallace, M. A., & Neddenriep, C. E. (2002). Academic Remediation: Educational application of research on assignment preference and choice. *Child and Family Behavior Therapy, 24*, 51-65.

Shapiro, E. S. (2004). *Academic skills problems: Direct assessment and intervention* (3rd ed.). New York: The Guilford Press.

Spargo, E. (1989). *Timed readings.* Providence, RI: Jamestown Publishers.

Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly, 21,* 360-406.

Stough, L. M. (1993). *Research on multiple-choice questions: Implications for strategy instruction.* Paper presented at the Annual Convention of the Council for Exceptional Children, San Antonio, April 5-9.

Wallace, M., & Williams, R. L. (2003). Multiple-choice exams: Explanations for student choices. *Teaching of Psychology, 29,* 234-237.

Williams, R. L., & Eggert, A. (2002). Notetaking predictors of test performance. *Teaching of Psychology, 29,* 234-237.

Williams, R. L., Oliver, R., Allin, J., Winn, B., & Booher, C. (2003a). Knowledge and critical thinking as course predictors and outcomes. *Inquiry: Critical Thinking across the Disciplines, 22,* 57-63.

Williams, R. L., Oliver, R., Allin, J., Winn, B., & Booher, C. (2003b). Psychological critical thinking as a course predictor and outcome variable. *Teaching of Psychology, 30,* 220-223.

Williams, R. L., Oliver, R., & Stockdale, S. (2004). Psychological versus generic critical thinking as predictors and outcome measures in a large undergraduate human development course. *Journal of General Education, 53,* 37-58.

Williams, R. L., & Worth, S. (2002). Thinking skills and work habits: Contributors to course performance. *Journal of General Education, 51,* 200-227.

Woodcock, R. W., McGrew, K. S., & Mather, N. (2001). *Woodcock-Johnson Tests of Achievement-Third Edition.* Itasca, IL: Riverside Publishing.