CURRICULUM-BASED MEASUREMENT OF
READING AND STUDENT READING
ACHIEVEMENT

by

Rosa Leyva

A DIRECTED RESEARCH PROJECT

Submitted to the Faculty of
Barry University in partial fulfillment
of the requirements for the degree of
Specialist in School Psychology

Miami Shores, Florida

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Approved By:

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Abstract

With the advent of state wide progress monitoring and consequent ramifications on school districts, schools, and teachers, the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) as a curriculum-based measurement tool used to monitor student progress, has received widespread attention. The present study attempts to investigate the relationship between the DIBELS Oral Reading Fluency (ORF) subtest and subsequent student achievement on the Florida Comprehensive Achievement Test (FCAT) across 115 Hispanic and 230 African American students, of which 175 were male and 175 female. The presence of a significant linear relationship between DIBELS and FCAT scores was found. Moreover, the mean scores obtained on the FCAT ’06 and ’07 by male and female as well as Hispanic and African American students did not differ significantly.
Progress Monitoring

The No Child Left Behind (NCLB) Act of 2001 is a United States federal law that mandates increased accountability for student performance; especially targeted toward the area of reading. It places accountability at the district and school level for having all students succeed academically; authorizing all states to create a system whereby each district and school is either rewarded or sanctioned depending on the ability of its students to meet high academic standards. As a percentage of school funding is based on statewide annual exam scores, it is no wonder that tracking student progress has become an issue of interest in the recent years (Stecker, Lembke & Foegen, 2008).

Progress monitoring is regarded as a valuable tool in instructional decision-making because it allows teachers to tailor instruction to the needs of each student. This is especially important after the passage of the NCLB act of 2001, as teachers are held accountable for promoting high levels of academic achievement for all students. Progress monitoring allows the teacher to know which students are not making progress at a rate that is acceptable. Using cut-off scores indicative of where students are supposed to score depending on their grade level and time of year (i.e., fall), teachers can identify those students who are likely to pass and those students who are “at-risk” of not passing the comprehensive achievement test given at the end of the year (Stecker, Lembke & Foegen, 2008). Since the focus of these state-mandated tests has been on student literacy, there has been a surge in research pertaining to high stakes testing (Hintze & Silbergliitt, 2005; La Roche & Shriberg, 2004; McGlinchey & Hixson, 2004; Roehrig, Yaacov & Nettles, 2008; Silbergliitt & Burns, 2006; Stage, 2001; Tuerk, 2005; Wood, 2006) and how best to monitor reading progress and gauge reading achievement (Bradley-Klug, Shapiro, Lutz & DuPaul, 1998; Burke & Hagan-Burke, 2007; Coyne, 2006; Fuchs, 2000).
Reading Fluency

Reading is the process of deriving meaning from print. The skill of reading is not developed in a vacuum. Rather, it builds upon skills developed early in life, such as linguistic, cognitive, and social skills. Moreover, the foundation that enables a child to become a competent reader is set before a child first attends school. Thus, by the time a child reaches 4 years of age, they have already acquired the basics of grammar, pragmatics, word meaning, and phonology (Rayner, Foorman, Perfetti, Pesetsky, & Seidenberg, 2001).

Reading is essential to the academic success of children, as those who have difficulty reading often experience academic problems that are long-term. Even when a slow reader’s reading rate grows through remediation, it is very difficult for them to catch up to the reading rate of a skilled reader, as many develop an attitude toward reading that is negative due to frequent failure (Otaiba, Kasanovich-Grek, Torgesen, Hassler & Wahl, 2005). Skilled readers experience success and their reading growth rate is superior to that of a slow reader, as they have a tendency to enjoy reading, and thus, do so more often. Slow readers who need to be reading more to gain fluency have a tendency to read less because, as it is more difficult for them, it proves less rewarding (Otaiba et al.).

Skilled readers are more likely to experience success in other life domains as well. For instance, there is a significant association between slow readers and high school drop-out, teen pregnancy, truancy, substance abuse, delinquency and incarceration (Burke & Hagan-Burke, 2007). Luckily, there is evidence suggesting that school-wide early intervention, screening and formative monitoring help reduce the rates of reading failure (Burke & Hagan-Burke). Moreover, it is essential that a preventive framework be established in all schools, as prevention is a better method when compared to remediation (Torgesen, 1998). Intensive remediation may
be required for children who have struggled with reading for years. Although prevention does not guarantee that every child will be a successful reader, those who receive remediation sooner rather than later, are able to make more progress (Torgesen). Once a child has been a poor reader for years, it is more difficult for them to reach an adequate level of reading fluency because they have missed out on many months and years of reading practice.

Reading fluency is defined by the National Reading Panel (2001) as “the ability to read text rapidly and quickly” (pg. 28). When skilled readers read they do so effortlessly, and when reading aloud they read smoothly, using correct intonation. Readers who lack fluency read slowly; laboriously sounding out words. Moreover, skilled readers typically have better comprehension than slow readers because they are able to pay attention to the meaning of what they are reading. Slow readers, on the other hand, must devote a substantial amount of their attention to decoding each word, leaving little attention for comprehension (National Reading Panel).

It is important to note that fluency involves more than just being able to decode words. Fluent readers are also able to read using expression (National Reading Panel, 2001). A child who is able to decode words, but reads in a monotone voice, lacks fluency. For an individual to be considered fluent, he/she must also apply the appropriate expression to what they are reading. The fluent reader is able to pause at the end of commas and sentences, as well as change their tone depending on what they are reading (i.e., when reading a question) (National Reading Panel).

Most researchers concur on the development of phonological, orthographic, and semantic processes as pre-requisite skills necessary for fluency in reading (Wolfe & Katzier-Cohen, 2001). An essential part in the reading process is the phonological system because it is a prerequisite
skill for attaining reading fluency. Phonological awareness is an individual’s knowledge concerning spoken words and their internal sound structure (Rayner et al., 2001). As a child learns to read, their knowledge of words and their sound structure is only partial. Further refinement through orthography allows the child to become more knowledgeable regarding the phonological sound structure of words. Novice readers have yet to grasp the concept of phonetics as having explicit representations, such as spelling. As children progress through school, they learn that spoken words have explicit representations and their reading ability becomes more refined (Rayner et al.). Reading automaticity, the ability to read rapidly and effortlessly, is gained through experience. However, differences in the levels at which automaticity develops do exist among individuals (Spear-Swerling & Sternberg, 1994).

Oral Reading Fluency

Oral Reading Fluency (ORF) is a skill that has been linked to reading achievement. ORF is the process by which text is translated orally with accuracy and speed (Fuchs, Fuchs, Hosp, & Jenkins, 2001). Oral reading as opposed to silent reading has been shown to increase reading achievement and fluency (National Reading Panel, 2001). This may be because when students read orally, they are able to monitor their reading and correct mistakes. Moreover, the teacher is unable to gauge how effectively students are using their silent reading time, as it is difficult to tell whether the child is actually reading what is in front of them.

The Laberge and Samuels’ model of information processing in reading (LaBerge, & Samuels, 1974) proposes that fluent reading is related to reading comprehension because the efficient recognition of words frees up mental capacity that is necessary for the simultaneous comprehension of text. This model proposes that developing readers progress through four stages of information processing. First, information is processed visually. At this level, readers
are focusing their attention on the way that printed text looks and thus, are using most of their attention to gain accuracy while reading. After the individual processes information visually, they then advance to processing information phonologically. Extensive research shows that good readers have good phonological awareness, whereas poor readers lack good phonological awareness (Catts, Gillispie, & Leonard, 2002; McBride-Chang & Manis, 1996; Penney, Leung & Chan, 2005; Pratt & Brady, 1998; Scarborough & Olson, 1998; Smith, Simmon & Kameenui, 1995). In a study conducted by Savage, Freederickson, Goodwin, Patni, Smith and Tuersley (2005), phonological awareness as evidenced by superior reading comprehension, spelling, and word reading, was demonstrated to be positively correlated with reading ability. In fact, phonological awareness was a better indicator of reading ability when compared to rapid digit naming, motor automaticity, and speech perception (Savage et al.).

Not only has phonological awareness been linked to successful reading acquisition, but several studies have also demonstrated the use of phonological awareness in predicting which individuals will have reading problems in the future (Cornwall, 1995; Mann & Brady, 1988; Savage & Carless, 2004; Wood & Hill, 2005). For instance, results from a study carried out by MacDonald and Wayne (1995) showed that when compared to students who had low scores on measures of phonological awareness, those students who had high scores exhibited greater reading and spelling achievement at age 17. By contrast, spelling and word identification skills, which were also assessed in kindergarten, were not found to be significant predictors of reading achievement at age 17. Developing readers who have mastered phonology will gain automaticity as they are processing information using a top-down approach (looking at the whole word), as compared to the bottom-up approach (looking at each individual letter) of processing information visually. Readers whose attention is focused on the visual aspects of information processing have
a tendency to achieve lower scores on tests that measure reading comprehension (Solan, Shelley-Tremblay, Hansen & Larson, 2007).

Once individuals are able to visually and phonologically process information while reading, they begin to process information using their episodic memory. In this stage, while processing information when reading, the reader is connecting how the print looks visually with phonological sounds and linking that to personal experiences. This gives the reader a frame of reference from which they can better understand what they are reading (Glordano, 1982). Once the developing reader has become adept at the visual, phonologic and episodic stages of information processing while reading, they proceed to encode printed text semantically. At the semantic level, readers are not processing information by linking it to experiences. Rather, they are using word meanings to gain an understanding of what they are reading (Prawat, 1982). This top-down view decreases the amount of attention that the reader needs to pay to the visual and phonologic aspects of printed text and increases their automaticity, allowing them to gain meaning by focusing on sentence syntax. Moreover, this allows the reader to use context cues while reading to aid them along when they are not sure of the meaning of certain words. For instance, they are able to garner the meaning of words they do not know by looking at the other words in the sentence (Prawat). Accordingly, the ability of a reader to fluently translate written text to spoken words is not just a good indicator of the reader’s word recognition skills, but also of reading comprehension (Fuchs et al., 2001).

A sample of 200 students from three different grade levels (3rd, 7th and 10th) were given tests which measured the dimensions of language, reading and cognitive ability (Schatzschneider, Buck, Torgesen, Wagner, Hassler, Hecht, & Powell, 2004) in order to determine which dimension was most important when accounting for variance in scores on the reading portion of
the FCAT. The authors found that ORF accounted for 56% of the variance, while the reading knowledge portion accounted for 44% of the variance in the 3rd grade. In tenth grade, however, the knowledge portion accounted for a higher percent of the variance (52%) and fluency, although still significant, accounted for 32% of the variance. Moreover, when asked to read the passages orally, students who scored at Level 1 (lowest score on the test) read at half the rate as those students who scored at Level 5. Thus, fluency is essential to achievement, especially in elementary school children.

Studies conducted by Deno, Mirkin, and Chiang (1986) and Sindelar (1992) have also found that students with good ORF tend to have good reading proficiency. A study conducted by White (1995) substantiated these findings, indicating that greater ORF was correlated with higher reading proficiency. In this study, ORF was measured by having fourth grade participants read narrative text aloud. Students who were rated as having high ORF read words in phrase groups that were larger, as well as with expressive interpretation, preserving the author’s syntax. By contrast, readers with poor ORF had poor sentence structure recognition and read in two-word phrases.

Several studies have supported the effectiveness of ORF in predicting reading comprehension (Hintze, Callahan III, Matthews, Williams, & Tobin, 2002; Spear-Swerling, 2006). The criterion validity of ORF was investigated by comparing four criterion measures of reading comprehension with a subtest of the Stanford Achievement Test (Fuchs et al., 1988). Three of the measures were direct measures (question answering, passage recall and cloze), whereas oral fluency was the only indirect measure used. The criterion validity of the oral fluency reading measure (.91) was stronger than the criterion validity for the other three direct measures (.82, .70, .72). Moreover, although all of the measures exhibited strong criterion validity, students’ scores on the ORF measure was most strongly related to their ability to read passages and answer
questions on the Stanford Achievement Test (Fuchs et al.). These findings were substantiated by Burke and Hagan-Burke’s (2007) study. Participants were administered the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) ORF and their scores were used to predict their performance on the Test of Word Reading Efficiency (TOWRE), that measures decoding fluency and sight-word fluency. Results suggest that among all DIBELS measures, ORF had the strongest predictive validity (.85). Thus, children with the highest scores on the ORF measure were more likely to fluently decode words on the TOWRE subtests. These findings on the validity of ORF provide evidence for its effectiveness when it is used to predict proficient reading comprehension as well as fluency (Burke).

Curriculum-Based Measurement

Curriculum-based measurement (CBM) (Deno, 1985) is a type of general outcome measurement that allows teachers and other school staff to monitor student progress with a series of mini achievement tests that contain actual material taken from the curriculum (Scott & Weishaar, 2003). Curriculum-based measurement 30 years ago involved the mastery measurement process in which teachers delivered instruction in a hierarchical fashion, with a series of short-term goals. When the child demonstrated mastery of a particular concept, the teacher would proceed to the next skill in the hierarchy. However, various problems have been found when progress is monitored via the mastery measurement approach (Fuchs & Deno, 1991). For instance, each skill is tested individually, without a mixing of different kinds of skills as is evident in the real world. Thus, the short-term goals inherent in the mastery measurement approach can lead teachers to believe that their students are making progress because they are unable to gauge how effective students’ progress is over time, as well as the effectiveness of the approach when compared to other strategies (Fuchs & Deno). Thus, broad-based competence is
not easily gained through short-term accomplishments. This can become readily apparent when the children are given exams that assess their global level of achievement, such as standardized tests at the end of the school year.

CBM allows the teacher to collect information on the progress of every individual student, which then allows the teacher to provide instruction that is tailored to every student’s particular needs (Fuchs, 2000; Fuchs, Fuchs, Hamlet, Phillips, & Karns, 1995), as well as modify instruction when necessary (Hintze & Pelle Petitte, 2001; Stage & Jacobsen, 2001). Some teachers that do not use CBM rely on steering groups, which are small groups of students whose needs are generalized to the other students in the class, as a method of developing class instruction. This method of instruction development signifies potential problems for those students who have serious learning problems because their needs may not be met. When teachers instruct students based on the needs of the average child in their class, those who need individualized instruction are left without remediation. CBM, on the other hand, allows the teacher to see individual student progress.

In a study conducted by Fuchs (2000), the author examined whether individualized instruction would improve students’ test score on an achievement test. CBM data was collected for 42 students, ranging from grades 2 through 8. These students were matched with target students who performed at the same mathematics level, but for whom CBM data was not collected. The teacher was to modify instruction based on the CBM data acquired for the CBM students. Thus, CBM students were receiving instruction modified to fit their own personal needs, whereas target students received the instruction that their matched CBM partners received. Those students for whom instruction was tailored scored higher on the Mathematics Operations Test-Revised
CBM and Reading Achievement 13

(Fuchs). These findings suggest that modifying instruction without tailoring it to fit the need of the individual student does not result in optimal achievement (Fuchs, 2000).

CBM is an effective tool in that it uses material taken out of the curriculum and provides a measure of how well each student is mastering the curriculum. With this information, teachers are better able to address the needs of each child and make sure that they are receiving appropriate remediation. Furthermore, instruction becomes more individualized because the teacher can provide the student with specific goals (Scott & Wishaar, 2003). Thus, it helps the teacher assess the student’s growth over time, as well as gather an accurate estimate of the student’s year-to-date performance (Fuchs, 2004). Not only does CBM provide an estimate of the student’s current year-to-date achievement, but it is also able to gauge instructional effectiveness. Accordingly, the teacher is able to modify instruction as necessary to generate a more adequate level of student responsiveness (Fuchs).

Many studies have reported on the effectiveness of CBM for screening (Bradley-Klug, Shapiro, Lutz & DuPaul, 1998; Marston, Mirkin, & Deno, 2001; Shin & Hhabedank, 2001). CBM can be seen as a tool that aids the screening process of those students referred for special education (Paulsen, 1997). For instance, CBM is a tool that can be administered to a group of individuals, and their progress can be compared with that of their peers. This allows for the identification of “at-risk” students and the implementation of interventions in a timely fashion. Without CBM, effective individualized interventions are not feasible because sufficient data is not gathered during the evaluation process.

CBM has been found to have high validity and reliability (Hintz & Conte, 1997; Shin, Deno, & Espin, 2000; Vanderheyden, Witt, Naquin & Noell, 2001; Espin, Shin, & Bush, 2005). A longitudinal study (Fewster & MacMillan, 2002) was conducted to assess the predictive validity
of CBM. CBM measures that included oral reading fluency scores and scores of written expression passages were gathered for children in late elementary through the first three years of junior high school. It was found (Fewster & MacMillan) that the words read correctly and words spelled correctly score on the CBM probes were significant ($p<.05$) in predicting student grades in grades 8, 9, and 10. More specifically, the words read correctly and words spelled correctly scores gathered in the 6th and 7th grades were positively correlated with English and Social Studies grades awarded in the 8th and 9th grades. Thus, not only can CBM be used when identifying students who are “at-risk”, but it is also a valuable tool regarding placement. Since CBM has been shown to have good predictive validity, it can be used when identifying those students who would be placed in special education classes, learning assistance classes, general education classes, and honors classes (Fewster & MacMillan). In this study, CBM scores on oral reading fluency were shown to predict which students gained membership into honors classes, special education classes, remedial classes and which students remained in general education classes in later grades.

High-Stakes Testing

Given the high predictive validity of CBM obtained in several studies (Fewster & MacMillan, 2002; Hintze & Silberglitti, 2005), many schools are using CBM as a tool of early intervention and identification (McGlinchey & Hixson, 2004). Moreover, several studies have been conducted assessing the effectiveness of CBM in predicting student achievement on high stakes testing (Sibley, Biwer, & Hesch, 2000; Stage, & Jacobsen, 2001; McGlinchey & Hixson, 2004; Shapiro, Keller, & Lutz, 2006; Silberglitt, Burns, Madyun, & Lail; 2006).

The relationship between Reading-CBM (R-CBM) and high stakes testing was examined in a longitudinal study looking at students in the first-grade through the third grade (Hintze and
Silberglitt, 2005). It was found that R-CBM was effective in predicting which students would achieve a high score on the Minnesota Comprehensive Assessment, administered at the end of the third grade (Hintze & Silberglitt).

The ORF subtest of the DIBELS was found to be highly accurate in predicting the reading comprehension of third grade students (Roehrig, Petscher, Nettles, Hudson & Torgesen, 2008). A strong correlation between the DIBELS ORF and the Florida Comprehensive Achievement Test (FCAT) as well as the Stanford Achievement Test-tenth edition (SAT-10) was found. This adds to the generalizability of the DIBELS ORF as an effective CBM tool in that, not only was it highly correlated with a state achievement test (FCAT), but also with a test that is used state-wide (SAT-10). The findings produced by this study are consistent with a study conducted by Buck and Torgesen (2003), who examined the relationship between measures of ORF and FCAT scores for third grade students. A strong correlation was found (r=.73, p<.001) as students who were identified as being “low-risk” on the measures of ORF had a tendency to score high on the FCAT. Similarly, another study that looked at ORF and high stakes testing found strong correlations (Schilling, Carlisle, Scott & Zeng, 2007) between the DIBELS ORF and the Iowa Test of Basic Skills (ITBS). Results indicate that 76% of second graders who were classified as being “low-risk” on the DIBELS ORF scored at or above their grade level on the ITBS.

A technical report on the correlation between the DIBELS ORF and the Ohio Proficiency Test (OPT) was investigated in a technical report written by Vander Meer, Lentz, and Stollar (2005). Results showed that the DIBELS ORF had an adequate correlation (.650) with the OPT, as 72% of the sample that scored within the “low-risk” range achieved a passing score on the OPT. The DIBELS ORF was also found to be correlated with the North Carolina end of grade reading assessment, as all of the students who scored within the “low-risk” range achieved a
passing score on the North Carolina end of grade reading assessment (Barger, 2003). However, when reviewing the results for students classified as “at-risk” by the ORF, 41% achieved a passing score on the assessment.

Student Characteristics

Gender and Race

A review of the research on the effects of gender and race on achievement finds that these two variables are interrelated (Patterson, Kupersmidt & Vaden, 1990). As such, the following section will review previous findings on the association between gender and achievement, race and achievement, and both race and gender together on achievement. There is an astounding body of research on the discrepancy in academic achievement between races (especially African American and Caucasian) (Baltodano, Harris, & Rutherford, 2005; Jimerson & Teo, 1999; Klein & Jimerson, 2005; La Roche & Shriberg, 2004; Lee, 2004; Lubienski, 2002; McNulty, 2003; Patterson & Kupersmidt, 1990; Porter, 2000), as well as gender (Halpern, 1996; Hyde & Linn, 1988; Nowell & Hedges, 1998). Perhaps the topic of race has garnered a disproportionate amount of attention because of the strong association between low academic achievement and social ramifications later in life, such as unemployment and delinquency (Scott, 2001). For instance, in a study comparing the academic achievement of incarcerated students from a juvenile corrections facility, Baltodano, Harris and Rutherford (2005) found that minority students performed significantly below the mean academically when compared to their non-minority counterparts.

Several research studies have examined the discrepancies between male and female achievement (Hyde & Linn, 1988; Halpern, 1996; Tyler, 1965). Results typically support the notion that females score higher on measures of reading, whereas males score higher on
measures of math (Lubienski, 2000; Nowell & Hedges, 1998; Patterson, Kupersmidt and Vaden, 1990). Nowell and Hedges (1998) looked at math, science, and reading scores obtained on the National Assessment of Educational Progress (NAEP) between 1960 and 1994. The score data gathered throughout this time displays a stable pattern of mean gender differences. Unlike other studies, gender differences were not found to be significant, accounting for approximately 3% of the variance. However, although not significant, the differences that were found in the score data are similar to findings from prior studies. Male students had a tendency to score higher on measures of math and science, whereas female students showed a tendency to score higher on measures of reading and writing. This difference was more pronounced when extreme scores were analyzed. For instance, males were more likely to achieve the highest scores in math and science, and the lowest scores in reading and writing. By contrast, females were more likely to achieve the highest scores in reading and writing, and the lowest scores in math and science.

A study conducted by Patterson, Kupersmidt and Vaden (1990) looked at the academic achievement of 868 male and female African American and Caucasian students by using the percentile score acquired from an achievement test that assessed reading, math and language. In contrast to the previous study, females scored significantly higher than males, even when Math was computed into their achievement score. It is important to note that although gender accounted for a significant portion of the variance in scores, race was the best predictor of academic achievement. These findings are substantiated by Lubienski (2000) which found that Caucasian students exhibited a tendency to score higher than African American students, even when accounting for socioeconomic status (SES). Moreover, 8th grade Caucasian students performed better, on average, than African American 12th grade students. These findings were not consistent with findings from Tulkin’s (1968) study. Differences on standard tests measuring
verbal IQ, nonverbal IQ, vocabulary achievement and language among Caucasian and African American 5th and 6th grade students were not found, even when SES was accounted for. Thus, Tulkin attributed the discrepancy in achievement among Caucasian and African American students to difference in social economic status, rather than race.

The academic achievement of a sample of Hispanic, African American and Caucasian students who came from low SES households was investigated in a study conducted by Bempechat, Graham, and Jimenez (1999). Even when SES was accounted for, race was found to have a significant impact on the academic achievement of these students, with Caucasian students outperforming Hispanic and African American children on the Wide Range Achievement Test (WRAT). The authors attributed the discrepancy in achievement to the differing educational socialization of these children. Students’ perception of the strategies their parents use regarding educational socialization was measured via the Educational Socialization Scale. Each students’ attributional style was measured by having them fill out the Sydney Attribution Scale. Then, students were asked to read scenarios regarding student achievement and attribute the outcome of these scenarios to effort, ability, or external factors such as luck. Sociocultural factors, such as the tendency for Hispanic and African American students to come from more collectivistic house holds (group success is paramount) and the tendency for Caucasian students to come from more individualistic households (foster independence and a sense of individual achievement), accounted for a significant proportion of the variance among the achievement scores across all three groups (Bempechat, Graham, and Jimenez). As such, individual aspirations, such as successful educational attainment, may be overridden at times because of the sense of strong familial obligation (Marin & Marin, 1991).
There are several studies that negate the notion of racial discrepancies between Hispanic and Caucasian students (Battle & Pastrana, 2007; Keith, 1999). In a study that looked at student achievement among Caucasian and Hispanic 12th grade students (Battle & Pastrana), significant discrepancies were not found. The scores of an achievement test (focusing on both math and reading) for 24,599 students were acquired via archival data. To eliminate the effects of language, students who were ELLs (English Language Learners) or English for Speakers of Other Languages (ESOL) were not included in the sample. Controlling for SES, the academic achievement of Hispanic students was not found to vary significantly from that of Caucasian students. These same students were tracked 2 years after they graduated and, surprisingly, Hispanic students were found to out-perform their Caucasian counterparts in achievement after high school. For instance, a greater proportion of the Hispanic students in this sample were found to be enrolled in a post-secondary institution when compared to Caucasian students (Battle & Pastrana). These findings are consistent with findings from Keith who examined the academic achievement of Caucasian and Hispanic students. Data on participants were obtained from the Wood Cock Johnson-Revised standardization sample, which contained the scores of students between grades 1 and 4. Results indicate that Caucasian and Hispanic students did not differ significantly in their academic achievement score.

The Proposed Study

The current study is an extension of past research (Barger, 2003; Buck & Torgesen, 2003; Roehrig, Yaacov, & Nettles, 2008; Schilling, Carlisle, Scott & Zeng, 2007; Vander Meer, C.D., Lentz, F.E., & Stollar, S., 2005) in that it seeks to add to the existing literature on the DIBELS as a valid CBM tool. More specifically, this study sought to investigate whether scores on high stakes testing increase as scores on the DIBELS ORF increase by looking at the correlation
between DIBELS and FCAT scores. It was expected that DIBELS scores would be strongly correlated with FCAT scores. Likewise, it was expected that DIBELS scores would be highly correlated with each other.

The present study also addresses the relationship of race (Hispanic and African American) as it pertains to reading achievement by means of FCAT scores. It was expected that a significant relationship between scores obtained by Hispanic and African American students would not be present. Moreover, the relationship of gender was also investigated. It was expected that female students would achieve higher scores on the FCAT when compared to male students. Also, retention as it impacts scores on the FCAT will be investigated. It was expected that non-retained students will achieve higher scores when compared to their retained counterparts.

Hypotheses

H1. There will be a significant correlation between DIBELS scores (2004-2005) and FCAT ’06 and FCAT ’07 scores.

H2. There will be a significant correlation between DIBELS scores (2005-2006) and FCAT ’06 and FCAT ’07 scores.

H3. There will not be a significant difference on the FCAT ’06 and ’07 scores between Hispanic and African American students.

H4. Students will obtain significantly higher FCAT ’06 and ‘07 scores when compared to their male counterparts.

Method

Sample

The archival data set utilized consisted of DIBELS scores obtained throughout the 2004-2005 school year (Time 1/Fall =09/28/94; Time 2/Win1 =12/03/04; Time 3/Win2 = 02/25/04; Time
4/Spring = 05/13/05) and 2005-2006 school year (Time 1/Fall = 09/20/05; Time 2/Win1 = 12/14/05; Time 3/Win2 = 03/06/06; Time 4/Spring = 05/23/06) as well as FCAT scores (’06 and ’07) of 350 students who are currently in the fifth grade (please refer to Table 1 for student demographics). The data was obtained from 11 schools in a large public school district in the Southern United States (please see Table 1). Participants of races other than Hispanic or African American were eliminated from the sample as they constituted such a small percentage of the sample that their inclusion would have been negligible. In addition, participants who had incomplete data (i.e., students who had missed a DIBELS assessment) were excluded from the sample.

Table 1

<table>
<thead>
<tr>
<th>Demographic Characteristics of Participants (N = 350)</th>
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<tbody>
<tr>
<td>Race *</td>
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<td>Total = 350</td>
</tr>
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* as designated by person enrolling the student
Measures

Curriculum-Based Measurement. The Dynamic Indicators of Basic Early Literacy Skills (DIBELS) is a type of CBM that is used to assess overall reading progress. The assessment consists of six measures: Letter Naming Fluency (LNF), Initial Sound Fluency (ISF), Phoneme Segmentation Fluency (PSF), Nonsense Word Fluency (NWF), Oral Reading Fluency (ORF), and Word Use Fluency (WUF). The facets of reading that these six measures assess are critical determinants of whether children are skilled or struggling readers (Burke & Hagan-Burke, 2007). The DIBELS is used to monitor the progress of students up to 4 times a year. School personnel can then modify the curriculum or provide intensive support to struggling readers, depending on the benchmark data.

For the purposes of this study, the Oral Reading Fluency (ORF) measure will be used. The ORF measure assesses how accurately and fluently an individual reads connected text. It consists of passages and procedures designed to identify those students who may benefit from additional instruction, as well as a tool for monitoring student progress toward his/her goals. The criterion validity of the DIBELS ORF measure with the TOWRE has been found to be between .52 and .91 (Burke & Hagan-Burke, 2007), alternate forms reliability between .92 and .97, and test-retest reliability between .92 and .97 for elementary students (Good & Kaminski, 2002).

The concurrent criterion-related validity of the ORF probe of the DIBELS was investigated in a study conducted by Burke and Hagan Burke (2007). A sample of 213 students who were in the middle of the first grade were administered the PSF, NWF, ORF, Retell Fluency and WUF subtests from the DIBELS and two subtests from the Test of Word Reading Efficiency (TOWRE), which measures word reading and decoding fluency. The authors found that among
the DIBELS subtests administered, the ORF subtest had the strongest correlation with the PDE subtest (.77) and the SWE subtest (.92) on the TOWRE.

*Reading Achievement.* Reading achievement will be assessed with the Florida Comprehensive Achievement Test (FCAT). The FCAT is an achievement test in which students’ performance is compared to benchmarks in math, writing, reading, and math. Benchmarks, as it relates to the FCAT, are used to measure student progress against state standards. The FCAT is given in grades 3 through 10. The reading areas assessed in grades 3 through 5 are words and phrases in context, main idea, plot and purpose, comparisons and cause/effect, and reference and research. The section about words and phrases assesses the individual’s ability to increase their vocabulary with strategies such as using prefixes, suffixes, antonyms, and synonyms. The main idea, plot and purpose section assesses the individual’s ability to read passages and answer questions pertaining to the passage’s main idea, style of narrative (persuasive, narrative) and their ability to arrange text in chronological order. In the comparisons and cause/effect area, the individual’s ability to compare and contrast, as well as their ability to recognize cause-and-effect relationships is assessed. The reference and research looks at the individual’s ability to extract information from maps, charts, and also their ability to interpret written text to be used in interviews, reports, and other tasks. The reliability of the reading portion of the FCAT given in grades 3 through 4 ranges from .91 to .94, indicating that the FCAT has high internal consistency, test-retest reliability, and inter-rater reliability. The validity of the reading portion of the FCAT that is administered to students in grades 3 through 4 ranges from .80 to .85. Thus, the FCAT has content-related evidence, high criterion-related evidence, and high construct-related evidence (Horne, 2004).
Procedure

The data set used included DIBELS ORF scores gathered at time 1 (Fall), time 2 (Win 1), time 3 (Win 2), and time 4 (Spring) for the 2004-2005 and 2005-2006 school years. Students’ ORF scores were retrieved from a database and used to assess oral reading fluency progress. The student reads from a passage for one minute while the individual administering the assessment counts the number of words substituted, hesitations, and words omitted. The ORF rate is calculated by adding the number of words read correctly. If the student self-corrects within three seconds, then the word is deemed correct.

The student’s ORF scores are classified as being High Risk (seriously below grade level and in need of substantial intervention), Moderate Risk (moderately below grade level and in need of additional intervention, Low Risk (at grade level), or Above Average (at or above the 60th percentile). The DIBELS Risk Level Chart was adapted from a chart acquired from the Florida Center for Reading Research (please refer to Table 2).

Table 2

*DIBELS ORF Risk levels for second and third grade*

<table>
<thead>
<tr>
<th></th>
<th>Second Grade</th>
<th></th>
<th>Third Grade</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall</td>
<td>Win 1</td>
<td>Win 2</td>
<td>Spring</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>HRa</td>
<td>0-25</td>
<td>0-43</td>
<td>0-56</td>
<td>0-69</td>
</tr>
<tr>
<td>MRb</td>
<td>26-43</td>
<td>44-59</td>
<td>57-73</td>
<td>70-89</td>
</tr>
<tr>
<td>LRc</td>
<td>44-65</td>
<td>60-81</td>
<td>74-95</td>
<td>90-108</td>
</tr>
<tr>
<td>Ad</td>
<td>66+</td>
<td>82+</td>
<td>96+</td>
<td>109+</td>
</tr>
</tbody>
</table>

*a*High Risk- seriously below grade level and in need of substantial intervention

*b*Moderate Risk- moderately below grade level and in need of moderate intervention

*c*Low Risk

*d*Above Average- At grade level or above the 60th percentile

On the FCAT, students are designated an achievement level based on their scaled score (please see Table 3 below for scaled scores and corresponding achievement levels). The Sunshine State Standards focuses on curriculum and instruction, including expectations on what students should learn during each grade level. Students at Level 1 are described as having little success with the challenging content of the Sunshine State Standards. Those in Level 2 have limited success with the challenging content of the Sunshine State Standards. At Level 3, students are described as having partial success with the challenging content of the Sunshine State Standards, but with inconsistent performance. For example, many of the test questions are answered correctly, but most of the challenging questions are answered incorrectly. Students at Level 4 have success with the challenging content of the Sunshine State Standards, but answer some of the challenging questions incorrectly. Finally, students scoring attaining achievement scores falling within Level 5, have success with the most challenging content of the Sunshine State Standards, answering most test questions correctly (adapted from the Florida Department of Education Website).

Table 3

<table>
<thead>
<tr>
<th>Year the FCAT was taken</th>
<th>Grade</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>3</td>
<td>100-258</td>
<td>259-283</td>
<td>284-331</td>
<td>332-393</td>
<td>394-500</td>
</tr>
<tr>
<td>2007</td>
<td>4</td>
<td>100-274</td>
<td>275-298</td>
<td>299-338</td>
<td>339-385</td>
<td>386-500</td>
</tr>
</tbody>
</table>

Proposed Analyses

*Correlation Between DIBELS and FCAT scores.*

In order to compare the association among the ten groups, a Bivariate Correlation was conducted. The Bivariate Correlation assisted in assessing whether there was a significant relationship among the DIBELS ORF and FCAT scores. Significant correlations between the DIBELS ORF and FCAT scores were expected. For Hypotheses 1, a correlation among the scores from the four DIBELS ORF administrations obtained throughout the 2004-2005 school year with the FCAT ’06 and ’07 was expected. Likewise, for Hypothesis 2, a significant correlation among the scores from the four DIBELS ORF administrations obtained throughout the 2005-2006 school year with the FCAT ’06 and ’07 scores were expected.

*T-Test for Independent Samples for gender, race and retention.*

Differences among race, but not gender in FCAT scores ’06 and ’07 was expected to be found. Hypothesis 3 is that there will not be a significant difference between the DIBELS ORF and FCAT scores among Hispanic and African American students. Hypothesis 4 is that female students would obtain significantly higher DIBELS ORF and FCAT ORF scores when compared to their male counterparts.

**Results**

The archival data that was used for the analyses consisted of the DIBELS ORF scores from the four administrations (Time 1/Fall = 09/28/04; Time 2/Win1 = 12/03/04; Time 3/Win2 = 02/25/05; Time 4/Spring = 05/13/05) acquired during the 2004-2005 school year and the four administrations (Time 1/Fall = 09/20/05; Time 2/Win1 = 12/14/05; Time 3/Win2 = 03/06/06; Time 4/Spring = 05/23/06) acquired during the 2005-2006 school year. The scores from 115
Hispanic and 230 African American students, of which 175 were male and 175 female was used. Of the 350 students, 93 had been retained before.

Correlation of Variables

The strength and direction of the linear relationship between the DIBELS ORF scores obtained at Times 1, 2, 3 and 4 (2004-2005 school year) and FCAT scores from ’06 and ’07 was determined by using a Pearson’s product moment correlation analysis (Table 1). Correlations between the DIBELS ORF and FCAT scores produced significant positive correlations. The strongest correlation with the FCAT ’06 was the DIBELS ORF score obtained at Time 3 (r = .53, p < .01). Likewise, the strongest correlation with the FCAT ’07 was the DIBELS ORF score obtained at Time 3 (r = .52, p < .01). These findings indicate that as scores on the DIBELS ORF increase, scores on the FCAT increase.

Table 1

Bivariate Correlations (2004-2005 school year)

<table>
<thead>
<tr>
<th></th>
<th>Time 1</th>
<th>Time 2</th>
<th>Time 3</th>
<th>Time 4</th>
<th>FCAT ’06</th>
<th>FCAT ’07</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 1</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Time 2</td>
<td>.537**</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Time 3</td>
<td>.874**</td>
<td>.576**</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Time 4</td>
<td>.522**</td>
<td>.315**</td>
<td>.560**</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>FCAT ‘06</td>
<td>.484**</td>
<td>.372**</td>
<td>.542**</td>
<td>.350**</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>FCAT ‘07</td>
<td>.489**</td>
<td>.252**</td>
<td>.516**</td>
<td>.351**</td>
<td>.590**</td>
<td>--</td>
</tr>
</tbody>
</table>

The strength and direction of the linear relationship between the DIBELS ORF scores obtained at Times 1, 2, 3 and 4 (2005-2006 school year) and FCAT scores from ’06 and ’07 was
determined by using a Pearson’s product moment correlation analysis (Table 2). Correlations between the DIBELS ORF and FCAT scores produced significant positive correlations. The strongest correlation with the FCAT ’06 was the DIBELS ORF score obtained at Time 2 ($r = .58$, $p < .01$). Likewise, the strongest correlation with the FCAT ’07 was the DIBELS ORF score obtained at Time 2 ($r = .57$, $p < .01$). These findings indicate that as scores on the DIBELS ORF increase, scores on the FCAT increase.

Table 2

Bivariate Correlations (2005-2006 school year)

<table>
<thead>
<tr>
<th></th>
<th>Time 1</th>
<th>Time 2</th>
<th>Time 3</th>
<th>Time 4</th>
<th>FCAT ’06</th>
<th>FCAT ’07</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 1</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Time 2</td>
<td>.904**</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Time 3</td>
<td>.674**</td>
<td>.703**</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Time 4</td>
<td>.750**</td>
<td>.775**</td>
<td>.637**</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>FCAT ’06</td>
<td>.556**</td>
<td>.581**</td>
<td>.519**</td>
<td>.416**</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>FCAT ’07</td>
<td>.531**</td>
<td>.569**</td>
<td>.469**</td>
<td>.515**</td>
<td>.590**</td>
<td>--</td>
</tr>
</tbody>
</table>

** $p < .01$

T-Test for Independent Variables

An independent sample one-tailed $t$ tests (Table 3) showed that the mean difference between FCAT ’06, $t(.48) = (2.60)$ and FCAT ’07 $t(1.43) = (8.45)$ scores between Hispanic and African American students was not significant. On the FCAT ’06, Hispanic students were found to have an average score of 297.97, whereas African American students were found to have an average score of 295.38. On the FCAT ’07, Hispanic students were found to have an average score of 303.95, whereas African American students were found to have an average score of 295.50.
Thus, Hispanic students scored approximately 2.60 points higher than African American students on the FCAT ’06 and 8.45 points higher on the FCAT ’07.

Table 3

*Mean differences of FCAT scores between Hispanic and African American students.*

<table>
<thead>
<tr>
<th>Race</th>
<th>Mean</th>
<th>Mean Difference</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCAT ‘06</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>297.97</td>
<td>2.60</td>
<td>348</td>
<td>.475</td>
</tr>
<tr>
<td>African American</td>
<td>295.38</td>
<td>2.60</td>
<td>348</td>
<td>.475</td>
</tr>
<tr>
<td>FCAT ‘07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>303.95</td>
<td>8.45</td>
<td>348</td>
<td>1.425</td>
</tr>
<tr>
<td>African American</td>
<td>295.50</td>
<td>8.45</td>
<td>348</td>
<td>1.425</td>
</tr>
</tbody>
</table>

An independent sample one-tailed $t$ tests (Table 4) showed that the mean difference between FCAT ’06, $t(-.729) = (-3.73)$ and FCAT ’07 $t(-.061) = (-.34)$ scores between male and female students was not significant. On the FCAT ’06, male students were found to have an average score of 294.63, whereas female students were found to have an average score of 298.37. On the FCAT ’07, male students were found to have an average score of 298.67, whereas female students were found to have an average score of 298.67. Thus, female students scored approximately 3.73 points higher than male students on the FCAT ’06 and .34 points higher than male students on the FCAT ’07.

Table 4

*Mean differences of FCAT scores between male and female students.*

<table>
<thead>
<tr>
<th>Gender</th>
<th>Mean</th>
<th>Mean Difference</th>
<th>df</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCAT ‘06</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>male</td>
<td>294.63</td>
<td>-3.73</td>
<td>348</td>
<td>-.729</td>
</tr>
<tr>
<td>female</td>
<td>298.37</td>
<td>-3.73</td>
<td>348</td>
<td>-.729</td>
</tr>
<tr>
<td>FCAT ‘07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>male</td>
<td>298.34</td>
<td>-.34</td>
<td>348</td>
<td>-.061</td>
</tr>
<tr>
<td>female</td>
<td>298.67</td>
<td>-.34</td>
<td>348</td>
<td>-.061</td>
</tr>
</tbody>
</table>
Discussion

The purpose of this study was to assess the relationship between the Oral Reading Fluency (ORF) probe of the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) and the Florida Comprehensive Assessment Test (FCAT). The following research questions were addressed:

a) Is there a significant correlation between DIBELS scores (2004-2005) and FCAT '06 and FCAT '07 scores?
b) Is there a significant correlation between DIBELS scores (2005-2006) and FCAT '06 and FCAT '07 scores?
c) Is there a significant difference on the FCAT '06 and '07 scores between Hispanic and African American students?
d) Will female students obtain significantly higher FCAT '06 and '06 scores when compared to their male counterparts?

Overall, findings are consistent with previous research demonstrating a significant relationship between oral reading fluency and reading achievement (Burke & Hagan-Burke, 2007; Hintze, Callahan III, Matthews, Williams, & Tobin, 2002; Spear-Swerling, 2006; White, 1995). Significant correlations between DIBELS scores from both the 2004-2005 and 2005-2006 school years with FCAT '06 and '07 scores were found. This is consistent with Roehrig, Yaacov, Nettles, Hudson and Torgesen’s (2007) findings. In their study, the authors examined the validity of the DIBELS in predicting student achievement on the FCAT as well as the Stanford Achievement Test (SAT-10). They found that the relationship between the DIBELS ORF and student performance on both achievement tests were highly correlated. In another study, Stage (2001) analyzed the predictive validity of the DIBELS ORF in predicting student achievement on the Washington Assessment of Student Learning (WASL) reading assessment. Findings indicated that the DIBELS ORF was an accurate predictor of which students passed or failed the WASL. These findings are similar to those included in a technical report written by John Wilson (2005), and released by the Tempe School District in Arizona. The purpose of the
technical report was to assess whether third grade students who met the ORF fluency benchmark on the DIBELS would meet the required benchmark on the Arizona Instrument to Measure Standards (AIMS). Results showed a strong correlation between student performance on the DIBELS ORF and AIMS. Thus, students who scored at the “At-Risk” range on the DIBELS ORF were unlike to meet the AIMS standards, whereas those students who scored at the “Low-Risk” range on the DIBELS ORF were likely to meet the AIMS standards. These findings promote the usefulness of the DIBELS ORF as a curriculum-based measure to monitor student reading achievement.

Aside from looking at the predictive validity of the DIBELS ORF, Roehrig et al. (2007) also examined bias based on demographic characteristics. More specifically, they assessed whether the DIBELS ORF was biased its predictions of reading achievement based on race (Hispanic, African American and White). Results indicate that the DIBELS ORF was able to adequately predict student reading achievement, independent of student race. These findings align with results from the present study, in which a significant difference between the mean scores obtained on the FCAT ’06 and ’07 between Hispanic and African American students was not found. However, Klein and Jimmerson (2005) did find a predictive bias regarding the DIBELS ORF’s validity in predicting reading achievement. The DIBELS ORF had a tendency to over-predict reading proficiency on the SAT-9 in Hispanic students whose native language was Spanish and under-predict reading proficiency in Hispanic students. The authors suggest that this bias may be attributed to the DIBELS ORF and SAT-9 measuring reading proficiency differentially in Hispanic student at varying Cognitive Academic Language Proficiency (CALP) levels (Klein & Jimmerson, 2005).
The mean score differences between males and female students were also investigated in Roehrigh et al.’s study. Similar to findings from the present study, significant differences in mean scores obtained on the FCAT were not present when gender was investigated. However, these findings are inconsistent with research demonstrating that female students have a tendency to outperform their male counterparts on reading achievement tests (Halpern, 1996; Stevenson & Newman, 1986; Tyler, 1965). However, it is consistent with a meta-analysis carried out by Hyde and Linn (1988). A total of 165 studies were reviewed and results concluded that there was a negligible difference between the verbal ability among male and female students.

Several limitations were present in this study. First, 95% of the sample used for this study did not have FCAT ’05 scores on file. Thus, a correlation between the DIBELS scores from 2004-2005 and FCAT ’05 scores was not possible. Also, the DIBELS ORF data used for this study was two years old as students were not administered the DIBELS ORF during the 2006-2007 and 2007-2008 school years. Thus, complete DIBELS ORF and FCAT scores were only available for the 2005-2006 school year. Although significant correlations were found among the scores for the 2005-2006 school year, it would have been interesting to see significant correlations applied to more recent data.

The school district whose archival data was used administered the DIBELS ORF in schools with a history of poor student achievement. These schools had a tendency to be located within low SES neighborhoods. As such, the sample that was used for this study was comprised only of Hispanic and African American students because of the small percentage of Caucasian students enrolled in schools that administered the DIBELS ORF. It is unknown whether including scores from Caucasian students would have changed the mean score difference between the races.
The current study substantiates previous research on the DIBELS ORF as a useful tool in gauging student progress throughout the year (Barger, 2003; Buck & Torgesen, 2003; Good & Kaminski, 2002; Elliot, Lee & Tollefson, 2001). A positive linear relationship between the DIBELS ORF and FCAT scores was found. As such, students that are classified as being “at-risk” of failing the FCAT can receive individualized remediation and their curriculum tailored to meet their specific needs. Research on effective CBM tools is important because the earlier children are classified as needing remediation, the better the outcome. Moreover, early detection is essential in preventing problems in other life domains (i.e., poor self-esteem, truancy). It would be interesting to examine the outcomes in student achievement and future success (i.e., college enrollment) between those students who were offered remediation at an early age and those who experienced years of reading failure and poor academic achievement.
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