THE CRITERION-RELATED VALIDITY OF CURRICULUM-BASED

MEASUREMENT IN WRITTEN EXPRESSION

ACROSS EDUCATIONAL LEVELS

by

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<u>ABSTRACT</u>

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Curriculum-based measurement (CBM) is gaining popularity as an effective system for evaluating the acquisition of basic academic skills (reading, writing, math, and spelling) within our nation's schools. There is currently a wealth of information available on the psychometric properties of CBM in reading; however, more technical information needs to be gathered on the remaining basic skill areas that CBM purports to assess.

This research project reviewed of the relevant literature on the criterion-related validity of CBM in written expression at the elementary, middle, and high school levels. The results of past research indicate three main findings. First, these measures appropriately differentiate elementary and middle school students according to age, grade, and program placement. Second, the most technically adequate CBM measure of written expression varies considerably across educational levels. Finally, although there is evidence that CBM is technically adequate for elementary and middle school students, greater confidence can be held in CBM measures at the elementary level.

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CHAPTER 1

Introduction

Curriculum-based measurement (CBM) is a systematic procedure used to monitor students' progress in the basic skill areas of reading, spelling, mathematics, and written expression (Deno, 1985; Deno & Fuchs, 1987). These simple, short-duration, standard fluency measures facilitate the process of making informed instructional decisions by functioning as "academic thermometers" or "indicators" that monitor student growth within the basic skill areas (Shinn, 1998). With frequent measurement, it is possible to assess a students' educational growth through CBM. If a student shows improvement on one of these indicators, it can be inferred that there is general improvement in a broader academic domain (Espin, Scierka, Skare, & Halverson, 1999). For example, researchers have found that the amount of words a child reads correctly in one minute is a good indicator of general reading ability (Deno, Mirkin, & Marston, 1980). Thus, a child who increases the amount of words they read correctly in one minute is likely improving his or her broader reading ability, including the ability to comprehend reading passages and read fluently.

Stanley Deno and colleagues at the University of Minnesota developed curriculum-based measurement (CBM) in the early 1970s. Deno's purpose was to create a way for special education teachers to accurately and efficiently evaluate the effectiveness of their instruction through monitoring the academic gains of their students (Deno, 1992). The original intent of CBM was to implement a system of assessment that allowed special education teachers to gauge the

effectiveness of their instruction through assessing what their students were achieving in the classroom. The methodology also allowed educators to determine if the students were not progressing in a specific academic area.

CBM was developed to be sensitive to minor gains in a child's academic performance. Unlike standardized norm-referenced tests, CBM's sensitivity allows educators to ascertain short-term academic growth that may have been previously missed. CBM allows educators to map out a student's academic growth as frequently as they choose. If a child is struggling, CBM provides the means to identify when learning has reached a plateau. They are then able to identify variables that may be attributing to their difficulties and implement appropriate changes.

It has been shown that when teachers use CBM they are more likely to construct and adapt their curriculum to benefit the needs of their students. As a result, students demonstrate higher rates of achievement in reading, math, and spelling (Fuchs & Fuchs, 1986). This indicates that teachers can use the information they gain from implementing CBM measures to develop instructional strategies that promote success.

Since it's inception, CBM has taken on a broader role within general education. Increasingly, principals and other general educators are seeking out what CBM has to offer as a means for identifying and documenting student progress within the basic skill areas for entire school districts (Shinn, 1998).

Writing competency is one basic skill of interest to educators and the public. The ability to express oneself in writing is a main facet of communication

with others. It is a valued skill in the schools, in the workforce, and in society as a whole. Unfortunately, many differences exist as to what constitutes good writing. Is it the ability to scribe legibly, spell correctly, use appropriate syntax/grammar, or think and communicate clearly on paper? These questions reflect a continuing debate in our field regarding the essence or essential components of writing competence. As a result of this debate, writing assessment has long been considered a problematic area for educators and researchers. Given these concerns, what types of curriculum-based measures should educators look at when they attempt to measure student growth in writing?

Curriculum-based measures of writing, like other measures of student growth in academics, need to be valid according to some standard or criterion. Deno et al. (1980) asserted that written expression CBMs need to "be valid with respect to widely used measures of achievement in written expression" (p. 9), and they must be able to "discriminate between students receiving LD services and those not receiving such services" (p. 21). A test's ability to perform these two functions often is referred to as criterion-related validity (Messick, 1995).

Establishing the criterion-related validity of curriculum-based measures of written expression is necessary. If the criterion-related validity of curriculum-based measures in writing can be established, educators can have confidence using such measures to monitor the academic progress of their students.

Purpose of Study

The strategy employed in this study is to examine the existing literature on curriculum-based measures of written expression. The purpose of this paper, then,

is to identify not only what constitutes CBM in written expression, but also what is currently known about the criterion-related validity of curriculum-based measures in writing at various educational levels. Four research questions guided this study:

1. What is CBM in written expression?

2. What is known about the criterion-related validity of CBMs in writing for elementary students?

3. What is known about the criterion-related validity of CBMs in writing for middle school students?

4. What is known about the criterion-related validity of CBMs in writing for high school students?

Definition of Terms

CBM- Curriculum-based measurement (CBM) is a set of measures that can serve as critical indicators of academic performance in the basic skill areas of reading, writing, spelling, and mathematical computation (Deno, 1986).

Correct Word Sequence (CWS)- Two adjacent, correctly spelled words that are acceptable to a native speaker of the English language (i.e., the word sequence is syntactically and semantically correct). Correct word sequences involve correctly spelled words, as well as the appropriate use of capitalization, punctuation, and conjunctions (Videen, Deno, & Marston 1982).

Holistic rating- An examiner reads an essay and makes a brief, subjective judgment from their general impression of the passage (Tindal & Parker,

1989).

Incorrect Word Sequence (IWS)- Two adjacent words that are not acceptable to

a native speaker of the English language (Videen et al., 1982).

Probe- Short, quick measure used to assess academic performance in one of the

four basic skill areas (Shinn, 1998).

Production-dependent measures- Measures that assesses an individual's ability

to write fluently (Tindal & Parker, 1989).

Production-independent measures- Measures that are used to assess the accuracy

of a writing sample (Tindal & Parker, 1989).

Story Starter- A short prompt used to initiate a student's writing sample. The

following is an example of a story starter: "Pretend you are playing on the

playground and a spaceship lands. A little green person comes out, calls

your name, and…" (Shinn, 1998).

T-unit length- A T-unit length is a countable indice that measures syntactic

complexity. It includes a subject and a verb; consequently, it is able to

stand alone as a sentence. Hunt (1966) defines T-unit length as a minimal

terminable unit in a writing sample.

CHAPTER 2

Review of Literature

The following literature review will first describe curriculum-based measurement in writing. It will then examine what is currently known regarding the criterion-related validity of curriculum-based measures of written expression at various educational levels. Each section will be devoted to answering the primary research questions addressed in chapter one.

What is Curriculum-based Measurement in Written Expression?

Curriculum-based measurement in written expression allows educators to gauge a student's competencies in writing. Researchers have found that measuring how many words a child writes correctly in a 3-minute time sample is a good indicator of their general writing ability at the elementary level (Deno et al., 1980). Thus, an elementary child who increases the amount of words written correctly in a 3-minute time period is likely improving his or her broader writing ability, including the ability to use proper grammar, correct punctuation, sentence structure, and story structure (Espin, et al., 1999). In written expression CBMs, students are given a story starter and asked to write a story for three minutes in response to a prompt (i.e., It was a dark and stormy night). Specific measures, such as counting the number of words written correctly, the number of words spelled correctly, or counting the number of correct word sequences in a writing sample are among the measures that have been developed to assess a student's general writing proficiency via CBM (Deno et al., 1980).

Criterion-Related Validity of Written Expression CBMs at the Elementary Level

To establish the criterion-related validity of written expression in CBM, Deno et al. (1980) compared its accuracy to systems of measurement (i.e., tests) that have previously been identified as valid ways to measure writing ability. Criterion-measures included the Test of Written Language (Hammill & Larsen, 1978), the Word Usage subtest of the Stanford Achievement Tests (Madden, Gardner, Rudman, Karlsen, & Merwin, 1978), and the Developmental Sentence Scoring System (Lee & Canter, 1971). Writing samples were collected from general education and learning disabled students in grades three through six. These samples were scored using the following measures: T-unit length, the number of mature words written, the total number of words written, the number of large words written, and the number of words spelled correctly. Samples were 3-minute imaginative stories written in response to picture prompts, story starters, or topic sentences. Excluding T-unit length, substantial correlations (ranging from .63 to .84 with the criterion measures) indicated strong relations between the existing four measures of written expression in CBM and other forms of writing assessment at the elementary level.

To further establish the criterion-validity of CBM in written expression at the elementary level, Deno et al. (1980) compared the performance of students receiving general education programming with those receiving services in learning disability resource programs. They found that on all measures, excluding T-unit length, the mean group differences were statistically significant. They ranged from 1.5 to 2.0 times greater for general education students compared to

students identified as learning disabled. Thus, these measures demonstrated accuracy in differentiating the resource room students from the general education students. Further, a one-way ANOVA was conducted to determine whether the measures were sensitive enough to differentiate student performance across grade levels. Deno et al.'s findings were statistically significant for all measures, indicating CBM's validity in differentiating the written performance of students between grade levels and program placement.

In a replication study, Deno, Marston, and Mirkin (1982) found similar results to their original investigation. They chose six measures to assess a student's writing ability. These measures were analyzed to find the strength of their relations with other variables. These variables included already established criterion measures, such as the age of the students. They also examined whether the measures differentiated students identified as learning disabled from those receiving general education programming. Again, using the same criterion measures used in the Deno et al. (1980) study, this replication study found moderate to high correlations with all measures for stories written by elementary-aged children, excluding mean T-unit length. The total number of words written produced correlations ranging from .58 to .84, the number of words spelled correctly produced correlations ranging from .57 to .80, the number of correct letter sequences ranged from .57 to .86, and the number of mature words produced correlations ranging from .61 to .83. A two-way ANOVA was conducted to determine the differences between age and program placement on a student's writing performance. Significant differences ($p < .001$) were found,

indicating power in the ability of these written expression CBMs to differentiate students at the elementary level.

In a longitudinal study examining the relation between the performance of elementary students across grade levels and at different times within the school year (within-grade measurement), Marston, Lowry, Deno, and Mirkin (1981) found significant differences in the levels of student performance using all curriculum-based measures. In written expression, the researchers used the number of words written and the number of words spelled correctly to serve as measures of academic growth. They found that at each increasing grade level, students outperformed the students in the grade below them. Further, significant growth was demonstrated when measuring the within-grade performance of students from fall to winter to spring. These findings further established the criterion-related validity of CBM in written expression as the measures were sensitive enough to accurately differentiate the performance of the students over time.

There is supportive evidence that CBM in written expression effectively discriminates among learning disabled students and general education students at the elementary level. Further research in this area has demonstrated that CBMs in written expression are able to differentiate between mildly handicapped students, low-achieving students, and general education students in the upper-elementary grades (Shinn & Marston, 1985). In the Shinn and Marston study, 209 students (ranging from grades four through six) were presented with a story starter and given three minutes to respond. The samples were scored using the number of

words written correctly. As expected, students with mild handicaps produced significantly fewer correctly written words than the low-achieving students. Further, the low-achieving students had fewer correct words than the general education students. These findings suggest that counting the number of words written correctly in a passage is a valid, efficient way to differentiate among various levels of functioning at the upper elementary level.

Criterion-Related Validity of Written Expression CBMs at the Middle School Level

Tindal and Parker (1989) examined whether or not measures identified as valid indices of written expression for elementary students also would be technically adequate at the middle school level. Using a sample of 172 students, (i.e., 30 students from special education and 142 from remedial programs) the researchers administered a story starter and asked the students to write for a total of six minutes. The students were in grades six though eight. From this study, the researchers sought to answer if counting the total number of words written, the number of words spelled correctly, and the number of correct word sequences were valid in assessing writing proficiency of older students. Their findings suggest other measures may be more appropriate. Not only did the measures fail to correlate favorably with the holistic ratings of student writing samples (r = .10 to .45), they did not significantly differentiate between students in compensatory and special education placements.

Through factor analysis, Tindal and Parker (1989) also found that production-independent measures were better indicators of written expression at the middle school level. They were more highly correlated with the holistic

ratings of essays than the production-dependent measures. Production-independent measures were defined as those that assess the grammar and syntax of writing, or writing accuracy (percent of legible words, percent of words spelled correctly, percent of correct word sequences, and the mean length of correct word sequences). Production-dependent measures were defined as those that measure an individual's ability to write fluently (number of words written, number of words written legibly, number of words spelled correctly, and the number of correct word sequences).

Although Tindal and Parker (1989) found the percentage of words spelled correctly and the percentage of correct word sequences to be the most valid indicators of written expression at the middle-school level, they are not feasible to assess growth over time, a principle use of CBM. Thus, using these CBM measures were not found to be valid in monitoring student writing performance over time. Still, these two percentage measures were able to discriminate between the educational placement of students in compensatory versus special education programs, and they had moderate correlations with holistic ratings (r =.73 and .75).

In an attempt to expand the research base on CBMs in written expression with middle school students, Watkinson and Lee (1992) examined the differences in writing samples produced by learning-disabled and non-disabled students. Students in grades six through eight were administered a story starter. Their writing sample was scored using eight different CBM measures. Their results are similar to Parker and Tindal's (1989) findings. Students with learning disabilities

scored significantly lower on the production-dependent factor of correct word sequences; however, there were no significant differences between the groups of students in the number of words written, the number of words written legibly, or the number of words spelled correctly. Thus, at the middle school level, there were not large differences in the ability to write fluently for the two student groups. Students with learning disabilities had significantly more difficulty than students in general education writing accurately, especially on measures of correct grammar and proper syntax. Watkinson and Lee (1992) concurred with Parker and Tindal (1989) that production-independent measures (i.e., accuracy measures) instead of production-dependent measures (i.e., fluency measures) in written expression CBMs may be better at differentiating students with learning disabilities from students in general education at the middle school level.

Armed with the knowledge that percentage measures were inappropriate for indexing academic growth, and the number of words written and words spelled correctly did not adequately discriminate among individuals above the elementary level, Espin et al. (2000) sought to identify the best indicators of writing proficiency for middle school students. Three to five minute story writing and descriptive samples were collected and scored from a group of 112 students in grades seven and eight. Measures used to score writing samples were the number of words written, the number of words, the number of words spelled correctly, the number of words spelled incorrectly, the number of characters written, the number of sentences written, the number of characters per word, the number of words per sentence, the number of correct word sequences, the number

of correct minus incorrect word sequences, and the mean length of correct word sequences. Criterion measures included a classroom teacher's rating of the students' writing proficiency and a district writing test. The number of correct word sequences minus the number of incorrect word sequences (CWS-IWS) was found to be a valid measure in identifying writing proficiency with middle-school students. Moderately high correlations were found between the writing samples' CWS-IWS scores and teacher ratings of the essay quality (.65 - .70). Further, the CWS-IWS scores were significantly correlated with the district writing test (.69 - .75). In conclusion, the researchers found CWS-IWS to have the most support as an indicator of written expression at the middle school level. Further, no differences were found regarding the validity and reliability of writing samples using story starters versus descriptive writing (Espin et al., 2000).

Criterion-Related Validity of Written Expression CBMs at the High School Level

In another study examining the criterion-related validity of written expression CBMs, Espin et al. (1999) collected data from 147 students in the 10th grade. The students in this study were randomly chosen from four groups of English classes: Learning Disabled, Basic, Regular, and Enriched English. The Language Arts subtest of the California Achievement Test (CAT), the group placement of the students, the students' semester grades in English class, and holistic ratings of writing were all used as criterion measures in this study. After computing correlations on CBM measures from the students' writing passages and criterion measures, researchers found the number of correct word sequences, the mean length of correct word sequences, the number of characters per word,

and the number of sentences written were the strongest predictors of writing

proficiency. However, all of these correlations were low to moderate, ranging

from r = .34 to .45. These results indicated that using one measure alone may be

insufficient in indicating writing proficiency at the 10th grade level. Using

regression analyses, it was found that a combination of measures (the number of

characters per word, the number of sentences written, plus the mean length of

correct word sequences) predicted the criterion scores better than any single

measure. This combination of measures yielded a moderately high correlation (r =

.62) with the CAT Language Arts subtest. These results indicate that a

combination of measures may be better than any single measure at predicting

writing proficiency at the high school level. Further, it was found that a

combination of the number of correct word sequences, the mean length of correct

word sequences, the characters per word, and the number of sentences written,

were effective in differentiating among student groups (i.e., students in Basic

versus Enriched English classes).

Criterion-Related Validity of Written Expression CBMs Across Grade Levels

Parker, Tindal, and Hasbrouck (1991) examined the criterion-related

validity of written expression CBMs at the elementary, middle, and high school

levels (grades 2, 5, 6, 8, and 11). They sought to examine five indices of writing

for making screening and eligibility decisions. These five indices included: the

number of words written, the number of words spelled correctly, the number of

correct word sequences, the percentage of correctly spelled words, and the

percentage of correct word sequences. Using holistic ratings of writing

proficiency, the researchers found the number of correct word sequences was a good predictor of writing proficiency at all grade levels with correlation coefficients as follows: Grade 2 (.60), Grade 5 (.55), Grade 6 (.52), Grade 8 (.56), Grade 11 (.48). Although the number of correct word sequences produced the strongest correlations with the holistic ratings, the researchers concluded that correct word sequences are not sufficient to make eligibility and screening decisions. The number of correct word sequences was found to be the most accurate predictor for differentiating between the grade levels for students who performed above the 10th percentile. When looking solely at students performing below the 10th percentile, the percentage of correct word sequences emerged as a better measure for differentiating student performance between grade levels.

CHAPTER 3

Conclusions and Discussion

Summary of Main Findings

The purpose of this literature review was to ascertain what is currently known regarding the criterion-related validity of written expression in CBM at three different educational levels. At the elementary level, there are numerous indices that an educator can use confidently to assess student performance in writing. Counting the total number of words written in a sample, the number of large words written, the number of mature words written, the number of words spelled correctly, and/or the number of correct word sequences all have received support as valid ways to score an elementary student's written essay (Deno et al., 1980; Deno et al., 1982; Marston et al., 1981; Parker et al., 1991). Correlations between these measures and previously validated tests for evaluating written expression ranged from .57 to .86 (Deno et al., 1980). Further, the score T-unit length was the only measure found not sensitive enough to detect growth at the elementary level.

When assessing elementary students' writing ability, CBM measures also can differentiate the performances of students in special education compared to those students in general education. Children receiving instruction through general education scored consistently higher in their writing ability using CBM procedures than those children in learning disabilities classrooms. Research at the elementary level indicates a statistical significance of $p < .001$ when comparing the writing samples of students in general education to those students in remedial

education classrooms (Deno et al., 1982). CBMs in written expression also have been shown to adequately differentiate between mildly handicapped students, low-achieving students, and general education students in the upper-elementary grades (Shinn & Marston, 1985).

At the elementary level, several countable indices (total number of words written, number of large words written, number of mature words written, number of correct word sequences, and/or number of words spelled correctly) validly differentiate the written performance of students between grade levels (Deno et al., 1980; Deno et al., 1982; Marston et al., 1981). Further, Marston et al. (1981) found that CBMs written expression indices can differentiate student performance within grade levels. Students increase their writing proficiency throughout the school year, and CBM measures in written expression are sensitive enough to detect the academic gains students make from fall to winter to spring in the elementary grades.

As students progress through the education system, their writing becomes more sophisticated. Watkinson and Lee (1992), Parker and Tindal (1989), found the increasing sophistication of the writing samples need to be juxtaposed with increasingly sophisticated scoring techniques. They concurred that production-independent measures (i.e., accuracy measures) instead of production-dependent measures (i.e., fluency measures) in CBMs written expression may be better at differentiating students with learning disabilities from students in general education programming at the middle school level. Further, it seems that percentage measures (i.e., percentage of words spelled correctly and the

percentage of correct word sequences) are the most valid indicators of written expression at the middle-school level, as they correlate most strongly with criterion measures (Tindal & Parker, 1989; Watkinson & Lee, 1992). Unfortunately, percentage measures are not feasible as CBMs because they are not able to detect academic growth. Percentage measures were not assessed in the research done by Espin et al. (2000). These researchers found that counting the number of correct word sequences minus the number of incorrect word sequences validly assesses writing ability at the middle school level. Similarly, Parker et al. (1991) corroborated that the number of correct word sequences correlated moderately high with criterion measures at the middle school level.

Unlike the elementary and middle school levels, there has been limited research evaluating the criterion-related validity of written expression at the high school level. From the preliminary research, it appears that a combination of measures (the number of characters per word, the number of sentences written, plus the mean length of correct word sequences) may be better at predicting criterion scores of writing proficiency than any single measure (Espin et al., 1999).

Limitations

There are inherent limitations when conducting a literature review. Although objectivity was a goal throughout this review, misperceptions related to the outcomes still need to be considered. The researcher's own biases towards CBM as a valid, effective system to use in the schools may have colored the way the findings have been presented.

Further, this literature review revealed that most studies used holistic scoring as the criterion measure for establishing the criterion-related validity of the curriculum-based measures of writing. Holistic scores are generated from a reader's opinion; and, although the reader may have had experience in scoring writing essays, holistic scores are largely subjective. Hence, the reliability and validity of holistic scores are suspect.

Another limitation of this literature review is that no new information is being contributed to the field of education. All of the information provided by this review could be obtained more reliably from the original empirical studies.

Implications for Further Research

After compiling information on the criterion-related validity of CBM in written expression at various educational levels, gaps in the research reveal the need for further research. There currently is limited information about the criterion-related validity of written expression curriculum-based measures at the secondary level. More needs to be done to identify the best measures of written expression for secondary students. Once provided, educators can then use this system of measurement with confidence at the middle and high school level.

Also, it appears that the validity of the measures used to assess writing varies across educational levels. Counting the total number of words in a writing sample appears to give a valid indication of an elementary student's writing proficiency; however, this measure does not give a good indication of a secondary student's writing ability. Educators would benefit from using measures that could be used continuously throughout the educational process. The writing ability of

students could then be assessed at the primary grade levels, and continue to be validly and effectively monitored throughout that student's educational career. Using common measures across grade levels would further simplify the process of CBM and allow for even greater gains in formative evaluation.

According to Parker et al. (1991), the most valid curriculum-based measures might be different when working with students who perform below the 10th percentile. More research involving students who perform below the 10th percentile would be beneficial to address the needs of this student population.

Implications for Practice

Elementary school personnel can have faith in using written expression curriculum-based measures to assess their students' writing capabilities. Using simple measures such as the number of words written, the number of words spelled correctly, and the number of correct word sequences are appropriate measures to use at the elementary level. They provide valid, efficient measures that are sensitive in detecting growth in writing proficiency at that level. Secondary teachers should realize that CBMs of written expression can be used to supplement other measures of writing proficiency. However, more research needs to be conducted with curriculum-based measures before making high stakes decisions about the writing proficiency of students at the secondary level.

Conclusion

Curriculum-based measurement (CBM) is gaining popularity as an effective system for evaluating the acquisition of basic academic skills (reading, writing, math, and spelling) within our nation's schools. There is currently a

wealth of information available on the psychometric properties of CBM in reading; however, more technical information needs to be gathered on the remaining basic skill areas that CBM purports to assess.

This research project reviewed the relevant literature on the criterion-related validity of CBM in written expression at the elementary, middle, and high school levels. The results of past research indicate three main findings. First, these measures appropriately differentiate elementary and middle school students according to age, grade, and program placement. Second, the most technically adequate CBM measure of written expression varies considerably across educational levels. Finally, although there is evidence that CBM is technically adequate for elementary and middle school students, greater confidence can be held in CBM measures at the elementary level.

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