

## **Using Curriculum-Based Measurement to Improve Students Achievement in a Special Education University Course**

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### **Abstract**

*Proper assessment of ELLs is essential for progress monitoring, determining language proficiency, predicting achievement, and identifying students with disabilities. This study examines the efficacy of CBM as an assessment methodology for enhancing students' achievement in higher education. It was an initial effort to examine the applicability of CBM procedures to measure reading fluency and spelling and the effects of CBM on students' achievement in a special education course. This course consisted of 45 university students; three who have a specific learning disability in reading. The results of a 15-week CBM process demonstrated the effectiveness of using CBM in higher education. Furthermore, when compared to the traditional way of assessment, the use of CBM produced significant gains in students' achievement, specifically, the students who were struggling with reading and spelling. The results of the study were cross validated in the next semester of the academic year and yielded the same conclusion.*

**Keywords:** Curriculum Based Measurement, Higher Education, English Language Learners, Special Education.

### **Introduction**

Curriculum based measurement (CBM) is considered to be a type of formative assessment. Formative assessment is not a test per se, but instead a process by which teachers use test-elicited evidence to revise instruction for students and help students adjust their own learning strategies (Popham, 2009). CBM has been used by teachers and school psychologists for over three decades and has been shown to provide reliable and valid indicators of students' achievement in reading, writing, and mathematics (for reviews, see Deno, 1985; Deno, Fuchs, Marston, & Shin, 2001). CBM is considered to be a type of authentic assessment practice that is designed to provide prevention and intervention services to students with reading difficulties (Hoover & Mendez-Barletta, 2008).

CBM was developed by Stan Deno at the University of Minnesota's Institute for Research on Learning Disabilities during the mid 1970's. Originally developed as a metric to examine the rates of growth in students participating in special education (Stecker, Fuchs, & Fuchs, 2005), its current applications have broadened to both formative and summative assessments of student skill acquisition. Within academic settings, CBM is useful for: (a) establishing norms for screening and identifying students in the need of special education services, (b) identifying students for special education evaluation who demonstrate a low level of performance and inadequate rate of improvement, (c) monitoring student progress, and (d) planning effective instruction in the general education classroom (Stecker et al., 2005).

However, to date and to the best of the author's knowledge, no studies exist that report the use of CBM in higher education. Furthermore, less research has investigated the validity of using CBM with English Language Learners (ELLs) with and without a specific learning disability (SLD). The purposes of this study were to: (a) improve students' achievement in a special education university course, (b) enhance the achievement of students who have reading and spelling disabilities, and (c) investigate the effectiveness of using reading and spelling CBM for ELLs in higher education.

### **Assessment as a Teaching Tool**

Assessment results shape teachers' beliefs about student abilities and the quality of instruction offered to them. Across higher education there is a growing demand for systematic and thoughtful student learning assessment. In general, however, legislators, national higher education boards, and administrators have been more enthusiastic about assessment than have academics. In part, faculty members' ambivalence toward assessment is fueled by their perceptions that much of what is done in the name of assessment is of little use to them in improving their own teaching, student learning, or the curriculum. The researcher of this study could not find any studies that have investigated the efficacy and feasibility for using CBM to promote student achievement in higher education. On the other hand, considerable research has been conducted on the use of CBM for students in elementary and middle school (Deno, 1985; Deno et al., 2001; Stecker et al., 2005). However, teachers in higher education need a valid and reliable assessment tool to track the quality of their day-to-day subject matter learning.

### **The Use of CBM to Improve Students' Achievement**

Fuchs, Deno, and Mirkin (1984) conducted a large-scale investigation with 39 special educators in New York City who either used CBM to monitor student performance and adjust instruction or did not use CBM. They found significant effects for CBM implementation on student reading achievement. Despite documentation that CBM could be used to effect better student outcomes, Wesson, King, and Deno (1984) reported that some teachers elected not to use CBM due to dissatisfaction with its time-consuming nature.

Recently, Yeo (2010) documented similar findings in his research synthesis. The purpose of that synthesis was to examine the relationship between CBM and statewide achievement tests in reading. A multilevel meta-analysis was used to calculate the correlation coefficient of the population for 27 studies that met the inclusion criteria. Results showed an overall large correlation coefficient of .68, which was heterogeneous among studies. Study sample size, proportion of English language learners, proportion of students with disabilities, and difference in time from when CBM and statewide achievement tests were administered were statistically significant components affecting the relationship between CBM and state achievement tests.

### **The Assessment of Subject Matter for English Language Learners**

Educators, policy makers, and the public should understand that all students who are learning English as an additional language are not alike. They enter schools with a wide range of language proficiencies (in English and in their native language) and of subject-matter knowledge. ELLs differ in their educational backgrounds, expectations of schooling, and socioeconomic status (Waggoner, 1999). As noted in the Standards for Educational and Psychological Tests, *every assessment is an assessment of language* (American Educational Research Association, American Psychological Association, and National Council on Measurement in Education, 1999). This was also expressed by Lenski, Ehlers-Zavala, Daniel, and Sun-Irminger (2006) who stated: "... all assessments in English are also assessments of English" (p. 29).

ELL students face a considerable challenge of having to learn English while also responding to the subject-matter demands of school. Given that the English-language proficiency level of students affects their performance on subject area assessments administered in English (García-Vázquez, Vázquez, López, & Ward, 1999) and that recently developed assessments require high level of English proficiency, assessments and assessment procedures appropriate for ELLs are needed. Formative tests can yield useful information about students' understanding of both the subject matter and the language. Formative assessments, such as CBMs and curriculum-based assessments, also provide useful information about the rate at which a student is achieving and the effectiveness of the interventions employed (Mather & Abu-Hamour, in press).

There appears to be much promise for the use of CBM with ELL students. Studies have demonstrated moderate to high correlations between CBM measures of reading (R-CBM and maze) in English and other standardized measures of reading achievement for ELL students (Baker & Good, 1995; Betts, Muyskens, & Marston, 2006; Wiley & Deno, 2005). Furthermore, R-CBM scores appear to discriminate among different levels of English language proficiency and educational placements (Englebert-Johnson, 1997; Graves, Plasencia-Peinado, Deno, & Johnson, 2005; Moore, 1997). In addition, studies have provided evidence supporting the use of R-CBM to monitor the reading growth of ELL students (Domínguez de Ramírez & Shapiro, 2006).

## Method

### Participants

A total of 135 undergraduate students from a public university in Jordan participated in the study. Students attended a course at the university entitled *Selected English Readings in Special Education*. The course was taught by a university instructor and assisted by a former Special Education teacher from America (native English speaking volunteer). Three samples were chosen for the present study. These samples were purposively chosen from the university course that was taught in English. Each one of the three samples was comprise of 45 students in three consecutive academic semesters. The summative assessment was used with the first group, while progress monitoring (CBM reading fluency and spelling) along with the summative assessment were used with the second and third groups. Consent for participation was obtained from the participants individually. Descriptive statistics for age, gender, and number of students with SLD in reading are presented in Table 1.

**Table 1. Descriptive Statistics**

Group/Variable	Range of Age in Years	Mean Age	Standard Deviation	Gender		Students with SLD
				Female	Male	
Group 1	20-23	21.65	.91	38	7	2
Group 2	20-24	21.69	1.1	35	10	3
Group 3	20-24	21.61	1.08	36	9	3

*Note.* SLD = Specific Learning Disability

All of students enrolled in the course speak Arabic as their first language and English as a second one. In order to determine a rough estimate of the students' knowledge of English, the accredited English language test at the university was given at the beginning of the first class. Students who got a score of 49 out of 100 or less were qualified as ELLs. The results indicated that approximately 100% of the students qualified as English learners in the three groups. Two, three, and three students with SLD in reading and spelling have been identified in three consecutive semesters by the office of students support at the university.

### Measures

**Reading Fluency.** The use of curriculum-based measurement (CBM) for progress monitoring allows for the assurance that the intervention plan designed for student is being translated into improvements in his or her ability to perform on literacy tasks (Kamil et al., 2008). Oral reading fluency (ORF), which can be measured by the number of words read correctly from a passage in one minute (CWPM), is a reliable indicator of overall reading achievement (Jenkins, Deno, & Mirkin, 1979); it is also an important measure of adolescent reading performance (Kamil et al., 2008). Due to the fact that students have significant weakness in learning English and based on the baseline results, probes were administered at the 9th grade level. A probes pool was developed from the course curriculum. Researchers have tried to reduce variability in individual students' data due to passage difficulty by using readability formulas to measure text difficulty (Griffiths, VanDerHeyden, Skokut, & Lilles, 2009). In this study, the researcher used the Spache formula to reduce the variance of the CBM probes (Good & Kaminski, 2002). This formula considers difficulty of vocabulary and sentence length. In addition, all probes were given to three university's instructors and three English teachers in the field to judge the difficulty of grammar and word order. Their suggestions were taken into consideration to make the final version of the probes. To complete a CBM weekly reading fluency probes, the instructor assistant sit down *individually* with the students and administered the probes.

**Spelling.** Spelling is an important skill for writing and evaluating that also provides information about student's decoding. Good spellers are always good readers, but the reverse is not always true; a poor speller can be a good reader or a poor reader (Mather, personal communication, March, 2012). Spelling CBM assesses students' ability to generalize learned spelling rules in novel tasks in addition to the number of words students can spell correctly. Spelling CBM has been field tested for more than 25 years and has been used successfully with general education students (Fuchs, Fuchs, Hamlett, Walz, & Getmann, 1993) and students with disabilities (Fuchs, Fuchs, and Hamlett, 1989).

Although they can be administered individually, CBM spelling probes are typically given to *groups* of students. The instructor reads aloud a list of 17 spelling words, reading successive words after a predetermined number of seconds (at the rate of one word every 7 seconds). Students attempt to spell the words on their answer sheets in the time allotted. Similar to traditional spelling tests, S-CBM can be scored for the number of words spelled correctly. S-CBM can also be scored by using a more sensitive procedure of counting the number of correct letter sequences (CLS). The CLS is determined by counting pairs of letters that are placed together correctly within a word (Hosp, Hosp, & Howell, 2007). In this study, the S-CBM was administered to the group of students using the CLS for scoring. Probes were derived from the course curriculum and administered at the 9th grade level. The procedures of checking probes' variability were identical to the one used with CBM ORF probes.

**End-of-Academic semester test.** A 100-point final examination included translation of sentences and vocabulary words from English to Arabic, translation of Arabic terms and sentences into English, fill in the blanks, and multiple choice questions. Three equivalent forms of this test were created from the course accredited curriculum and administered to the students in the three consecutive semesters.

### **Procedures**

Forty-five university students attended a course at public university in the southern region of Jordan, *Selected English Readings in Special Education*. This course was taught completely in English. Primary materials for the course consisted of various articles in English about Special Education. The articles had been revised and simplified. Paragraphs were broken down into individual sentences and the articles were laid out so that students could make notes and write Arabic translations below the English sentences. Separate pages of vocabulary words and phrases were also created. In order to assess the students' general knowledge of English reading, a 50-point pretest was given at the first full class period. Points were given for translating sentences and vocabulary words from English to Arabic, translating Arabic terms and sentences into English, and completing fill in the blanks and multiple choice questions that followed the reading of a paragraph in English.

Using the results of the pretest, students were divided into mixed ability groups of three members at the second class meeting. Each group was assigned a special education topic from the text and a special education article, all in English. They were instructed to read the materials, familiarize themselves with the pronunciation and, in turn, present the information to the rest of the class. They were asked to create handouts and have an overhead prepared. Students' presentations continued each week until the end of the semester. The instructor and his assistant provided corrections and feedback for the students' performance. Students with SLD were given 1:1 tutoring by graduate students in special education. The tutoring was based on the results of a pre-test that was designed to identify the specific problems the students were having in their classes. Intervention focused on teaching the students to independently use strategies to overcome these specific problems.

Three Summative assessments were used to evaluate the effectiveness of instructional programs and services during and at the end of an academic semester. Although the summative assessments were administered for all semesters, CBM for reading fluency and spelling were just administered in the second and third semester to validate the use of CBM assessments to improve students' achievement.

**Procedural and Inter-rater Reliabilities.** To ensure consistency of testing administration across CBM probes, the Course Instructor (CI) and his Teaching Assistant (TA) read from scripts and used timers. The fidelity of testing administration was tested by using a detailed checklist to ensure each test was administered as it was intended and described in the manuals of CBM testing (Hosp et al., 2007). Procedural reliability was obtained during 100% of testing sessions with an average reliability of 100 percent.

The TA scored each CBM probe and entered the data into an excel sheet. The CI checked randomly 25% of the scoring sheets. The average inter-rater reliability of scoring fidelity data was 99% (range 98%-100%). In terms of data entry reliability, all of the excel data (100%) were checked against the paper scores and all discrepancies were resolved by examining the original protocols. In addition, the CI had weekly updates and discussions with the TA to address the crucial points of teaching the course and using the CBM assessments.

## Results

A 50-point accredited English test in the university was given to the students in the beginning of each semester to determine their English skills. To assure that there were no violations of assumptions in one-way independent Analysis of Variance (ANOVA), a set of statistical tests were administered. No violations of normality and homogeneity of variance were detected. The variances were equal among all groups,  $F(2, 132) = .93, p > .05$ .

Although students in the three groups had varied means (M) and standard deviations (SD) on the English test (M = 23.38, SD = 1.17), (M = 21.71, SD = 1.19), and (M = 24.78, SD = 1.40) respectively, no significant differences in terms of English language skills were found among all groups  $F(2, 132) = 1.47, p > .05$ .

The following sections present the results for each hypothesis explored in this study.

*Hypothesis 1: there will be a significant difference in terms of performance on achievement tests between students who were administered CBM and summative assessment in the second semester compared to students who were just administered summative assessment in the first semester.*

All assumptions of performing independent *t*-tests were examined. No violations of normality and homogeneity of variance were detected. The variances were equal for the CBM group and summative group assessment,  $F(1, 88) = 1.82, p > .05$ . On average, students who had CBM measures achieved higher grades (M = 76.60, SD = 2.19) than students who experienced just summative assessment during the academic semester (M = 66.24, SD = 2.26). This difference was significant  $t(88) = -3.28, p < .05$ , and it did represent a medium-sized effect  $r = .33$ .

*Hypothesis 2: The two consecutive groups who will receive the CBM (experimental groups) will have better achievement than students who were administered only the summative assessment (control group). In addition; there will be no significant difference in terms of achievement between students who receive CBM in the last two consecutive semesters.*

To explore this hypothesis, two planned comparisons had been performed: one to test whether the control group was different to the two groups who received CBM, and one to investigate whether there were differences between the two CBM consecutive groups. All assumptions of performing one-way independent ANOVA were examined. No violations of normality and homogeneity of variance were detected. The variances were equal for CBM groups and summative group assessment,  $F(2, 132) = .22, p > .05$ .

Planned contrasts revealed that using CBM along with the summative assessment significantly increased the academic achievement compared to just using a summative assessment,  $t(132) = 3.72, p < .05$  (1-tailed),  $r = .30$ , and that there was no significant difference in terms of achievement between students who received CBM in the two consecutive semesters  $t(132) = -.28, p > .05$  (1-tailed).

*Hypothesis 3: Students with SLD will develop a positive increase/trend-line in their reading and spelling skills as a result of using CBM for reading and spelling*

The CBM results, a more sensitive measure of growth, also were used to support the efficacy of using CBM with students with SLD in higher education. Due to the small number of students with SLD and the similar results that were documented in the second and third semesters, the researcher decided just to graph the progress of the students with SLD in the second group of this study. The trend line represents the student progress. Basically, a trend-line is a line of “best fit” in terms of showing the trajectory of the student’s performance. Although a student’s data may be variable (higher one day than the next day), a trend-line provides a clear picture of the overall trajectory in relationship to a student’s goal-line (Hosp et al., 2007).

As it was expected, the three students progressed on their reading fluency from (67, 65, 54) CWPM on first probe to (89, 98, 84) CWPM respectively by the last week of instruction. Figure 1 illustrates the students’ weekly reading progress. On spelling lists, they progressed from (58/120, 62/120, 42/120) to (78/120, 80/120, 63/120) CLS respectively (See Figure 2). Even though these results are encouraging, these students are still extremely far behind their peers in literacy skills, and will require additional remedial intervention with progress monitoring to continue closing the gap.

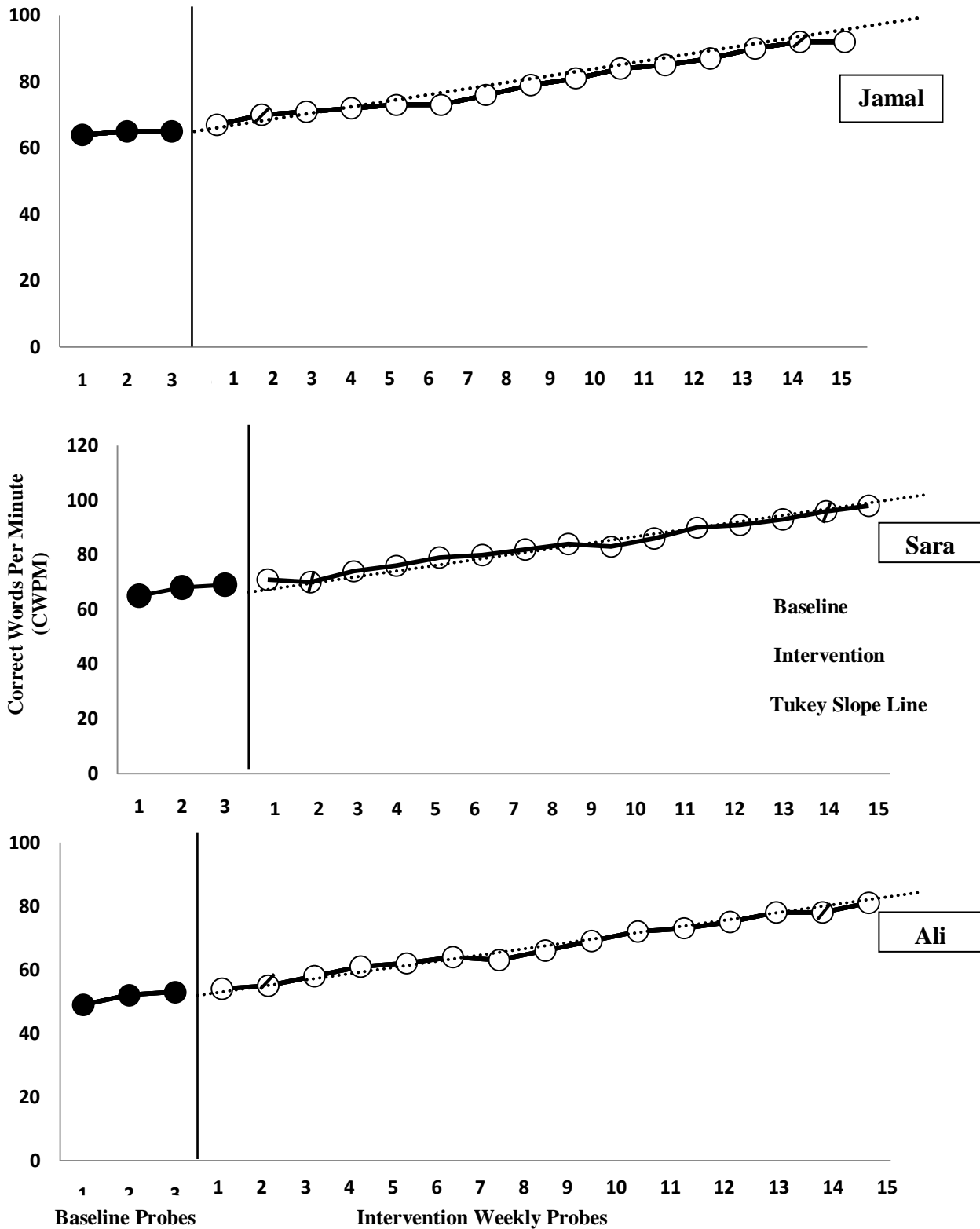


Figure 1. Results of students' oral reading fluency reported in Correct Words Per Minute (CWPM).

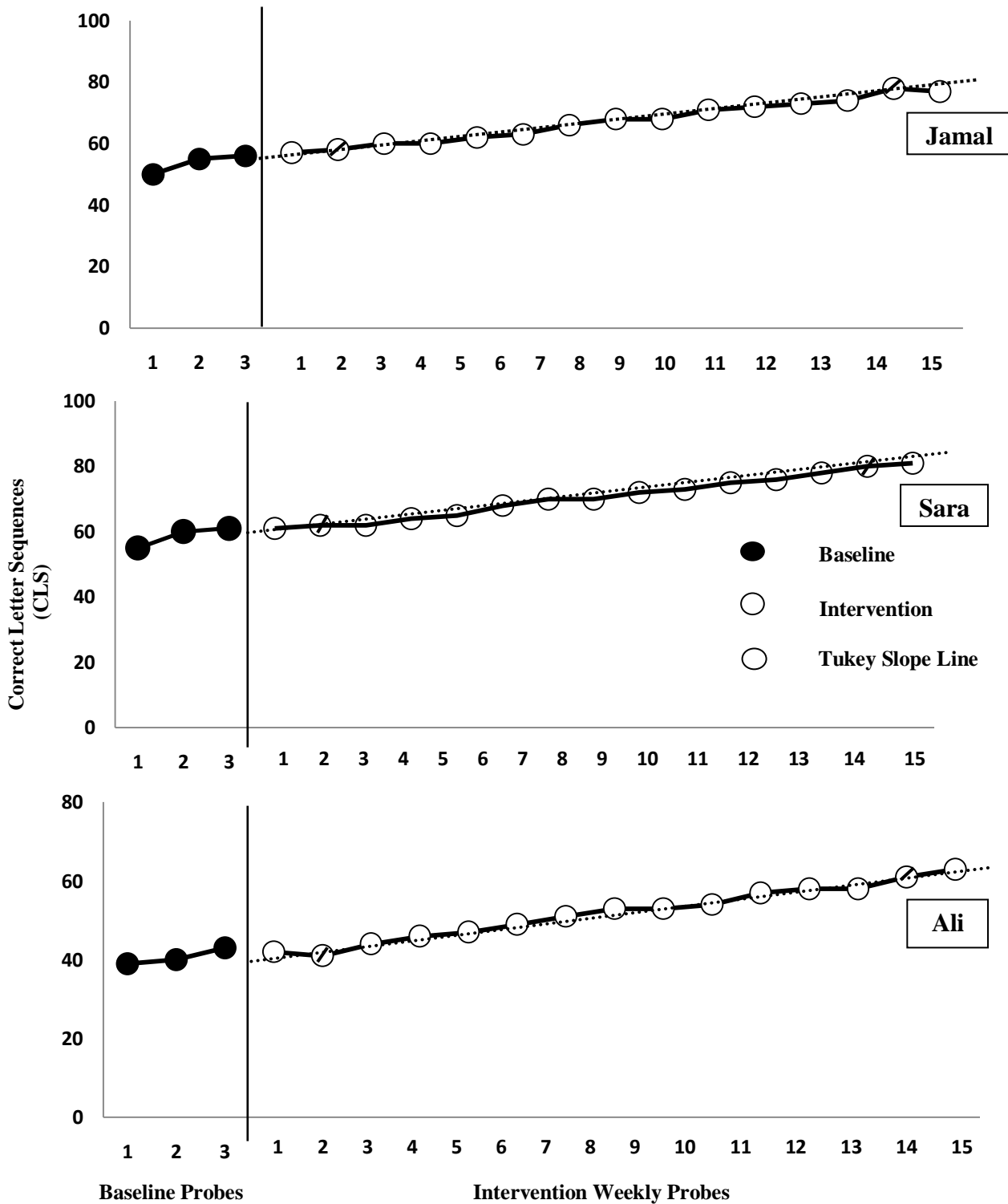


Figure 2. Results of students spelling reported in Correct Letter Sequences (CLS).

**Social Validity**

Evaluations of social validity focus on satisfaction with the intervention's outcomes by those who use them (Clarke, Worcester, Dunlap, Murray, & Bradley-Klug, 2002). Students with SLD and the entire class completed a survey containing five questions in a yes/no format that assessed whether they felt their English reading, spelling, and achievement skills improved during the CBM period and whether they enjoyed the instructional program.

Although students stated that this course was a lot of work for them, results indicated that participants involved in this study were satisfied with the assessment process and the tutoring procedures. Approximately, 95% of the students believed that their reading and spelling skills improved because of the use of CBM.

### **Discussion**

In today's educational climate, school success is defined as "...ensuring achievement for every student" (Safer & Fleischman, 2005, p. 81). With younger students, research findings have suggested that CBM is the best method for teachers to use for progress monitoring purposes and ensuring student achievement (National Research Council on Learning Disabilities, 2007). This study illustrates that CBM can also improve the academic achievement for ELL postsecondary students with and without reading or spelling difficulties. As indicated before, the purposes of this study were to: (a) improve the achievement of ELL students in a Special Education university course, (b) enhance the achievement of students who have reading and spelling disabilities, and (c) investigate the effectiveness of using reading and spelling CBM for ELLs in higher education.

The results indicated that using CBM for reading fluency and spelling had a significant effect in increasing students' achievement in general. The results also illustrated that students with SLD improved their reading fluency and spelling skills. Thus, the use of reading and spelling CBMs for ELLs in higher education classrooms was effective. Based on both the graphing and quantitative analyses of the results, it can be concluded that the students who received the CBM significantly improved their academic performance as reflected in their higher grades in the university course.

These results provide strong support for the use of CBM in post secondary setting. First, they support the importance of providing specific instruction for administering CBM in a consistent matter so that students are guided to prepare themselves and work efficiently with the CBM reading and spelling probes during the entire semester. What is particularly encouraging about the results of this study was the finding that the students were able to maintain their improvement over time. These results also support the use of the diagnostic or prescriptive approach where the students' specific problems are identified through the results of the weekly CBM probes feedback.

CBM is a useful tool for both general and special educators to evaluate and improve student achievement. Although it is backed by more than 30 years of research and validation, particularly in reading, many teachers still do not use CBM in their classrooms. As it was several decades ago, some teachers may still feel that they would choose not to use CBM due to time constraints (Yell et al., 1992; Wesson et al., 1984). Hopefully, advances in data management through technology applications have the potential to eliminate this concern (for more details see: [www.studentprogress.org](http://www.studentprogress.org)).

The most recent reauthorization of The Individuals with Disabilities Education Act (IDEA, 2004) also requires schools to show that students with disabilities are progressing at the same rate as their typically developing peers to the greatest extent possible. This accountability of academic progress of students with disabilities is relatively new. In this study, the researcher used a trend line to follow up the individual progress for students' with SLD. The overall trajectory of students with SLD in this study indicated a significant improvement in their reading fluency and spelling skills. Despite substantial progress, these students will still require accommodations and interventions to address their reading and spelling difficulties.

Based on the questionnaire that was administered to the students at the end of the study, many factors emerged as being related to student improvement. Motivation to succeed academically was probably the most important factor in student success for the college students in this study. Students with high motivation for academic success showed greater improvement than students who did not care as much about their academic status. The more motivated students followed their CBM progress and were willing to work harder and longer than the less motivated students. Many students stated that "...the weekly progress monitoring kept them highly motivated during the semester."

### **Limitations and Future Implications**

Even though the current research supports the validity of using CBM probes to improve achievement scores for ELLs at the postsecondary level, more evidence is needed.



Many variables, such as exposure to English language media and language spoken in the home and with friends, also need to be investigated as possible contributors to the effectiveness of CBM with ELL students (Englebert-Johnson, 1997; Sandberg & Reschly, 2011). In addition, the amount of time spent in special language services or private schools could affect how useful CBM scores are as predictors of achievement (Betts et al., 2006; Englebert-Johnson, 1997).

Although this is only one study of a convenient sample of college students, the findings do suggest that CBM measures of reading fluency and spelling show promise for increasing the literacy of ELL adults. Further work should be done to develop standardized reading and spelling rate measures and norm it on a large representative ELLs adult population. Ideally, clinical norms could be gathered for ELLs adults with learning disabilities and ADHD as well. Additional research is needed to determine whether students at the postsecondary level can learn to use CBM in different subject matter courses. Second, research is needed that evaluates why some instructors refuse to explore new valid and reliable assessment tool such as CBM in their courses in higher education.

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