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easyCBM® Reading Criterion Related Validity Evidence: Grades 2-5

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Abstract

In this technical report, we present the results of a study to gather criterion-related evidence for Grade 2-5 easyCBM® reading measures. We used correlations to examine the relation between the easyCBM® measures and other published measures with known reliability and validity evidence, including the Gates-MacGinitie Reading Tests and the Dynamic Indicators of Basic Early Literacy Skills (DIBELS). Across grades, the correlation between easyCBM® vocabulary and comprehension-based measures and comparator measures ranged from low to moderate (r_s = .39 - .76), and the correlation between the easyCBM® fluency-based measures and DIBELS ORF was consistently strong (r > .80).

easyCBM® Reading Criterion Related Validity Evidence: Grades 2-5

In this report, we present the results of a criterion validity study examining the relation between easyCBM® reading measures with comparator measures for use with students in Grades 2-5. Using correlation analyses, we examined the relation between easyCBM® Vocabulary, Common Core State Standards reading (CCSS), Multiple Choice Reading Comprehension (MCRC), and the Gates-MacGinitie Reading Comprehension and Vocabulary tests and easyCBM® Passage Reading Fluency (PRF) measures and the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Oral Reading Fluency (ORF) measures.

The easyCBM® Progress Monitoring Assessments

The online easyCBM® progress monitoring assessment system, launched in September 2006 as part of a *Model Demonstration Center on Progress Monitoring* funded by the Office of Special Education Programs (OSEP). At the time this technical report was published, the assessment system was used by over 325,000 educators, representing over 2.3 million students, with accounts from every US state. Over 17.4 million easyCBM® tests have been taken since the system was first made available in the fall of 2006. The system provides both universal screener assessments for fall, winter, and spring administration and multiple alternate forms of a variety of progress monitoring measures designed for use in K-8 school settings.

As part of Response to Intervention (RTI) initiatives, schools need technically-adequate measures for monitoring progress. Given the increasing popularity of the easyCBM® system, it is imperative that a thorough analysis of the measures' technical adequacy be conducted and the results shared with research and practitioner communities. This report addresses that need directly, providing criterion validity evidence supporting the use of the easyCBM® reading assessments.

Methods

Setting and Subjects

Data came from a convenience sample of students from ten schools in an Oregon school district that uses easyCBM® reading measures as part of its Response to Intervention (RTI) model. This study was conducted in January 2013, with the initial duration of the study extended from one month to 1.5 months, due to an unexpected severe flu season, which caused a high absenteeism rate. At the beginning of the study, a total of 1017 students from grade 2 (n=240), grade 3 (n=311), grade 4 (n=247), and grade 5 (n=219) were recruited. As a result of the high absenteeism rate, the final sample consisted of 204 2nd-grade students, 288 3rd-grade students, 184 4th-grade students, and 206 5th-grade students. No demographic information was collected in this study.

Data Collection

In all, 27 teachers participated in this study. Before the study started, the study's project coordinator hand-delivered the paper-pencil version of the testing materials for the study. Teachers received a packet of materials that include the testing materials and administration instructions for the paper-pencil and online measures. When the study was completed, the coordinator picked up the completed materials from the schools. Once data collection was complete, each participating teacher was compensated $150 to be used for classroom supplies for their assistance in the study.

Measures

We first describe the easyCBM® reading measures for grades 2-5, followed by the comparator measures. Additional validity information about the easyCBM® reading assessments can be found in Sáez et al. (2010) and Jamgochian et al. (2010) and reliability information in Lai

et al. (2012a, 2012b), Park et al. (2012a, 2012b), and Alonzo and Tindal (2009). Although all of the easyCBM® reading measures examined in this study (except for the fluency measure) are available as both computer-based and paper-pencil measures, the paper-pencil version of the Progress Monitoring measures were used for the study for logistical reasons.

easyCBM® Reading Measures

Vocabulary measures. The easyCBM® vocabulary measures are designed to be group administered by computer, with automatic recording and scoring of student responses, or group-administered on paper, with student responses later entered into the computer for scoring. The Oregon State Standards provided the basis for item creation during the development of the vocabulary measures. Each question is comprised of a sentence in which the target vocabulary word is bolded, and three possible answers: the correct answer and two incorrect but plausible distracters. There are a total of 12 points possible for the vocabulary measures in grade two and 20 points possible for the vocabulary measures in grades three through five. Students earn one point for every question they answer correctly. Form 10 of each grades' Vocabulary progress monitoring measures was used in this study.

Common Core State Standards reading (CCSS) measures. These group-administered assessments are designed to address the Common Core State Standards for reading in Literature, Informational Text, and Literacy in Science and Technical Subjects (retrieved May 15, 2013 from http://www.corestandards.org/). Students read four texts in the form of stories, short dramas, poetry, and non-fiction prose (text words length increases over grades) and one technical text (e.g. directions, forms, and information displayed in graphs, charts, or maps). Students then answer five multiple choice questions based on the text, for a total of 25 questions across each form of the CCSS reading measure. Each question is comprised of the question stem and three possible answers: the correct answer and two incorrect but plausible distractors. Each

comprehension measure has a total of 25 points possible; students earn one point for every question they answer correctly. Only Form 10 of each grades' CCSS progress monitoring measures was used in this study.

MCRC Reading Comprehension measures. The MCRC reading comprehension measures on easyCBM® are designed for group administration. Students first read an original work of narrative fiction (text words length increases over grades, ranging from approximately 900 words at grade 2 to approximately 1500 words at grades three-five), and then answer a set of multiple choice questions based on the story (12 questions for grade two, 20 questions for grades three through five). Of the questions, seven sample literal comprehension, seven inferential comprehension, and six evaluative comprehension. Each question is comprised of the question stem and three possible answers: the correct answer and two incorrect but plausible distractors. Each MCRC comprehension measure has a total of 12 points possible for grade two and 20 points for grade three through five; students earn one point for every question they answer correctly. Only Form 17 of each grades' MCRC progress monitoring measures was used in this study.

Passage Reading Fluency measures. On the passage reading fluency measure, students are given 60 seconds to read aloud a short narrative passage of approximately 250 words presented to them on a single side of a sheet of paper. Assessors follow along on their own test protocol, marking as errors any words skipped or read incorrectly. If a student pauses more than three seconds on a word, the assessor supplies the word and marks it as incorrect. Self-corrections are counted as correct. The passages used are written to be at middle of the year reading level for each grade. The score, total words read correctly, is calculated by subtracting the number of errors from the total words read. Only Form 17 of each grades' PRF progress monitoring measures was used in this study.

Comparator Measures

Gates-MacGinitie Reading Tests

The Gates-MacGinitie (MacGinitie, MacGinitie, Maria, & Breyer, 2002) is a widely used standardized, norm-referenced reading assessment comprised of a 48-item word knowledge (vocabulary) subtest and a 45-item reading comprehension subtest. This assessment is intended to be group-administered. Students are given 20 minutes to complete the vocabulary test and 25 minutes to complete the comprehension test. The vocabulary subtest assesses idioms, parts of speech, and word meaning while the comprehension subtest includes short passages with 3- 5 questions that are primarily literal in nature. The publisher of this test, Riverside Publishing, provides considerable technical adequacy information. The test developers claim exceptional care in constructing tasks for each grade to measure a progression of vocabulary development. Formats are based on research findings and "on the authors' assessment of their practical usefulness" (MacGinitie et al., 2002, p. 70).

The publishers provide considerable information about field tests and reviews by individuals representing different ethnic groups from across the country to ensure test questions were not biased or contained content that distracted students from performing at their best. Reliability coefficients using Kuder-Richardson Formula 20 (K- R 20) are in the range of .90 for Forms S and T. The two forms are highly inter-correlated with each other (in the range of .80-.85). The publishers provide evidence that the time allotted for taking the test is adequate, with high rates of test completion in both fall and spring. The Fourth Edition of the Gates MacGinitie test provides ranges of item difficulty to reduce the potential for ceiling and floor effects. The online version of the subtests (Form T, Norms winter 2006) were used in this study.

The Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Oral Reading Fluency (ORF)

The DIBELS ORF (6th edition; Good & Kaminski, 2001) are standardized and individually administered 1-minute measures that assess oral reading fluency rates and accuracy. The DIBELS has demonstrated reliability, has been shown to be useful in identifying students who are not progressing as expected, and is predictive of later reading proficiency (Good & Kaminski, 2002). The DIBELS ORF Progress Monitoring Probe #20 was used in this study.

Data Preparation and Analysis

Before data were analyzed, missing scores were coded to several categories: No test, Moved, Missing, Invalid, Refusal, and Absent. To establish criterion validity of the easyCBM® reading measures, we conducted Pearson's and Spearman's rank correlation analyses using the following comparator measures:

Measures	
easyCBM®	Comparator Measures
Vocabulary	Gates-MacGinitie Word Knowledge
*CCSS Reading	Gates-MacGinitie Reading Comprehension
Reading Comprehension	Gates-MacGinitie Reading Comprehension
Passage Reading Fluency	DIBELS Oral Reading Fluency

Note: *CCSS Reading measures for Grades 3-5 only.

Prior to conducting the analyses, we checked assumptions of linearity and normality of distribution, both of which should be met to justify using a Pearson's correlation. These assumptions were not met for the measures in this study, except for the fluency-based measures. Therefore, we used Spearman's rank correlation, a non-parametric statistic, for all measures except for the fluency-based measures, where we used Pearson's correlation. The Pearson's coefficient (r), measures the strength and direction of the linear relation between two measures. The r can range from -1 to +1, with -1 indicating a perfect negative correlation, +1 indicating a perfect positive correlation, and 0 indicating no correlation at all. Similar to the Pearson's

coefficient, the Spearman's correlation coefficient (r_s) also indicates the strength of relation between a pair of measures, but specifically the monotonic relation between paired data. A monotonic function is one that either never increases or never decreases as its independent variable increases. Interpretation of r_s is similar to that of Pearson's correlation coefficient, with the closer r_s is to ±1, the stronger the monotonic relation.

Results

Descriptive statistics are presented in Table 1a-d. Across all grades, 3-11% of data was missing for the easyCBM® and DIBELS data. Within the Grade 2, 4, and 5 samples, only 20-40% of the students were administered the Gates-MacGinitie measures due to technological challenges at schools (e.g., incompatible computer specifications, power outage, etc.) during our weeks of data collection. For Grade 3, missing data was especially high (about 60%). A clear reason for the high rate of missingness in this grade level could not be determined. Tables 2a and 2b list the reasons for each missing case.

Table 1a
Descriptive Statistics – Grade 2

Measures	*n*	Min	Max	*M*	*SD*
easyCBM® Vocabulary	233	1	12	9.84	2.70
easyCBM® MCRC	233	1	12	8.36	2.84
easyCBM® PRF	181	1	94	43.72	26.28
Gates-MacGinitie Word Knowledge	199	1	99	53.49	27.21
Gates-MacGinitie Reading Comprehension	230	10	197	89.57	36.52
DIBELS ORF	229	5	178	82.16	36.72

Table 1b

Descriptive Statistics – Grade 3

Measures	*n*	Min	Max	*M*	*SD*
easyCBM® Vocabulary	292	3	19	15.36	3.20
easyCBM® MCRC	283	0	16	8.33	3.20
easyCBM® CCSS	289	0	25	20.76	4.39
easyCBM® PRF	291	5	230	117.03	38.02
Gates-MacGinitie Word Knowledge	128	1	99	51.64	29.87
Gates-MacGinitie Reading Comprehension	126	2	99	44.12	25.50
DIBELS ORF	290	6	225	98.72	39.24

Table 1c

Descriptive Statistics – Grade 4

Measures	*n*	Min	Max	*M*	*SD*
easyCBM® Vocabulary	239	3	20	16.24	3.48
easyCBM® MCRC	233	2	20	13.17	4.08
easyCBM® CCSS	236	5	25	19.52	4.34
easyCBM® PRF	239	25	243	126.24	40.76
Gates-MacGinitie Word Knowledge	148	1	97	59.90	24.97
Gates-MacGinitie Reading Comprehension	142	1	99	58.78	27.90
DIBELS ORF	236	28	199	98.32	32.02

Table 1d

Descriptive Statistics – Grade 5

Measures	*n*	Min	Max	*M*	*SD*
easyCBM® Vocabulary	202	6	20	16.20	2.70
easyCBM® MCRC	198	2	20	14.37	3.78
easyCBM® CCSS	192	3	25	20.47	4.47
easyCBM® PRF	208	22	290	150.65	48.85
Gates-MacGinitie Word Knowledge	96	1	99	59.16	26.60
Gates-MacGinitie Reading Comprehension	97	1	99	52.59	27.49
DIBELS ORF	208	12	263	136.13	41.11

Table 2a

Frequencies of missing student – Grade 2

Measure	No Test	Moved	Missing	Total	
				n	*%*
easyCBM® Vocabulary	-	1	7	8	3.32
easyCBM® MCRC	7	1	-	8	3.32
easyCBM® PRF	7	-	4	11	4.56
Gates-MacGinitie Word Knowledge	-	-	42	42	17.43
Gates-MacGinitie Reading Comprehension	-	-	60	60	24.90
DIBELS ORF	7	-	5	12	4.98

Note. No Test – Student's completed testing materials were not returned. Moved – Student moved away. Missing – Student's testing materials was blank or missing.

Table 2b

Frequencies of missing student – Grade 3

Measure	No Test	Moved	Invalid	Missing	Refusal	Absent	*Total*	
							n	*%*
easyCBM® Vocabulary	8	5	1	14	-	1	29	9.03
easyCBM® CCSS	8	4	1	17	1	1	32	9.97
easyCBM® MCRC	8	5	1	20	1	3	38	11.84
easyCBM® PRF	8	4	1	16	-	1	30	9.35
Gates-MacGinitie Word Knowledge	-	-	-	193	-	-	193	60.12
Gates-MacGinitie Reading Comprehension	-	-	-	195	-	-	195	60.75
DIBELS ORF	8	4	1	17	-	1	31	9.66

Note. No Test – Student's completed testing materials were not returned. Moved – Student moved away. Invalid – Student was given an incorrect measure. Missing – Student's testing materials was blank or missing. Refusal – Student's teacher or parents did not allow student to participate in study. Absent – Student was absent.

Table 2c

Frequencies of missing student –Grade 4

Measure	No Test	Moved	Invalid	Missing	Refusal	Absent	*Total*	
							n	*%*
easyCBM® Vocabulary	5	4	-	2	-	-	11	3.43
easyCBM® CCSS	5	4	-	5	-	-	14	4.36
easyCBM® MCRC	5	4	-	8	-	-	17	5.30
easyCBM® PRF	4	4		3	-	-	11	3.43
Gates-MacGinitie Word Knowledge	-	-	-	102	-	-	102	31.78
Gates-MacGinitie Reading Comprehension	-	-	-	108	-	-	108	33.64
DIBELS ORF	4	4	-	6	-	-	14	4.36

Note. No Test – Student's completed testing materials were not returned. Moved – Student moved away. Invalid – Student was given an incorrect measure. Missing – Student's testing materials was blank or missing. Refusal – Student's teacher or parents did not allow student to participate in study. Absent – Student was absent.

Table 2d

Frequencies of missing student – Grade 5

Measure	No Test	Moved	Invalid	Missing	Refusal	Absent	*Total*	
							n	*%*
easyCBM® Vocabulary	9	1	1	5	1	-	17	5.30
easyCBM® CCSS	9	1	1	14	1	1	27	8.41
easyCBM® MCRC	9	1	1	8	1	1	21	6.54
easyCBM® PRF	7	1	-	2	1	-	11	3.43
Gates-MacGinitie Word Knowledge	-	-	-	123	-	-	123	38.32
Gates-MacGinitie Reading Comprehension	-	-	-	122	-	-	122	38.01
DIBELS ORF	7	1	-	2	1	-	11	3.43

Note. No Test – Student's completed testing materials were not returned. Moved – Student moved away. Invalid – Student was given an incorrect measure. Missing – Student's testing materials was blank or missing. Refusal – Student's teacher or parents did not allow student to participate in study. Absent – Student was absent.

Overall, the correlations between the easyCBM® vocabulary measures with the Gates-MacGinitie Word Knowledge measures varied across the grades, with r_s ranging from the .30s to .70s. For Grades 3 and 5, the easyCBM® CCSS measures showed low to moderate correlations (r_s = .40s) with the Gates-MacGinitie Reading Comprehension measure, with moderate correlations (r_s = .70s) for Grade 4. Similarly, the correlations between the easyCBM® reading comprehension measures and the Gates-MacGinitie Reading Comprehension measures varied across the grades, with r_s ranging from the .40s to .70s. The easyCBM® passage reading fluency measures showed high correlations with the DIBELS ORF measures across all grades, with r ranging from the .80s to .90s. Tables 3-6 present the correlation results.

Table 3
Correlation Results – Grade 2

Measures		easyCBM® Vocabulary	easyCBM® MCRC	Gates-MacGinitie WK	Gates-MacGinitie RC	DIBELS ORF
easyCBM® Vocabulary	r_s	1	.56**	**.76****	.58**	-
	n	233	233	194	176	-
easyCBM® MCRC	r_s	-	1	.61**	**.66****	-
	n	-	233	194	176	-
Gates-MacGinitie WK	r_s	-	-	1	.68**	-
	n	-	-	199	181	-
Gates-MacGinitie RC	r_s	-	-	-	1	-
	n	-	-	-	181	-
easyCBM® PRF	*r*	-	-	-	-	**.95****
	n	-	-	-	-	229

Note. r_s = Spearman's rho rank correlation coefficient. *r* = Pearson's correlation coefficient. **. Correlation is significant at the 0.01 level (2-tailed). easyCBM®-comparator measure coefficients in bold-red fonts. MCRC = Multiple Choice Reading Comprehension, WK = Word Knowledge, RC = Reading Comprehension, PRF = Passage Reading Fluency.

Table 4
Correlation Results – Grade 3

Measures		easyCBM® Vocabulary	easyCBM® CCSS	easyCBM® MCRC	Gates-MacGinitie WK	Gates-MacGinitie RC	DIBELS ORF
easyCBM® Vocabulary	r_s	1	.49**	.49**	**.39****	.38**	-
	n	292	275	278	121	119	-
easyCBM® CCSS	r_s	-	1	.47**	.44**	**.41****	-
	n	-	283	280	116	114	-
easyCBM® MCRC	r_s	-	-	1	.35**	**.41****	-
	n	-	-	289	118	116	-
Gates-MacGinitie WK	r_s	-	-	-	1	.77**	-
	n	-	-	-	128	126	-
Gates-MacGinitie RC	r_s	-	-	-	-	1	-
	n	-	-	-	-	126	-
easyCBM® PRF	*r*	-	-	-	-	-	**.94****
	n	-	-	-	-	-	290

Note. r_s = Spearman's rho rank correlation coefficient. *r* = Pearson's correlation coefficient. **. Correlation is significant at the 0.01 level (2-tailed). easyCBM®-comparator measure coefficients in bold-red fonts. CCSS = Common Core State Standards, MCRC = Multiple Choice Reading Comprehension, WK = Word Knowledge, RC = Reading Comprehension, PRF = Passage Reading Fluency.

Table 5
Correlation Results – Grade 4

Measures		easyCBM® Vocabulary	easyCBM® CCSS	easyCBM® MCRC	Gates-MacGinitie WK	Gates-MacGinitie RC	DIBELS ORF
easyCBM® Vocabulary	r_s	1	.57**	.64**	**.63****	.58**	-
	n	239	233	235	147	142	-
easyCBM® CCSS	r_s	-	1	.70**	.69**	**.71****	-
	n	-	233	233	146	141	-
easyCBM® MCRC	r_s	-	-	1	.71**	**.70****	-
	n	-	-	236	147	142	-
Gates-MacGinitie WK	r_s	-	-	-	1	.79**	-
	n	-	-	-	148	142	-
Gates-MacGinitie RC	r_s	-	-	-	-	1	-
	n	-	-	-	-	142	-
easyCBM® PRF	*r*	-	-	-	-	-	**.93****
	n	-	-	-	-	-	236

Note. r_s = Spearman's rho rank correlation coefficient. *r* = Pearson's correlation coefficient. **. Correlation is significant at the 0.01 level (2-tailed). easyCBM®-comparator measure coefficients in bold-red fonts. CCSS = Common Core State Standards, MCRC = Multiple Choice Reading Comprehension, WK = Word Knowledge, RC = Reading Comprehension, PRF = Passage Reading Fluency.

Table 6
Correlation Results – Grade 5

Measures		easyCBM® Vocabulary	easyCBM® CCSS	easyCBM® MCRC	Gates-MacGinitie WK	Gates-MacGinitie RC	DIBELS ORF
easyCBM® Vocabulary	r_s	1	.51**	.52**	**.49****	.51**	-
	n	202	197	190	94	95	-
easyCBM® CCSS	r_s	-	1	.47**	.51**	**.58****	-
	n	-	198	188	92	93	-
easyCBM® MCRC	r_s	-	-	1	.53**	.42**	-
	n	-	-	192	91	92	-
Gates-MacGinitie WK	r_s	-	-	-	1	**.73****	-
	n	-	-	-	96	96	-
Gates-MacGinitie RC	r_s	-	-	-	-	1	-
	n	-	-	-	-	97	-
easyCBM® PRF	*r*	-	-	-	-	-	**.88****
	n	-	-	-	-	-	208

Note. r_s *= Spearman's rho rank correlation coefficient. r = Pearson's correlation coefficient. **. Correlation is significant at the 0.01 level (2-tailed). easyCBM®-comparator measure coefficients in bold-red fonts. CCSS = Common Core State Standards, MCRC = Multiple Choice Reading Comprehension, WK = Word Knowledge, RC = Reading Comprehension, PRF = Passage Reading Fluency.*

Discussion

The criterion-validity evidence gathered from this study suggests that the easyCBM® Vocabulary, CCSS and reading comprehension measures had low to moderate correlations with the Gates-MacGinitie Word Knowledge and Reading Comprehension measures across Grades 2-5. The low-moderate correlations between the two vocabulary measures could be due to the differences in assessment targets. The easyCBM® Vocabulary was designed using the Oregon State Standards for vocabulary. The Gates-MacGinitie Word Knowledge test, on the other hand, measures idioms, parts of speech, and word meaning. Similarly, the easyCBM® CCSS was created to address the Common Core State Standards for reading in Literature, Informational Text, and Literacy in Science and Technical Subjects and the easyCBM® MCRC Reading Comprehension measures consist of questions assessing students' literal, inferential, and evaluative comprehension skills. The Gates-MacGinitie reading comprehension measures, on the other hand, assess primarily literal comprehension according to their publisher.

Finally, the easyCBM® passage reading fluency measures was highly correlated with the DIBELS ORF measures across the grades. Overall, results from this study suggest a moderate level of evidence of criterion validity for the easyCBM® measures with the Gates-MacGinitie reading tests and a high level of evidence of criterion validity was found for the easyCBM® PRF measure with the DIBELS ORF.

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