

**The Efficacy of Using State Standards-Based Assessments for Predicting Student Success  
in Community College Classes**

Scores on state standards-based assessments are readily available and may be an appropriate alternative to traditional placement tests for assigning or accepting students into particular courses. Few community colleges require students to provide ACT or SAT scores for admissions; however, typically they do require some kind of placement scores for first year English and math courses. In this study, we exam the efficacy of using the reading and math portions of the Kansas State Assessment (KSA) for predicting the success of high school students taking College Algebra and College English I at a Kansas community college. At this time the community college uses scores from the following to accept students in this program: ACT comprehensive, ACT English, ACT math, ASSET reading, and ASSET elementary algebra. Demonstrating the efficacy of state standardized assessments for specific college program admissions would provide an avenue for significant cost savings on the part of post secondary institutions as well as increase student motivation to perform well on the state standards-based assessment.

**Predictive Validity of State Standards-based Assessments (Achievement Tests)**

In examining the alignment of state tests to college placement exams, reviewers found agreement in the types of skills expected from students across the exams (Le, 2002). Le proposes that, due to the broad nature of their content, state standards-based assessments could be used as alternatives to remedial college placement exams (Le, 2002, xvi). However, Le did not endorse

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the use of end-of-course exams as placement exams because end-of-course exam content is overly specific to the particular course.

**Content Validity.** In a study by Brown and Conley (2007), 60 math and English assessments from 20 states were analyzed for content alignment with college expectations. The researchers found that high school reading assessments, on the whole, corresponded to college-level expectations and that high school math assessments corresponded closely to “certain specific standards” while lacking correspondence to other standards entirely. The authors pointed out that while state assessments may be useful for course placement purposes, the assessments may not provide sufficient breadth of content needed for college admission purposes and cautioned against using state standards assessments for purposes for which the exams were not intended.

**Arizona.** Cimetta, D’Agostino, and Levin (2010) and D’Agostino and Bonner (2009) researched whether the Arizona state standards-based assessment (AIMS) could be used to predict college performance. The authors found that the mathematics and writing scores were significant and positive predictors of first year GPA, but the reading score was not predictive (D’Agostino & Bonner, 2009). Interestingly, the predictive value of the AIMS increased, to the point of matching the predictive value of the SAT, once performance on the AIMS assessment was tied to high school graduation (Cimetta, D’Agostino, & Levin, 2010).

**Washington.** McGhee’s (2003) paper on the predictive validity of the Washington Assessment of Student Learning (WASL) for students enrolled in Washington state universities reported a positive correlation between WASL scores and freshman year GPA. McGhee found that prediction models which included freshman year GPA and each of the standardized assessments (WASL, SAT, and ACT) were comparable in model fit (2003). An exploration of

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the relationship between WASL scores and grades in twelve high enrollment college courses produced significant correlations with WASL math and reading subtests. However, the WASL was not as predictive for courses that are more specifically college-level, such as calculus and chemistry.

### **Descriptive Data**

In this study we conducted an analysis of actual examinee scores and the relationships between the scores and pertinent outcomes. Data analyses were based on 2053 ninth, tenth, and eleventh grade high school students in a community college dual enrollment program during the academic years of 2006-2009. The participants were selected on the basis of availability of their academic records for either or both the College English I and College Algebra courses as well as either or both of their KSA reading and math scores. The courses were taught in high schools by high school instructors approved by the community college using course content and assessments provided by the community college. At this time the community college uses the following assessments as placement tests for this program: ACT comprehensive, ACT English, ACT math, ASSET reading, and ASSET elementary algebra. Table 1 presents the means and standard deviations of reading and math scores for KSA assessments taken between the academic years of 2005-2008. Tables 2 and 3 separate mean assessment scores by criteria for successful completion of the college course for students who completed both the Kansas State Assessment and received a grade in either College English I or College Algebra.

The possible range and observed range of scores for the variables are as follows: out of a possible range of 0-4 for course grades, there was an observed range of 0-4; out of a possible range of 0-100 for KSA reading score, there was an observed range of 40-100; and out of a possible range of 0-100 for KSA math score, there was an observed range of 26-100.

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Table 1  
*Total Group Descriptive Statistics*

	N	M	SD
College English I Grade	2761	3.02	1.15
KSA Reading Score	1777	85.52	7.52
KSA Math Score	1537	72.85	14.78
College Algebra Grade	1538	2.66	1.26
KSA Reading Score	1049	86.45	7.23
KSA Math Score	856	75.74	13.52

*Note.* Not all students participating in the pre-college courses had associated KSA scores.

Of the College English I students (n = 2,761), 1207 (39.5%) received a grade of A, 855 (28.0%) received a grade of B, 422 (13.8%) received a grade of C, 89 (2.9%) received a grade of D, and 189 (6.2%) received a grade of F. Not all students participating in the dual credit program had associated KSA scores.

Table 2  
*Descriptive Statistics for Participants Who Took College English I and Had KSA Reading Scores*

College English I: Satisfactory Completion	N= 1777	Satisfactory	Unsatisfactory
Grade of C or higher	N	1736	41
	Mean KSA Reading Score	85.61	81.74
	SD	7.47	8.63
Grade of B or higher	N	1541	236
	Mean KSA Reading Score	86.20	81.13
	SD	7.11	8.61

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Of the College Algebra students ( $n = 1,542$ ), 491 (31.8%) received a grade of A, 452 (29.3%) received a grade of B, 344 (22.3%) received a grade of C, 97 (6.3%) received a grade of D, and 159 (10.2%) received a grade of F. Not all students participating in the dual credit program had associated KSA scores.

Table 3

*Descriptive Statistics for Participants Who Took College Algebra and Had KSA Math Scores*

College Algebra:		N = 856		Satisfactory	Unsatisfactory
Satisfactory Completion Grade of C or higher	N			807	49
	Mean KSA Math Score			76.52	63.33
	SD			13.20	12.96
Grade of B or higher	N			619	237
	Mean KSA Math Score			79.38	66.31
	SD			11.80	13.21

Data in this study were obtained from a community college in Kansas and from the Center for Educational Testing and Evaluation (CETE) at the University of Kansas. Kansas State Assessment (KSA) scores in reading and math were obtained for students participating in a dual credit program for students earning credit for college while still finishing high school. Student KSA scores were compared with final grades in College English I and College Algebra.

### **Methods and Results**

Two approaches were used to judge the efficacy of KSA scores for placing students into college courses: ordinary least squares regression (with associated correlations) and logistic regression. Analyses were conducted using SAS, version 9.2.

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Regression analysis is a commonly accepted approach for predicting an outcome based upon observed continuous data. In the case of this specific study, regression analysis allows us to estimate to what extent the student's course performance may be related to, or predicted by, KSA test scores. Using regression, a line of best fit is estimated for the data by calculating the path which falls closest to all points in the data set. The resulting equation would illustrate the change in the predictor value and the resulting expected change in the criterion value. In addition, the correlation coefficient describes the strength of the relationship between the two measures.

As an alternative to predicting the specific grade a student will earn, one can define a satisfactory outcome and predict the probability of that outcome. A common statistical approach in such situations is logistic regression.

In this study, we used both linear regression and logistic regression to analyze the relationship between Kansas State Assessment scores and performance in college courses. The linear model was used to quantify how well the combination of predictor variables, Kansas State Assessments in math and reading, explained student performance in College English I and College Algebra. The logistic model provided the calculated probability of a student's successful course performance based upon the predictor scores.

### **Correlations**

The degree of association between the variables was calculated using Person product-moment correlation coefficient for the nine variables: KSA reading score, KSA math score, College English I course grade, College Algebra course grade, ACT comprehensive, ACT English, ACT math, ASSET reading, and ASSET elementary algebra. Course grades for College English I and College Algebra were dichotomized into categories of Satisfactory and Unsatisfactory. For the first analysis, grades A and B were labeled Satisfactory and grades C, D,

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and F as Unsatisfactory. For the second analysis grades A, B, and C were labeled Satisfactory and grades D and F as Unsatisfactory. Students who did not complete the course(s) (n =5) were not included in the analysis.

Table 4  
*Correlations between Test Scores and College English I and College Algebra Grades*

Test Scores	College English I		College Algebra	
	r	n	r	n
ACT English	.27	844	.30 (.20)	511
ASSET Writing	.24	221	.23 (.16)	132
KSA Reading	.31	1779	.30 (.28)	1050
ACT Math	.22	846	.34 (.43)	514
ASSET Algebra	.17	233	.05# (.47)	187
KSA Math	.30	1316	.51 (.51)	857

# NOT significant at the .05 level.

KSA math correlated to KSA reading,  $.52, p < .01$  (N=1529) and College Algebra correlated with College English I,  $.54, p < .01$  (n=1250).

### **Logistic Regression**

In order to calculate the probability of success based upon KSA scores, two logistic regression models were fit, univariate and bivariate. Course grades for College English I and College Algebra were dichotomized into categories of Satisfactory (first analysis, grades A and B; second analysis, grades A, B, and C) and Unsatisfactory (first analysis, grades C, D, and F; second analysis, grades D and F). Students who did not complete the course(s) (n = 5) were not included in the analysis.

### **One Predictor Model**

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**College English I.** Binary logistic regression was used to predict a student earning a grade of C or higher (see Table 5) and a grade of B or higher (see Table 6) in College English I (n = 1,777) based on the student’s KSA reading score. The KSA Reading Score was found to be a significant predictor of successful completion (defined as being in the Satisfactory category) of College English I. From Figure 1, we can see that a student with a KSA reading score of 55 would have a 90% probability of completing College English I with a grade of C or higher and a 51% probability of getting a grade of B or higher.

Table 5  
*Logistic Regression Analysis of the Probability of Student Earning a Grade of C or Higher in College English with KSA Reading Scores*

Predictor	$\beta$	SE $\beta$	Wald’s $\chi^2$	df	p.	$e^\beta$ Odds Ratio
Constant	-1.06	1.44	.55	1	.46	
Reading Score	.06	.02	10.69	1	.001	1.06

*Note.* n = 1777. Dichotomous scores are 1 = Grade of A, B, C; 0 = Grade of D, F.

Table 6  
*Logistic Regression Analysis of the Probability of Student Earning a Grade of B or Higher in College English I with KSA Reading Scores*

Predictor	$\beta$	SE $\beta$	Wald’s $\chi^2$	df	p.	$e^\beta$ Odds Ratio
Constant	-4.89	.73	44.96	1	< .001	
Reading Score	.08	.01	83.96	1	< .001	1.08

*Note.* n= 1777. Dichotomous scores are 1 = Grade of A, B; 0 = Grade of C, D, F.



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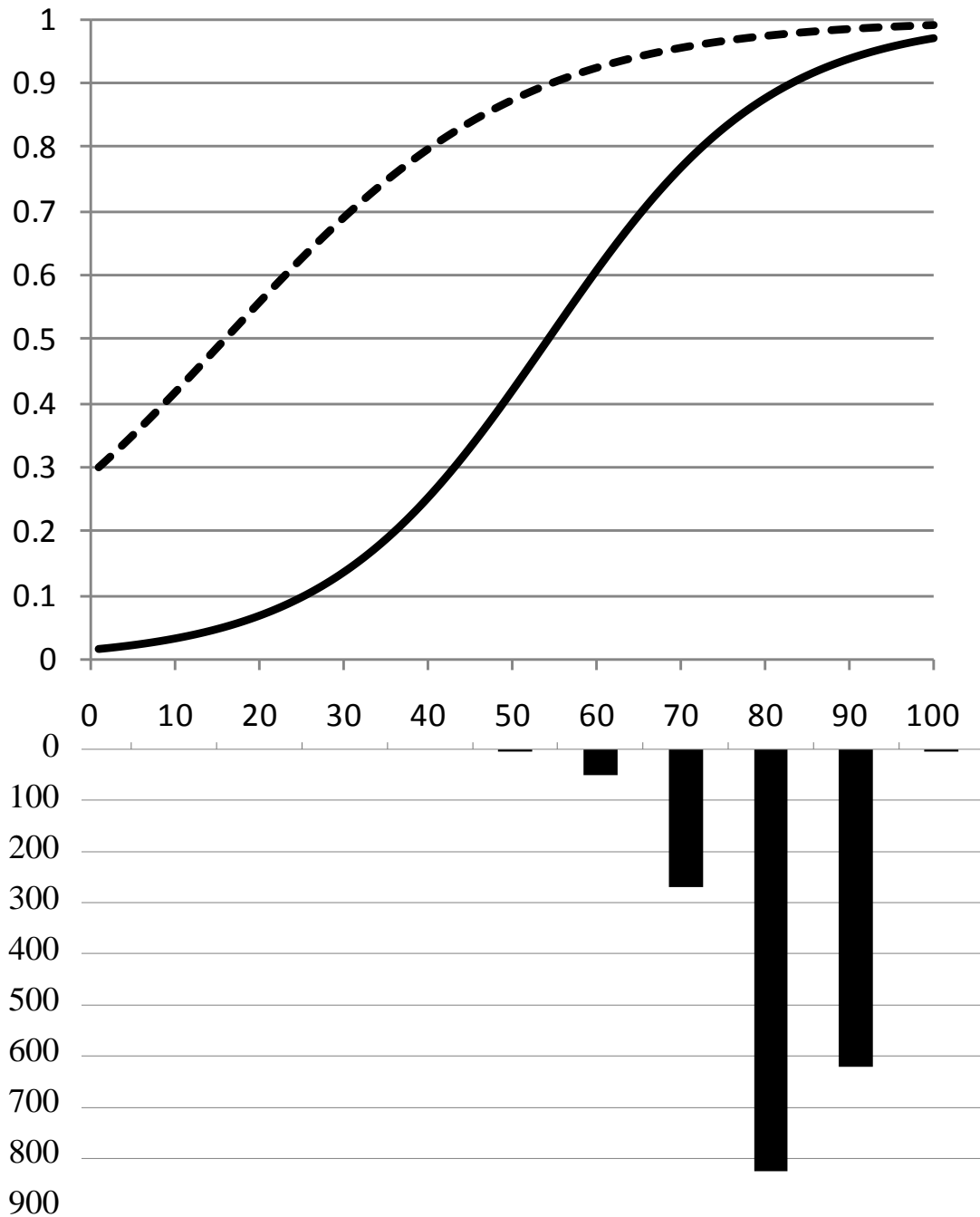


Figure 1. Probability of student successful completion of College English I from Kansas State Assessment reading scores, with the dotted line depicting a satisfactory grade of C and the solid line depicting a satisfactory grade of B. Reverse histogram depicting distribution of observed scores.

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**College Algebra.** A binary logistic regression was used to predict a student earning a grade of C or higher (see Table 7) and a grade of B or higher (see Table 8) in College Algebra (n = 856) based on the student’s KSA math score. The KSA math score was found to be a significant predictor of algebra class performance. From the Figure 2, we can see that a student with a KSA math score of 59 would have a 90% probability of completing College Algebra with a grade of C or higher and a 46% probability of getting a grade of B or higher.

Table 7

*Logistic Regression Analysis of the Probability of Student Earning a Grade of C or Higher in College Algebra with KSA Math Scores*

Predictor	$\beta$	SE $\beta$	Wald’s $\chi^2$	df	p.	$e^\beta$ Odds Ratio
Constant	-1.91	.72	7.01	1	.01	
Math Score	.07	.01	37.82	1	< .001	1.07

*Note.* n= 856. Dichotomous scores are 1 = Grade of A, B, C; 0 = Grade of D, F.

Table 8

*Logistic Regression Analysis of the Probability of Student Earning a Grade of B or Higher in College Algebra with KSA Math Scores*

Predictor	$\beta$	SE $\beta$	Wald’s $\chi^2$	df	p.	$e^\beta$ Odds Ratio
Constant	-4.77	.50	92.83	1	< .001	
Math Score	.08	.01	131.10	1	< .001	1.08

*Note.* n = 856. Dichotomous scores are 1 = Grade of A, B; 0 = Grade of C, D, F.

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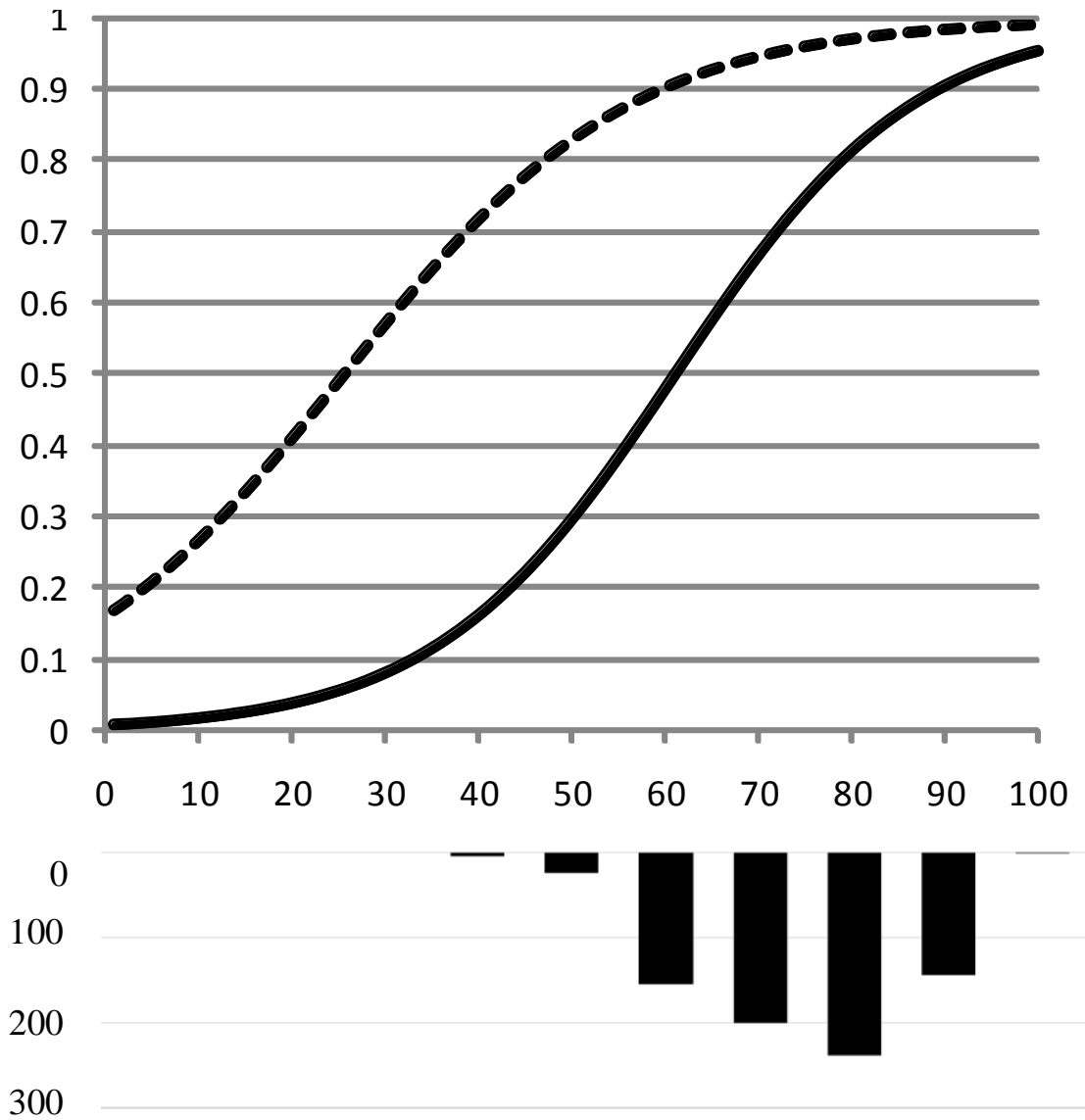


Figure 2. Probability of student successful completion of College Algebra from Kansas State Assessment math scores, with the dotted line depicting a grade of C or higher and the solid line depicting a grade of B or higher. Reverse histogram depicting distribution of observed scores.

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### Two Predictor Model

**College English I.** Table 9 shows that combining KSA reading score and KSA math score improved the prediction of a student earning a grade of B or higher in the English class.

Table 9

*Logistic Regression Analysis of the Probability of Student Earning a Grade of B or Higher in College English I with KSA Reading and Math Scores*

Predictor	$\beta$	SE $\beta$	Wald's $\chi^2$	df	<i>p.</i>	$e^\beta$ Odds Ratio
Constant	-4.20	.86	26.27	1	< .001	
Reading Score	.05	.01	14.98	1	< .001	1.05
Math Score	.03	.01	26.27	1	< .001	1.03

*Note.* n= 1313. Dichotomous scores are 1 = Grade of A, B; 0 = Grade of C, D, F.

Table 10 illustrates the calculated probabilities of a student obtaining a grade of B or higher in College English I based upon both KSA math and KSA reading scores.

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Table 10  
Possible KSA Math and Reading Scores and the Calculated Probability of Obtaining a B or Higher in College English I.  
Probabilities of 0.60, 0.70, 0.80, and 0.90 are shaded.

KSA Reading Score	KSA Math Score																		
	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
10	0.03	0.04	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.12	0.14	0.16	0.18	0.21	0.23	0.26	0.30	0.33	0.37
15	0.04	0.05	0.05	0.06	0.07	0.08	0.10	0.11	0.13	0.15	0.17	0.19	0.22	0.25	0.28	0.31	0.34	0.38	0.42
20	0.05	0.06	0.07	0.08	0.09	0.10	0.12	0.13	0.15	0.18	0.20	0.23	0.26	0.29	0.32	0.36	0.40	0.44	0.48
25	0.06	0.07	0.08	0.09	0.11	0.12	0.14	0.16	0.19	0.21	0.24	0.27	0.30	0.34	0.37	0.41	0.45	0.49	0.53
30	0.07	0.09	0.10	0.11	0.13	0.15	0.17	0.20	0.22	0.25	0.28	0.32	0.35	0.39	0.43	0.47	0.51	0.55	0.59
35	0.09	0.10	0.12	0.14	0.16	0.18	0.21	0.23	0.26	0.30	0.33	0.37	0.41	0.44	0.48	0.52	0.56	0.60	0.64
40	0.11	0.13	0.15	0.17	0.19	0.22	0.25	0.28	0.31	0.35	0.38	0.42	0.46	0.50	0.54	0.58	0.62	0.66	0.69
45	0.14	0.16	0.18	0.20	0.23	0.26	0.29	0.32	0.36	0.40	0.44	0.48	0.52	0.56	0.60	0.63	0.67	0.70	0.74
50	0.16	0.19	0.21	0.24	0.27	0.30	0.34	0.38	0.41	0.45	0.49	0.53	0.57	0.61	0.65	0.68	0.72	0.75	0.78
55	0.20	0.22	0.25	0.28	0.32	0.35	0.39	0.43	0.47	0.51	0.55	0.59	0.63	0.66	0.70	0.73	0.76	0.79	0.81
60	0.24	0.27	0.30	0.33	0.37	0.41	0.45	0.49	0.53	0.57	0.60	0.64	0.68	0.71	0.74	0.77	0.80	0.82	0.85
65	0.28	0.31	0.35	0.38	0.42	0.46	0.50	0.54	0.58	0.62	0.66	0.69	0.72	0.76	0.78	0.81	0.83	0.85	0.87
70	0.33	0.36	0.40	0.44	0.48	0.52	0.56	0.60	0.63	0.67	0.71	0.74	0.77	0.79	0.82	0.84	0.86	0.88	0.90
75	0.38	0.42	0.45	0.49	0.53	0.57	0.61	0.65	0.69	0.72	0.75	0.78	0.80	0.83	0.85	0.87	0.89	0.90	0.92
80	0.43	0.47	0.51	0.55	0.59	0.63	0.66	0.70	0.73	0.76	0.79	0.81	0.84	0.86	0.88	0.89	0.91	0.92	0.93
85	0.49	0.53	0.57	0.61	0.64	0.68	0.71	0.74	0.77	0.80	0.82	0.85	0.87	0.88	0.90	0.91	0.92	0.94	0.94
90	0.54	0.58	0.62	0.66	0.69	0.73	0.76	0.78	0.81	0.83	0.85	0.87	0.89	0.90	0.92	0.93	0.94	0.95	0.95
95	0.60	0.64	0.67	0.71	0.74	0.77	0.80	0.82	0.84	0.86	0.88	0.90	0.91	0.92	0.93	0.94	0.95	0.96	0.96
100	0.65	0.69	0.72	0.75	0.78	0.81	0.83	0.85	0.87	0.89	0.90	0.92	0.93	0.94	0.95	0.95	0.96	0.97	0.97

### **Discussion**

Scores on state standards-based assessments are readily available and may be an appropriate alternative to traditional placement tests for assigning or accepting students into particular courses. Our goal for this study was to examine the accuracy of using state standards-based tests for predicting the course performance of high school students taking first year college courses at a community college. Correlational evidence showed that KSA Reading scores predicted grades in College English I about as well as did ACT English scores (.31 versus .27) and better than ASSET Writing scores (.24). KSA Mathematics scores predicted grades in a College Algebra course better than ACT Mathematics (.51 versus .34) and much better than ASSET Algebra scores (.05).

The logistic regression results provide information that might be easy for policy makers to use in determining eligibility to take these courses. For example, it might be reasonable for policy makers to decide admission to a course requires at least a .7 probability (70%) of attaining a grade of C or better.

### **Caveats**

This study only considered high school students enrolled in college level courses. Results based on non-traditional students who graduated high school and took time off before enrolling in college might be different.

Students in this sample were selected based (in part) on ACT and ASSET scores. As such correlations with those measures are likely reduced by direct restriction of range. Correlations with KSA scores are also affected by restriction of range, but their indirect restriction of range is likely to not have as great an effect on the magnitude of the observed correlation.

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Using an assessment for purposes for which it was not designed often has challenges. Le's (2002) review of secondary and post secondary assessment alignment suggests that the predictive validity of assessments based on high school curriculum has a limited reach into post-secondary content assessment. This is reinforced by McGhee's (2003) findings that WASL was not as predictive for courses that are more specifically college-level, such as calculus and chemistry. Brown and Conley (2007) concluded from their alignment study that high school exams do not cover sufficient content to be appropriate for any but basic classes. The current study suggests that alignment between the content of the Kansas Mathematics Assessment and precursor skills for College Algebra is excellent, but that the similar alignment between the content of the Kansas Reading Assessment and College English I is merely adequate. This is not surprising as success in College English depends on much more than reading skills.

Linking state standards assessments to post-secondary opportunities, such as college or vocational training, helps bridge the gap between secondary and post-secondary expectations for students. An added benefit from linking state assessments with tangible outcomes such as course placement may be an increase in test validity such as the increase reported by Cimetta, D'Agostino, & Levin (2010) in their study of the Arizona standards-based test before and after the test's establishment as a graduation requirement.

Demonstrating the efficacy of state standardized assessments for specific college program admissions provides an avenue for significant cost savings on the part of post secondary institutions as well as increasing student motivation to perform well on the state standards-based assessment.

**References**

- Brown, R. S., & Conley, D. T. (2007). Comparing state high school assessments to standards for success in entry-level university courses. *Educational Assessment, 12*, 137-160.
- Cimetta, A. D., D'Agostino, J. V., & Levin, J. R. (2010). Can high school achievement tests serve to select college students? *Educational Measurement: Issues and Practices, 29*(2), 3-12.
- D'Agostino, J. V., & Bonner, S. M. (2009). High school exit exam scores and university performance. *Educational Assessment, 14*, 25-37.
- Le, V. (2002). *Alignment among secondary and post-secondary assessments in five case study states*. Washington, DC: RAND Corporation.
- McGhee, D. E. (2003). *The relationship between WASL scores and performance in the first year of university*. Seattle, WA: Office of Educational Assessment, University of Washington.