Shining a Light on College Remediation in Colorado:

The Predictive Utility of the ACT for Colorado and the

Colorado Student Assessment Program (CSAP)

Dianne L. Lefly, PhD
Director of Research & Evaluation
Colorado Department of Education

Cheryl D. Lovell, PhD
Chief Academic Officer
Colorado Department of Higher Education

Jo M^{c}F. O'Brien, MA
Assistant Commissioner
Colorado Department of Education

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Abstract

The purpose of this study was to examine postsecondary readiness for 17,499 Colorado students by exploring the congruence between middle school and high school state assessment results (Colorado State Assessment Program) from 2007, ACT results from 2008 and the need for remediation for Colorado students who graduated from high school in the spring of 2009 and entered a Colorado postsecondary institution in fall 2009. By examining the assessment results for these students from as early as the sixth grade, it was clear that if students were not proficient on the state assessment in sixth grade, they were likely to require remediation in their first year of college. If middle school teachers would analyze the state assessment data for this purpose they would be better able to identify which students are very likely be postsecondary ready and which students are not. Also teachers could use the assessment results to target the academic skills of struggling students early in middle school to focus on preparing them to be postsecondary ready. The eighth grade results could be used to gauge how successful the middle and K-8 schools have been in moving students toward Postsecondary and Workforce Readiness (PWR). High schools could use the data from the middle school years to target incoming ninth graders who are not yet proficient on the state assessment. More precise use of state assessment data could focus educators on the ultimate goal of developing postsecondary- and workforce-ready students in all grades, not just those for which graduation is rapidly approaching. (Contains 22 tables, 4 graphs, and 5 appendices)

Background and Introduction

Colorado has a long history of standards-based education and statewide assessments. The original Colorado Model Content Standards in reading, writing, math, science, history and geography were adopted in 1995 by the Colorado State Board of Education. In June 1996, the Colorado State Board of Education adopted standards-based assessments in reading, writing, mathematics and science as well as a timeline for their gradual implementation. The assessment system was called the Colorado Student Assessment Program (CSAP). Colorado school districts were required to adopt the Colorado Model Content Standards by January 1997. In spring 1997, standards-based CSAP assessments in reading and writing were administered statewide only in grade 4. In 1998, reading was also assessed statewide in grade 3. CSAP mathematics assessments were added in grades 5, 8 and 10 in 2001.

As a result of the federal No Child Left Behind law (NCLB), passed in 2001, reading and math assessments became mandatory in grades 3 through 8. However, Colorado chose to assess reading in

grades 3 through 10 and math in grades 5 through 10. In 2005, mathematics assessments were added at grades 3 and 4 so that math was also assessed in grades 3 through 10. The CSAP met the NCLB peer-review approval requirements of NCLB in December 2006. This approval was based on psychometric qualities such as the reliability and validity of the CSAP assessments[1].

The main goal of these assessments was to gauge the progress of children toward achieving proficiency relative to the Colorado Model Content Standards[2]. Beginning in spring semester 2001, the Colorado legislature required that all students in the eleventh grade take "a standardized, curriculum-based, achievement, college-entrance examination selected by the Department of Education." The ACT was chosen by the state and administered for the first time in 2001. The purpose of this assessment was to gauge the postsecondary readiness of Colorado's eleventh-grade students. The ACT for Colorado is given near the end of the eleventh grade while there is still time for identifying potential areas of academic weakness before graduation. Since this is a statewide administration of the ACT, it is referred to as the ACT for Colorado. It is important to know that it is the same ACT administered in exactly the same way as the national ACT college-entrance examination. The ACT for Colorado is accepted as a valid college-entrance test by all colleges and universities across the United States, including the military academies. It has also been endorsed by the National Collegiate Athletic Association (NCAA) as a valid college-entrance test. This approval was important because it allowed student athletes to use the ACT for Colorado when they applied to colleges and universities across the country.

In 2008, the Colorado legislature passed sweeping legislation that required the alignment of the PreK-12[3] system and the higher education system into a combined P-20 system with an ultimate goal of postsecondary and workforce readiness for all Colorado students. Known as the Colorado Achievement Plan for Kids (CAP4K), it called for rethinking education in Colorado. CAP4K put the focus from the very earliest grades on developing postsecondary- and workforce-ready (PWR) high school graduates. The Colorado Department of Education and the Colorado Department of Higher Education jointly developed and adopted a description of *postsecondary and workforce readiness*[4] (PWR) that defines the essential knowledge, skills, and behaviors common to high school graduation, college entry, and workplace success. To achieve postsecondary and workforce readiness, CAP4K mandated redefined

[1] USDOE approval letter is included in Appendix A

[2] The yearly CSAP technical reports are available at the following link: http://www.cde.state.co.us/cdeassess/tech_resources.html

[3] Preschool through Grade 12

[4] The *postsecondary and workforce* readiness description was adopted by the Colorado State Board of Education and the Colorado Commission on Higher Education. It describes the knowledge, skills, and behaviors essential for high school graduates to be prepared to enter college and the workforce and compete in the global economy.

clearer and more rigorous academic achievement standards developed with the goal of PWR for all students. Stakeholders from PreK-12, postsecondary education, business, and the military came together to develop the new academic standards and to recommend the elements of a new assessment system to measure them. In addition, in 2010 the Colorado State Board of Education also adopted the 'Common Core' State Standards recommended by the Council of Chief State School Officers and the National Governor's Association. Colorado is a member of both national assessment consortia: Smarter Balanced Assessment Consortium (SBAC) and Partnership for the Assessment of Readiness for College and Careers (PARCC). The new assessment system as recommended by Colorado stakeholders goes beyond a single end-of-year assessment and incorporates formative and interim assessments. The recommended assessment system is intended to assess mastery of the new standards from kindergarten through high school graduation.

As a part of CAP4K and some earlier legislation, Colorado's PreK-12 and higher education systems were encouraged to share student data. Postsecondary institutions were directed to use the same state-assigned student identifier (SASID) as used in the PreK-12 system as an alternate identifier to their own postsecondary student identifier no later than July 1, 2009 (C.R.S. 23-5-127). This meant that the graduating class of 2009 was the first to have their SASID available for data sharing between PreK-12 and higher education. Prior to this legislation, it was impossible to match postsecondary students with their PreK-12 educational histories including the results from the CSAP or the ACT for Colorado.

Postsecondary Remediation in Colorado

Colleges in Colorado and across the United States face a daunting task each year when new students apply for admission to their institutions. At a minimum, most rely on either the SAT (Scholastic Aptitude Test) or the ACT (ACT, Inc.) in combination with student high school grade-point averages to guide them in their selections. Selecting students who will be successful at the postsecondary level and complete their degree programs is not an exact science. Colleges and universities across the nation report high rates of remediation during the first year of the attendance. It is common in literature to read of remediation rates of 30 percent or more for first-year students. This remediation is expensive both for the postsecondary institutions and for the students who are required to take remedial classes and pay tuition for them. Further, it also elongates their time to a potential successful degree completion.

Eric Bettinger, Case Western Reserve University, and Bridget Terry Long, Harvard School of Education, analyzed the college remediation issue in a 2005 Ohio study titled "Addressing the Needs of

Under-Prepared College Students: Does College Remediation Work?". According to Bettinger and Long (2005), most two- and four-year colleges across the country offer remedial courses in reading, writing, and mathematics. The objective is for students completing these courses to then be prepared to complete standard degree requirements. According to Bettinger and Long (2005), nearly one-third of first-year students in the United States were required to take remedial classes in 2001. However, schools varied widely in their policies for offering and/or requiring remediation. Ongoing debate continues to surrounds the issues of whether these programs are effectively implemented, when and where the courses should be offered, and who should pay the bill.

According to the Bettinger and Long study, all public colleges in Ohio administer remediation placement exams to all incoming freshmen. The institutions are free to select the tests and cut scores used to assess need for remediation. Overall, in fall 1998, the freshman year for study subjects, 36 percent of students in Ohio's public higher education system were placed in remediation for math, or English, or both. These percentages were higher at two-year colleges than at four-year universities. The population of students in remediation covered a broad range of ages, racial backgrounds, and family income levels. At the state level in Ohio, college remediation in math is more common than in English (30 percent vs. 20 percent of students, respectively). According to the Ohio Board of Regents (2002) (cited in Bettinger and Long [2005]), 25percent of students who had completed a core high school curriculum still needed remediation in either math or English. This finding at the intersection between PreK-12 education and higher education highlights a disconnect between the level of preparation attained by many high school students and the academic expectations of universities. The presence of the same disconnect is reported in Colorado.

CCHE reports on Colorado's remediation rates and their cost each year. CCHE *Policy I-E: Statewide Remedial Education Policy*[5] exists "To ensure that each enrolled first-time undergraduate enrolled at one of its institutions is assessed in mathematics, writing, and reading prior to enrolling in the second semester of their college career." Section 2.02.01 states that "If the student has completed one of the following within the past five years, no additional assessment is required:

- scored a 19 or higher mathematics subscore, an 18 or higher writing (English) subscore, and a 17 or higher reading subscore on the ACT Assessment Test; or

[5] **http://highered.colorado.gov/Publications/Policies/Current/i-parte.pdf**

- scored 430 or higher on the SAT Verbal (English) for reading, 440 or higher on the SAT Verbal (English) for writing, and 460 or higher on the SAT mathematics; or

- scored 85 or higher on the Accuplacer Elementary Algebra test, 95 or higher on the Accuplacer Sentence Skills test, 80 or higher on the Accuplacer Reading Comprehension test; or

- met one of the following criteria for exemption from assessment. In addition to those listed in section 3.04.02, exemptions include students who:
  a) have successfully completed a college-level mathematics and college-level writing course; or
  b) have successfully completed necessary remedial course(s), if required, in mathematics, writing, and reading.

  Note: Successfully completed refers to a student who earns a grade of C- or higher or a Satisfactory completion.

While the CCHE remediation report for fiscal year 2010 is now available,[6] this paper focuses on the CCHE remediation report for fiscal year 2009 because the student data under analysis in this report were for 2009 Colorado high school graduates who entered college in the fall of 2009. The CCHE 2009 remediation report states that 29.3 percent of students enrolling in a postsecondary institution for the first time required remediation in basic content areas of reading, writing or mathematics. Some students required remediation in more than one basic content area. Students attending two-year institutions needed considerably more remediation (52.7 percent) than did students attending four-year institutions (19.9percent). These results are very similar to those reported by Bettinger and Long (2005) in Ohio and very likely similar to those of many other states. The cost to Colorado postsecondary institutions for the 2009 remediation was more than $13 million dollars. It is important to note that the than $13 million dollars in remediation costs to postsecondary institutions does not reflect the cost to students who must take remedial courses and pay for them. It is estimated that if the costs to students were included, the total cost of remediation in Colorado would more than double the reported amount. Reducing the amount of required remediation and the subsequent costs is a goal of educators in both Colorado's PreK-12 system and Colorado's postsecondary institutions.

[6] http://highered.colorado.gov/Publications/Reports/Remedial/FY2010/2010_Remedial_relfeb11.pdf

Method

This paper reports on the results of analyses based on data shared between the Colorado Department of Education and the Colorado Department of Higher Education for Colorado students who graduated from high school in spring 2009 and entered a Colorado postsecondary institution in fall 2009. This group of students was the first to have their state-assigned student identifier (SASID) in their state record for both high school and college. As a part of the required CCHE yearly remediation report for 2009, data were gathered about how many of the 22,657 students who graduated from Colorado high schools in 2009 and enrolled in Colorado postsecondary institutions required remediation.

The original research question for this paper was to report on the degree of congruence between high school state assessment results and the need for remediation for Colorado students who graduated from high school in the spring of 2009 and entered a Colorado postsecondary institution in the fall of 2009. The purpose and focus of the paper evolved as the data analyses revealed a dramatic degree of congruence between earlier state assessment results and the need for remediation in the first year of college. Colorado educators have never been in a position until now to examine how well the CSAP results are predictive of college remediation needs. The first data revealing postsecondary remediation needs for each student became available in November, 2010.

The Sample: Colorado High School Graduating Class of 2009

In 2009, 50,174 students graduated from Colorado high schools. A total of 27,517 (54.8 percent) students did not enroll in Colorado's postsecondary system, with 22,657 students (45.2 percent) appearing in Colorado postsecondary enrollment files. The SASID made it possible to identify the students' 2007 tenth-grade CSAP and eleventh-grade ACT scores. Of the 22,657 graduates who entered Colorado colleges, CDE had records of the CSAP and ACT scores for 20,868 of these students. Remediation information from CDHE and assessment data from CDE were available for 17,499 students. The remaining 3,369 students who were enrolled in postsecondary institutions had no remediation data available. Table 1 presents the postsecondary and remediation breakdown of these students.

By law, the goal of Colorado's P-20 system is postsecondary and workforce readiness or PWR. The PWR definition adopted in 2009 by the Colorado Commission on Higher Education and the Colorado State Board of Education is "the description of the knowledge, skills, and behaviors essential for high school graduates to be prepared to enter college and the workforce and compete in the global

economy." An underlying assumption is that all graduates of Colorado high schools will be able to complete their first semester of postsecondary education without remediation. If the state education system is to make sure all students are postsecondary ready, it is important to understand what successful and 'unsuccessful' postsecondary readiness looks like as students move through the educational system. The analyses below may help educators and others recognize students who are "postsecondary ready" and those who are not.

Table 1
Colorado Graduates, Postsecondary Attendance and Remediation

		Remediation Status			
Postsecondary Type	Total	Pending Review	Remediation	No Remediation	Remediation Unknown
Not In Colorado Postsecondary Institution	27517	NA	NA	NA	NA
2-Year	7125	346	1710	2882	2187
4-Year	15532	661	836	12494	1541
Total	50174	1007	2546	15376	3728

Colorado has an advantage over many other states because all Colorado eleventh grade students must take the ACT (legally identified as the ACT for Colorado). The Colorado sample is a population sample rather than a college-bound sample. This means that all eleventh-grade students in Colorado, regardless of whether they intend to enter college or not, are tested with a college entrance examination. Consequently, the average scores on the ACT for Colorado will tend to be somewhat lower than the national averages, which are based on a sample of college-bound students.

The 2009 Colorado graduating class took the Colorado state assessment (CSAP) for the final time in 2007 and the ACT for Colorado in 2008. As this report will reveal, the CSAP and the ACT are substantially related to one another. The degree of relationship is measured by the correlation between the two tests. The initial correlational analysis between the CSAP and the ACT was established using the 2003 grade 10 CSAP and the grade 11 2004 ACT results. The correlation coefficients reported in Table 2 were statistically significant and moderately high for all content areas.

Table 2
Correlations between 2003 10th Grade CSAP and 2004 ACT for matched students

CSAP 2007 Subject	ACT 2008 Subject	Correlation	Number of Students
Reading	Reading	*r* = .69	N=40,773
Reading	English	*r* = .74	N=40,773
Math	Math	*r* = .82	N=40,773
	ACT Reading—ACT English	*r* = .80	N=40,773

Analysis was performed on more recent administrations of these assessments in order to validate these results. The correlations reported in Table 3 again reveal a strong positive relationship between results on these two different assessments. The high correlations between CSAP Reading and ACT Reading (*r* = .73), between CSAP Reading and ACT English (*r* = .77), and between CSAP Math and ACT Math (*r* = .82) indicate that this positive relationship exists in all three content areas measured by these two assessments.

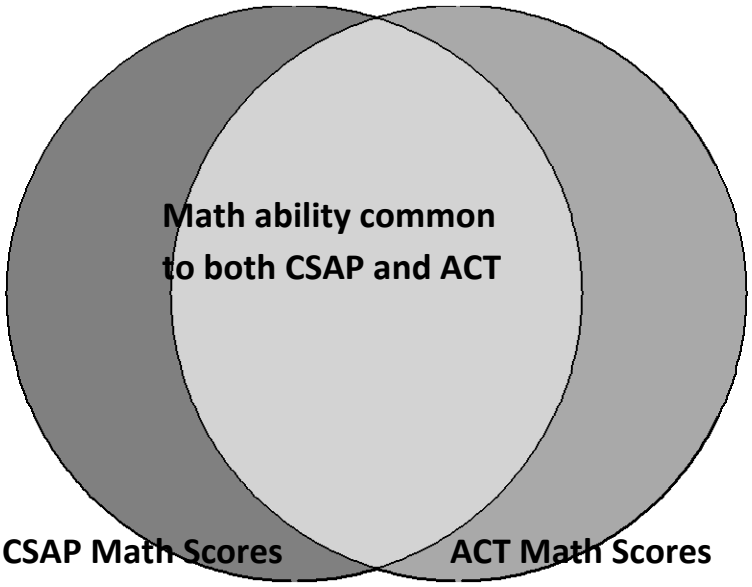
Table 3
Correlations between 2007 10th Grade CSAP and 2008 ACT for matched students

CSAP 2007 Subject	ACT 2008 Subject	Correlation	R^2	Number of Students
Reading	Reading	*r* = .73	.53	N=45,233
Reading	English	*r* = .77	.60	N=45,233
Math	Math	*r* = .83	.68	N=45,358
	ACT Reading—ACT English	*r* = .82	.67	N=45,358

The output of this analysis can also be expressed in a more detailed way, giving us a picture of the amount of shared variance between the two assessments within each content area. Table 3 also shows the adjusted R^2 [7] values associated with the relationships between these assessment content areas. The data show that CSAP Reading and ACT Reading (R^2 = .53), CSAP Reading and ACT English (R^2 = .60), and CSAP Math and ACT Math (R^2 = .68) all have large amounts of shared variance. This relationship for the Math content area is portrayed in Figure 1 as an example.

[7] **Coefficient of Determination**

Figure 1. Shared Variance between Csap Math Scores and Act Math Scores



Although the overlap between test results for matched students is not a perfect one, we would not expect it to be – an entire academic year separates these results in time, along with all the experiences that go along with being an 11th-grader in Colorado. Shared variance between CSAP Reading and the two ACT subtests of Reading and English is somewhat lower than that of Math. This is likely due to the separation of the Reading content into two different areas on the ACT. Indeed, the shared variance between the ACT Reading and English tests is .67, suggesting that although there is a great amount of overlap between the two subtests, there is also quite a bit of difference. Overall, however, on the basis of these analyses, CSAP scores are very good predictors of subsequent ACT scores in all three content areas.

ACT has developed benchmarks for college success based on their large database of college-bound students. The national ACT college-ready benchmark for reading is 21, and for math it is 22. The ACT benchmarks can be used as informational guidelines about which students are likely to be successful in college, and which are likely to have more difficulty. The national ACT college benchmarks are higher than the Colorado-specific benchmarks[8], but when students get to college, whether in Colorado or elsewhere, they will be enrolled with students from around the nation, so comparing their scores against the ACT benchmarks probably gives a fair approximation of their

[8] For Colorado specific information, see Appendix B.

likelihood of success. Students with scores below the national ACT benchmarks are considered "Not ACT College Ready" while those with scores meeting or exceed these benchmarks are considered "ACT College Ready." For an explanation of what ACT College Ready means for each content area, see Appendix D.

A retrospective examination of the ACT benchmarks from 2008 for the graduating class of 2009 allows the examination of college readiness for students who have already enrolled in college and whose remediation needs are already known. An examination of the ACT data will provide useful information both to the public schools from which they graduated and to the colleges in which they enrolled. Table 4 displays the demographic information for the 17,499 students with available remediation and assessment data. These are the graduates whose CSAP and ACT for Colorado results will be examined in the analyses that follow.

Table 4
Demographic Data for Graduates Assessed for Reading Remediation

Subgroup	2-Year Institutions	4-Year Institutions	Total
Total Students	4,208	13,291	17,499
Gender			
Male	2,128	6,251	8,379
Female	2,080	7,040	9,120
Race/Ethnicity			
Native American	34	79	113
Asian/Pacific Islanders	126	662	788
Black	293	496	789
Hispanic	869	1418	2287
White	2835	10,500	13,335
Not Identified by Race/Ethnicity	51	136	187

Table 5 contains the ACT college readiness results in reading for students who enrolled at Colorado two-year and four-year postsecondary institutions who graduated from Colorado high schools in 2009. As demonstrated by these data, about two-thirds of enrollees at 2-year institutions do not appear to be college-ready, based on the ACT benchmarks. Conversely, about two-thirds of those who attend 4-year institutions scored in the college-ready range, while fully one-third did not.

Table 5
ACT Reading College Readiness Indicator Colorado Graduates 2009 Enrolled in Colorado Postsecondary Institutions

Postsecondary	ACT Reading College Readiness	Total	% of Graduate Enrollees
2-Year Institution	Not College Ready	2,811	66.80%
	College Ready	1,397	33.20%
	Total	4,208	
4-Year Institution	Not College Ready	4,131	31.10%
	College Ready	9,160	68.90%
	Total	13,291	

Table 6 contains the ACT college-readiness results in math for students who enrolled at Colorado two-year and four-year postsecondary institutions that graduated from Colorado high schools in 2009. There were a total of 4,211 students from this graduating class that entered two-year postsecondary institutions. Of these students 3,323 (78.9 percent) did not score at or above the ACT college benchmarks in ACT mathematics while 21.1 percent met the ACT criterion. There were a total of 13,289 Colorado graduates who entered four-year postsecondary institutions. Over 5,200 [5,233 - 39.4 percent)] of these students did not score at or above the ACT College Readiness Criterion while 8,056 (60.6 percent) met the ACT criterion. These data clearly show that there are a large number of high school graduates successfully enrolling in both two-and four-year colleges who are probably not college-ready on the basis of their ACT scores.

Table 6
ACT Math College Readiness Indicators for Colorado Graduates 2009 Enrolled in Colorado Postsecondary Institutions

Postsecondary	ACT College Math Readiness	Total	Percent of Graduate Enrollees
2-Year Institutions	Not College Ready	3323	78.90%
	College Ready	888	21.10%
	Total	4211	
4-Year Institutions	Not College Ready	5233	39.40%
	College Ready	8056	60.60%
	Total	13289	

Table 7 presents a more detailed picture of this situation, with the percent of enrolled Colorado graduates needing reading remediation and their ACT Reading 'College Ready' and 'Not College' Ready status. It is clear that the ACT College readiness indicator is not completely accurate when compared with actual need for remediation, as determined by college placement assessments. There are students not meeting the ACT criterion who subsequently were not identified as in need of remediation. For example, 1,301 (46.3 percent) students at two-year institutions and 3,270 (79.2 percent) students at four year institutions were identified as "Not ACT College ready," but these students did not in fact require remediation. However, when a student was identified by the benchmark as being "college ready" in reading, approximately 90 percent were correctly classified in that they did not require remediation. The basis for the over-referrals by for remediation by the national ACT benchmark might be because it is based on a national sample of college-bound students rather than the Colorado population sample.

Table 7
ACT Reading College Readiness and Remediation Status Enrolled Colorado Graduates 2009

		Reading Remediation					
Postsecondary	ACT College Readiness	Pending Review	Remediation	No Remediation	Total	% Remediation	% No Remediation
2-Year Institution	Not College Ready	175	1335	1301	2811	47.50%	46.30%
	College Ready	106	40	1251	1397	2.90%	89.50%
4-Year Institution	Not College Ready	118	743	3270	4131	18.00%	79.20%
	College Ready	504	14	8642	9160	0.20%	94.30%

Table 8 presents the percent of enrolled Colorado graduates requiring math remediation and their ACT math 'College Ready' status. Again, many students who did not score above the ACT College Ready benchmark did not need remediation in math, particularly at four-year institutions. For example, 3,256 (62.2 percent) students at four-year institutions did not score at or above the 'college ready' benchmark, but did not need remediation. However, when students were identified as 'college ready' in math, over 90 percent were correctly classified.

Table 8
ACT Math College Readiness Indicator for Two-Year and Four-Year Institutions and Percentage Requiring Remediation--Fall 2009

		Math Remediation					
Postsecondary	ACT College Math Readiness	Pending Review	Remediation	No Remediation	Total	% Remediation	% No Remediation
2-Year Institution	Not College Ready	357	2128	838	3323	64.0%	25.2%
	College Ready	60	14	814	888	1.6%	91.7%
4-Year Institution	Not College Ready	93	1884	3256	5233	36.0%	62.2%
	College Ready	520	15	7521	8056	0.2%	93.4%

It is clear from examining Tables 5 through 8 that four-year institutions have higher admission requirements than the two-year institutions. This is consistent with the findings of the Bettinger and Long (2005) study. As one might expect, students who were admitted to either two-year or four-year institutions and did not score at or above the ACT College readiness benchmark had a much higher chance of requiring remediation. However, there were also a number of students who did not score above the ACT College readiness benchmark who required no remediation. Given the costs of remediation to postsecondary institutions, it appears that it might be helpful to them to have additional valid and reliable high school assessment data beyond the ACT to provide more information as to which students might need remediation and who might not.

Colorado high school students currently take the Colorado State Assessment (CSAP) for the final time in tenth grade. Table 9 provides the remediation details for students based on their achievement levels on the CSAP reading assessment. The CSAP provides four proficiency categories that might be useful in identifying students in need of remediation. The Unsatisfactory and Partially Proficient categories from the CSAP tenth grade reading assessment correctly identify the majority of students at two-year institutions who are in need of remediation. These categories are less successful at identifying students later requiring remediation in four-year institutions. The Proficient and Advanced categories have a high degree of correct classifications of students who do not require remediation at both levels though at the four-year institutions the classification rate is clearly better.

Table 9
Tenth Grade CSAP Reading Proficiency Levels for Students at Two-Year and Four-Year Institutions and Percentage Requiring Remediation--Fall 2009

		Reading Remediation					
Postsecondary	10th Grade CSAP Proficiency	Pending Review	Remediation	No Remediation	Total	% Remediation	% No Remediation
2-Year Institutions	Unsatisfactory	17	171	35	223	76.7%	15.7%
	Partially Proficient	52	598	260	910	65.7%	28.6%
	Proficient	194	559	2,076	2,829	19.8%	73.4%
	Advanced	9	0	113	122	0.0%	92.6%
	No Score	5	29	39	73	39.7%	53.4%

		Reading Remediation					
4-Year Institutions	Unsatisfactory	3	26	33	62	41.9%	53.2%
	Partially Proficient	20	242	426	688	35.2%	61.9%
	Proficient	384	466	9,133	9,983	4.7%	91.5%
	Advanced	205	1	2,107	2,313	0.0%	91.1%
	No Score	7	4	98	109	3.7%	89.9%

Table 10 provides the remediation details for the CSAP math assessment. The Unsatisfactory category from the CSAP tenth grade mathematics assessment correctly identifies the majority of students at two-year and four-year institutions who are in need of remediation. The Partially Proficient category is again less diagnostic as previously observed to be the case for the reading data. The Proficient and Advanced categories have a high degree of correct classification at both levels, though at the four-year institutions the classification rate is clearly better. Colorado educators have never been in a position until now to examine how well the CSAP results are predictive of college remediation needs. For an explanation CSAP proficiency in each content area, see Appendix E.

Table 10
Tenth Grade CSAP Math Proficiency Levels for Students at Two-Year and Four-Year Institutions and Percentage Requiring Remediation--Fall 2009

		Math Remediation					
Postsecondary	CSAP Math Proficiency 2007	Pending Review	Remediation	No Remediation	Total	% Remediation	% No Remediation
2-Year Institutions	Unsatisfactory	205	1159	116	1,480	78.3%	7.8%
	Partially Proficient	140	865	790	1,795	48.2%	44.0%
	Proficient	48	55	657	760	7.2%	86.4%
	Advanced	11	0	49	60	0.0%	81.7%
	No Score	10	31	23	64	48.4%	35.9%
4-Year Institutions	Unsatisfactory	36	706	327	1069	66.0%	30.6%
	Partially Proficient	70	1063	3329	4462	23.8%	74.6%
	Proficient	321	81	5829	6231	1.3%	93.5%
	Advanced	177	3	1091	1271	0.2%	85.8%
	No Score	6	16	98	120	13.3%	81.7%

It would appear that that the accuracy of correct remediation placement for either CSAP or ACT by itself is insufficient for a highly accurate correct classification rate. However, the combination of the two assessments may offer more accuracy in identifying those students who need remediation and those who do not. Multiple sources of data generally yield better prediction than any single one. When the

ACT college-ready benchmark is combined with the CSAP proficiency-level data, high schools have a better idea of the remediation needs of their students before graduation. Postsecondary institutions also have a clearer picture of the remediation needs of the students they are considering for enrollment.

Table 11
ACT for Colorado 2008 Reading College Ready Benchmark and 2007 Tenth Grade Reading CSAP Proficiency Category and Percentage Requiring Remediation--Fall 2009

			Reading Remediation					
Postsecondary	ACT College Ready	10th Grade CSAP Proficiency	Pending Review	Remediation	No Remediation	Total	% Remediation	% No Remediation
2-Year Institutions	Not ACT College Ready	*Unsatisfactory*	17	171	28	216	79.2%	13.0%
		Partially Proficient	46	594	220	860	69.1%	25.6%
		Proficient	106	526	1014	1646	32.0%	61.6%
		Advanced	1	0	5	6	0.0%	83.3%
		No Score	4	28	20	52	53.8%	38.5%
	ACT College Ready	*Unsatisfactory*	0	0	7	7	0.0%	100.0%
		Partially Proficient	6	4	40	50	8.0%	80.0%
		Proficient	88	33	1062	1183	2.8%	89.8%
		Advanced	8	0	108	116	0.0%	93.1%
		No Score	1	1	19	21	4.8%	90.5%
4-Year Institutions	Not ACT College Ready	*Unsatisfactory*	3	26	22	51	51.0%	43.1%
		Partially Proficient	19	242	337	598	40.5%	56.4%
		Proficient	89	453	2792	3334	13.6%	83.7%
		Advanced	1	0	52	53	0.0%	98.1%
		No Score	4	4	32	40	10.0%	80.0%
	ACT College Ready	*Unsatisfactory*	0	0	11	11	0.0%	100.0%
		Partially Proficient	1	0	89	90	0.0%	98.9%
		Proficient	295	13	6341	6649	0.2%	95.4%
		Advanced	204	1	2055	2260	0.0%	90.9%
		No Score	3	0	66	69	0.0%	95.7%

Tables 11 and 12 present the ACT for Colorado College Ready information and include the tenth grade CSAP proficiency levels for reading and math. The combined results appear to do a better job of predicting which students will require remediation. Using these data provides a more accurate estimate

of the basic skills of high school students prior to graduation. Because the goal of Colorado high schools is to graduate postsecondary- and workforce-ready students, this information could be used to target potential remediation needs for these students in their senior year. Such intervention would be beneficial to students regardless of whether they entered postsecondary institutions, the military, or the workforce after high school.

Table 12

ACT for Colorado 2008 Math College Ready Benchmark and 2007 Tenth Grade Math CSAP Proficiency Category and Percentage Requiring Remediation--Fall 2009

			Math Placement					
Postsecondary	ACT College Ready	10th Grade CSAP Proficiency	Pending Review	Remediation	No Remediation	Total	% Remediation	% No Remediation
2-Year Institutions	Not ACT College Ready	*Unsatisfactory*	203	1159	109	1471	78.8%	7.4%
		Partially Proficient	130	859	564	1553	55.3%	36.3%
		Proficient	12	47	145	204	23.0%	71.1%
		Advanced	0	0	0	0	0.0%	0.0%
		No Score	9	31	12	52	59.6%	23.1%
	ACT College Ready	*Unsatisfactory*	2	0	7	9	0.0%	77.8%
		Partially Proficient	10	6	226	242	2.5%	93.4%
		Proficient	36	8	512	556	1.4%	92.1%
		Advanced	11	0	49	60	0.0%	81.7%
		No Score	1	0	11	12	0.0%	91.7%
4-Year Institutions	Not ACT College Ready	*Unsatisfactory*	34	706	305	1045	67.6%	29.2%
		Partially Proficient	45	1061	2126	3232	32.8%	65.8%
		Proficient	11	71	744	826	8.6%	90.1%
		Advanced	0	0	2	2	0.0%	100.0%
		No Score	1	16	42	59	27.1%	71.2%
	ACT College Ready	*Unsatisfactory*	2	0	22	24	0.0%	91.7%
		Partially Proficient	25	2	1203	1230	0.2%	97.8%
		Proficient	310	10	5085	5405	0.2%	94.1%
		Advanced	177	3	1089	1269	0.2%	85.8%
		No Score	5	0	56	61	0.0%	91.8%

The CSAP results clearly help identify which students are most likely to need remediation at either two-year or four-year institutions. If students did not perform at the proficient or advanced levels on the tenth grade CSAP, they are highly likely to need remediation at the postsecondary level. However, if a student is identified by the ACT for Colorado as College Ready, the need for remediation is very low regardless of content area.

Predicting College Remediation From Previous Years' CSAP Results

In 2001 and 2002 the CSAP was revised and vertically scaled to provide comparable scores for students from one grade to another. The current vertically-scaled CSAP assessment system has been in place since 2003. Colorado has had a system of unique student identifiers since 2002. The unique student identifier now follows students from high school to college and it is possible to study student results back to earlier CSAP results. Tables 12 and 13 provide a historical review of CSAP reading and math data for the 2009 graduating class attending a Colorado postsecondary institution in the fall of 2009. These students were in sixth grade when they took the vertically-scaled CSAP for the first time in 2003. In 2005, these students were in eighth grade when they took that year's CSAP. These results are reported in Tables 13 and 14.

Table 13 shows more than two-thirds (66.3 percent) of the students who needed college reading remediation in two-year postsecondary institutions had CSAP results demonstrating they were below proficient in reading in both sixth and eighth grades. Nearly half (47.8 percent) of the students who required reading remediation at four-year institutions were below proficient on CSAP reading in both sixth and eighth grades. The data also show that 85.3 percent of students who required no remediation and attended two-year postsecondary institutions were already proficient or above on the sixth grade reading CSAP. Of the students who attended four-year institutions and required no remediation, 93 percent were proficient or above on both sixth and eighth grade CSAP reading. In other words, proficiency on the CSAP reading assessment early in students' academic careers is highly predictive of later success.

Table 13
Sixth and Eighth Grade CSAP Reading Results and College Remediation Status

Postsecondary Institution	2009 College Remediation Status	Sixth Grade Reading Below Proficient 2003		Sixth Grade Reading Proficient & Above 2003		Total
		Count	Row N %	Count	Row N %	Count
2-Year Institution	Pending Review	72	28.8%	178	71.2%	250
	Remediation	795	66.3%	404	33.7%	1199
	No Remediation	330	14.7%	1913	85.3%	2243
	Total	1197	32.4%	2495	67.6%	3692
4-Year Institution	Pending Review	39	7.3%	497	92.7%	536
	Remediation	311	47.8%	339	52.2%	650
	No Remediation	655	6.3%	9776	93.7%	10431
	Total	1005	8.7%	10612	91.3%	11617
Postsecondary Institution	2009 College Remediation Status	Eighth Grade Reading Below Proficient 2005		Eighth Grade Reading Proficient & Above 2005		Total
		Count	Row N %	Count	Row N %	Count
2-Year Institution	Pending Review	79	29.4%	190	70.6%	269
	Remediation	887	69.5%	390	30.5%	1277
	No Remediation	437	18.5%	1926	81.5%	2363
	Total	1403	35.9%	2506	64.1%	3909
4-Year Institution	Pending Review	33	5.8%	540	94.2%	573
	Remediation	346	49.6%	352	50.4%	698
	No Remediation	698	6.4%	10285	93.6%	10983
	Total	1077	8.8%	11177	91.2%	12254

Table 14 reveals that more than 75 percent of the students who attended either two-year or four-year postsecondary institutions and who needed college-level math remediation had CSAP math results that were below proficient in both sixth and eighth grades. Table 13 also reveals that large percentages of students who required no remediation in their first year of college were proficient or above on the sixth and eighth-grade CSAP math assessment.

Not surprisingly, most students below proficient on the CSAP in middle school were not on track to be ready for postsecondary education after high school. The results show that students who were proficient or above on the CSAP were ready for postsecondary education in either content area. This is powerful information for teachers of students in the middle grades, and It provides educators a wide

window within which to focus on all students to prepare them for postsecondary and workforce readiness.

Table 14
Sixth and Eighth Grade CSAP Mathematics Results and College Remediation Status

Postsecondary	College Remediation Status	Sixth-Grade CSAP Mathematics Below Proficient 2003		Sixth-Grade CSAP Mathematics Proficient & Above 2003		Total
2-Year Institution	Pending Review	238	65.0%	128	35.0%	366
	Remediation	1415	74.9%	474	25.1%	1889
	No Remediation	364	25.3%	1075	74.7%	1439
	Total	2017	54.6%	1677	45.4%	3694
4-Year Institution	Pending Review	64	12.1%	463	87.9%	527
	Remediation	1075	63.6%	614	36.4%	1689
	No Remediation	1224	13.0%	8177	87.0%	9401
	Total	2363	20.3%	9254	79.7%	11617
Postsecondary	College Remediation Status	Eighth-Grade CSAP Mathematics Below Proficient 2005		Eighth-Grade CSAP Mathematics Proficient & Above 2005		Total
2-Year Institution	Pending Review	288	72.9%	107	27.1%	395
	Remediation	1656	83.5%	328	16.5%	1984
	No Remediation	493	32.7%	1013	67.3%	1506
	Total	2437	62.7%	1448	37.3%	3885
4-Year Institution	Pending Review	67	11.9%	496	88.1%	563
	Remediation	1372	77.7%	393	22.3%	1765
	No Remediation	1604	16.3%	8259	83.7%	9863
	Total	3043	25.0%	9148	75.0%	12191

Remediation by Subgroup

Disaggregation of data by subgroups provides more specific information whether certain subgroups might need more remediation than others. These results provided here (Table 15 and Table 16) show data for students entering colleges in Colorado in the fall of 2009. The subgroups were determined based on the demographic data collected when the students took the CSAP for the final time in 2007. The subgroups with the highest remediation needs are students of poverty, English learners, students with disabilities, and Black and Hispanic students. However, for each of these subgroups the majority of students did not need reading remediation. For example, fifty percent of the 634 students

with disabilities did not need reading remediation. Slightly more than 58 percent of the English learners did not need reading remediation, and 66 percent of students who were eligible for free or reduced prices lunch in tenth grade did not need reading remediation. More than 66 percent of Black and Hispanic students did not need remediation. Students requiring remediation are a heterogeneous group. They are not focused in one or two subgroups of students. The data tells a similar, but not identical, story in math (Table 16).

Table 15
College Remediation needs in Reading by Subgroup

	Reading Remediation					
	Pending Review	Remediation	No Remediation	Total	% Remediation	% No Remediation
Not eligible	763	1408	12690	14861	9.5%	85.4%
Free or reduced lunch eligible	133	688	1627	2448	28.1%	66.5%
				0		
Male	579	973	6729	8281	11.7%	81.3%
Female	317	1123	7590	9030	12.4%	84.1%
				0		
Not ELL	835	1701	13686	16222	10.5%	84.4%
ELL	61	396	633	1090	36.3%	58.1%
				0		
Students No Disabilities	858	1828	14007	16693	11.0%	83.9%
Students with Disabilities	38	267	312	617	43.3%	50.6%
				0		
Native American	3	20	90	113	17.7%	79.6%
Asian	47	99	642	788	12.6%	81.5%
Black	24	237	528	789	30.0%	66.9%
Hispanic	127	627	1533	2287	27.4%	67.0%
White	695	1114	11526	13335	8.4%	86.4%

Table 16
College Remediation needs in Mathematics by Subgroup

	Math Remediation					
	Pending Review	Remediation	No Remediation	Total	% Remediation	% No Remediation
Not FRL eligible	*830*	*2908*	*11125*	*14863*	19.6%	74.9%
FRL eligible	*193*	*1072*	*1182*	*2447*	43.8%	48.3%
Male	*629*	*1687*	*5967*	*8283*	20.4%	72.0%
Female	*393*	*2292*	*6341*	*9026*	25.4%	70.3%
Not ELL	*939*	*3492*	*11795*	*16226*	21.5%	72.7%
ELL	*84*	*488*	*513*	*1085*	45.0%	47.3%
Students No Disabilities	*955*	*3635*	*12105*	*16695*	21.8%	72.5%
Students with Disabilities	*67*	*345*	*204*	*616*	56.0%	33.1%
Native American	*7*	*30*	*76*	*113*	26.5%	67.3%
Asian	*54*	*123*	*609*	*786*	15.6%	77.5%
Black	*51*	*391*	*347*	*789*	49.6%	44.0%
Hispanic	*172*	*982*	*1135*	*2289*	42.9%	49.6%
White	*739*	*2454*	*10142*	*13335*	18.4%	76.1%

Discussion and Limitations

This retrospective study is based on new data provided by the Colorado Department of Higher Education (CDHE) about student-level college remediation status. This data provides a key link between the state's preK-12 school system and the state's postsecondary system. The information provided by CDHE provides a new lens through which to understand postsecondary readiness.

Schools should use assessment data to target academic skills for students throughout the middle school and secondary grades; such attention would be of great benefit to students regardless of their post-high school plans. Interventions to eliminate remediation also need to be in place throughout the secondary system as these findings suggest that if the schools utilized existing statewide assessment data they would be well-served in identifying which students need what type of remediation. When students

move from grade to grade without intervention to improve their basic skills, this lack of skills appears evident in postsecondary and workforce situations.

Additionally, if the postsecondary community used this information as part of their admissions program, it would also help to inform their decisions about which students will likely need a remediation. Students who have tenth-grade CSAP scores at the unsatisfactory level and ACT scores that indicate they are not college ready are very likely to need a great deal of remediation before being ready for college-level work. It would appear to be a step in the right direction to have both the state assessment scores and ACT scores reported on the transcripts of graduating seniors. In addition, the assessment results could assist high schools in determining who will be eligible for postsecondary and workforce-ready endorsed diplomas. It is clear from the evidence presented in this study that students who are both proficient or above on the CSAP in grade 10 and meet the ACT College-ready criteria in grade 11, are very likely to require no remediation in their first year in a postsecondary institution. The Colorado State Board of Education, the Commission for Higher Education, and each institutional Governing Board might consider using these criteria for eligibility for postsecondary- and workforce-ready endorsed diplomas.

By examining assessment results from as early as the sixth and eighth grades, it is also clear that if students were not proficient on the state assessment in the sixth or eighth grade, then they were very likely to require remediation later when they entered college. If middle schools would analyze the state assessment data for this purpose they would be better able to identify which students are very likely be postsecondary ready and which students are not. Also teachers could use the assessment results to target the academic skills of struggling students early in middle school to focus on preparing them to be postsecondary ready. The eighth grade results could be used to gauge how successful the middle and K-8 schools have been in moving students toward PWR. High schools could use the data from the middle school years to target incoming ninth graders who are not yet proficient on the state assessment. More precise use of state assessment data could focus educators on the ultimate goal of developing postsecondary- and workforce-ready students in all grades, not just those for which graduation is rapidly approaching.

The new assessment system currently being developed[9] as recommended by Colorado stakeholders goes beyond a single end-of-year assessment and incorporates both formative and interim

[9] **http://www.cde.state.co.us/asmtrev/home**

assessments. The recommended assessment system is designed to assess mastery of the new academic standards from kindergarten through high school graduation. It is likely that the results from the new assessment system will offer similar postsecondary-readiness guidance to middle and high schools and to the postsecondary community because the new assessment system will be based on standards that were developed with the goal of preparing postsecondary and workforce ready students. However, it will be important to evaluate the performance of the new state assessment system in relationship to postsecondary remediation needs. The new assessment system must offer the psychometric validity and reliability that are comparable to the current assessments in order to be approved by federal peer review. In essence, these analyses provide Colorado's P-20 system an opportunity to learn from past evidence and be in a position to apply this knowledge to the new assessment system that will be in place in 2014.

One of the limitations of this study is not having postsecondary information about students who did not enroll in college in Colorado. It would be very helpful to know whether students who left Colorado to attend college elsewhere had similar results as their peers enrolled within the state. It would be equally important to know about the success of students who graduate from high school and then join the workforce and/or the military. These are directions for future research at both the Colorado Department of Education and the Colorado Department of Higher Education. Additionally, further investigation of college remediation will be conducted as more high school graduating classes enter college.

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Appendix A

UNITED STATES DEPARTMENT OF EDUCATION
OFFICE OF ELEMENTARY AND SECONDARY EDUCATION

THE ASSISTANT SECRETARY

DEC 18 2006

The Honorable William J. Moloney
Commissioner of Education
Colorado Department of Education
201 East Colfax Avenue
Denver, Colorado 80203-1704

Dear Commissioner Moloney:

I am pleased to approve Colorado's assessment system under Title I of the *Elementary and Secondary Education Act of 1965* (ESEA), as amended by the *No Child Left Behind Act of 2001* (NCLB). I congratulate you on meeting this important NCLB requirement.

My decision is based on input from peer reviewers external to the U.S. Department of Education (the Department) and Department staff who reviewed and carefully considered the evidence submitted by Colorado. I have concluded that the evidence demonstrates that Colorado's standards and assessment system satisfies the NCLB requirements. Specifically, Colorado's system includes academic content standards in reading/language arts, mathematics, and science; student achievement standards in reading/language arts and mathematics; alternate achievement standards for students with the most significant cognitive disabilities in reading/language arts and mathematics; assessments in each of grades 3 through 8 and high school in reading/language arts and mathematics; and alternate assessments for those subjects.

Accordingly, Colorado's system warrants ***Full Approval with Recommendations***. This status means that Colorado's standards and assessment system meets *all* statutory and regulatory requirements, but that the assessment system could be strengthened in some ways. The Colorado Student Assessment Program (CSAP), alternate assessment based on alternate achievement standards, and the Lectura meet the essential requirements of NCLB, but we recommend Colorado continue to research the impact of accommodations on the meaningfulness of scores for limited English proficient students. I am pleased to know that Colorado participated in our recent LEP Partnership meetings and hope that your involvement with this initiative will help in this effort.

Please be aware that approval of Colorado's standards and assessment system under NCLB is not a determination that the system complies with Federal civil rights requirements, including Title VI of the *Civil Rights Act of 1964*, Title IX of the *Education Amendments of 1972*, Section 504 of the *Rehabilitation Act of 1973*, Title II of the *Americans with Disabilities Act*, and requirements under the *Individuals with Disabilities Education Act*. Finally, please remember that, if Colorado makes significant changes in its standards and assessment system, the State must submit information about those changes to the Department for review and approval.

We have found it a pleasure working with your staff on this review. Please accept my congratulations for your State's approved standards and assessment system under NCLB. I wish you well in your continued efforts to improve student achievement in Colorado.

Sincerely,

Henry L. Johnson

cc: Governor William Owens
Beth Celva

Appendix B

Colorado College Ready Indicators

Colorado also uses ACT cut points to indicate college readiness. The Colorado cut points are an ACT score of 17 for reading and an ACT score of 19 for math. It creates a middle group that is considered college ready in Colorado, but they are not ACT college ready. The great majority of students that are considered Colorado college ready, but not ACT college ready do not need remediation. Tables 16 through 21 provide the Colorado college readiness indicators with the ACT for Colorado and CSAP reading and math information that was included in the main body of the paper.

Table 17
ACT & Colorado Reading Readiness Indicators for Colorado Graduates 2009 Enrolled in Colorado Postsecondary Institutions

Postsecondary	ACT Reading College Readiness	Total	% of Graduate Enrollees
2-Year Institution	Not College Ready	1802	42.2%
	CO College Ready—Not ACT College Ready	1076	25.2%
	ACT College Ready	1397	32.7%
	Total	4275	
4-Year Institution	Not College Ready	1728	12.9%
	CO College Ready—Not ACT College Ready	2470	18.5%
	ACT College Ready	9160	68.6%
	Total	13358	

Table 18
ACT & Colorado Math College Readiness Indicators for Colorado Graduates 2009 Enrolled in Colorado Postsecondary Institutions

Postsecondary	College Math Readiness	Total	% of Graduate Enrollees
2-Year Institution	Not College Ready	2721	63.6%
	CO College Ready—Not ACT College Ready	666	15.6%
	ACT College Ready	888	20.8%
	Total	4275	
4-Year Institution	Not College Ready	3118	23.3%
	CO College Ready—Not ACT College Ready	2182	16.3%
	ACT College Ready	8056	60.3%
	Total	13356	

Table 19
ACT & Colorado Reading Readiness Indicator for Two-Year and Four-Year Institutions and Percentage Requiring Remediation--Fall 2009

Postsecondary		Reading Remediation					
	College Reading Readiness	Pending Review	Remediation	No Remediation	Total	% Remediation	% No Remediation
2-Year Institutions	Not College Ready	*79*	*1238*	*485*	*1802*	*68.7%*	*26.9%*
	CO College Ready—Not ACT College Ready	*102*	*134*	*840*	*1076*	*12.5%*	*78.1%*
	ACT College Ready	*106*	*40*	*1251*	*1397*	*2.9%*	*89.5%*
	Total	*287*	*1412*	*2576*	*4275*		
4-Year Institutions	Not College Ready	*49*	*704*	*975*	*1728*	*1.9%*	*95.2%*
	CO College Ready—Not ACT College Ready	*72*	*46*	*2352*	*2470*	*0.2%*	*94.3%*
	ACT College Ready	*504*	*14*	*8642*	*9160*	*5.7%*	*89.6%*
	Total	*625*	*764*	*11969*	*13358*		

Table 20

ACT & Colorado Math Readiness Indicator for Two-Year and Four-Year Institutions and Percentage Requiring Remediation--Fall 2009

		Math Remediation					
Postsecondary	College Math Readiness	Pending Review	Remediation	No Remediation	Total	% Remediation	% No Remediation
2-Year Institutions	Not College Ready	*314*	*2090*	*317*	*2721*	*76.8%*	*11.7%*
	CO College Ready—Not ACT College Ready	*58*	*77*	*531*	*666*	*11.6%*	*79.7%*
	College Ready	*60*	*14*	*814*	*888*	*1.6%*	*91.7%*
	Total	*432*	*2181*	*1662*	*4275*		
4-Year Institutions	Not College Ready	*64*	*1876*	*1178*	*3118*	*60.2%*	*37.8%*
	CO College Ready—Not ACT College Ready	*33*	*27*	*2122*	*2182*	*1.2%*	*97.3%*
	College Ready	*520*	*15*	*7521*	*8056*	*0.2%*	*93.4%*
	Total	*617*	*1918*	*10821*	*13356*		

Table 21

ACT & Colorado Reading Readiness Benchmarks (2008) and 2007 Tenth Grade Math CSAP Proficiency Category and Percentage Requiring Remediation--Fall 2009

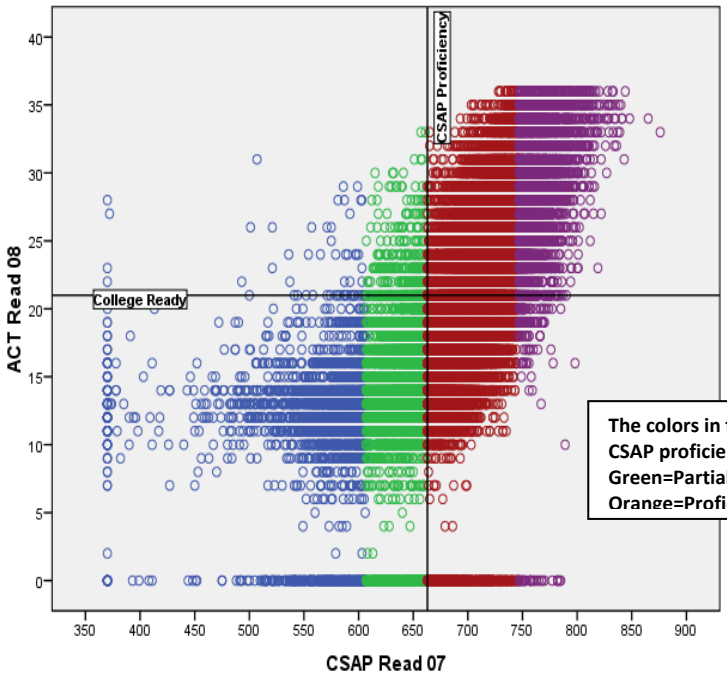
			Reading Remediation					
Postsecondary	ACT College Ready	CSAP Reading Proficiency	Pending Review	Remediation	No Remediation	Total	% Remediation	% No Remediation
2-Year Institutions	Not ACT College Ready	*Unsatisfactory*	17	170	20	207	82.1%	9.7%
		Partially Proficient	36	580	168	784	74.0%	21.4%
		Proficient	56	489	586	1131	43.2%	51.8%
		Advanced	0	0	1	1	0.0%	100.0%
		No Score	3	24	14	41	58.5%	34.1%
	Colorado College Ready--Not ACT College Ready	*Unsatisfactory*	0	1	8	9	11.1%	88.9%
		Partially Proficient	10	14	52	76	18.4%	68.4%
		Proficient	50	37	428	515	7.2%	83.1%
		Advanced	1	0	4	5	0.0%	80.0%
		No Score	1	4	6	11	36.4%	54.5%
	ACT College Ready	*Unsatisfactory*	0	0	7	7	0.0%	100.0%
		Partially Proficient	6	4	40	50	8.0%	80.0%
		Proficient	88	33	1062	1183	2.8%	89.8%
		Advanced	8	0	108	116	0.0%	93.1%
		No Score	1	1	19	21	4.8%	90.5%
4-Year Institutions	Not ACT College Ready	*Unsatisfactory*	3	25	18	46	54.3%	39.1%
		Partially Proficient	16	241	260	517	46.6%	50.3%
		Proficient	46	442	1389	1877	23.5%	74.0%
		Advanced	1	0	16	17	0.0%	94.1%
		No Score	4	4	17	25	16.0%	68.0%
	Colorado College Ready--Not ACT College Read	*Unsatisfactory*	0	1	4	5	20.0%	80.0%
		Partially Proficient	3	1	77	81	1.2%	95.1%
		Proficient	43	11	1403	1457	0.8%	96.3%
		Advanced	0	0	36	36	0.0%	100.0%
		No Score	0	0	15	15	0.0%	100.0%
	ACT College Ready	*Unsatisfactory*	0	0	11	11	0.0%	100.0%
		Partially Proficient	1	0	89	90	0.0%	98.9%
		Proficient	295	13	6341	6649	0.2%	95.4%
		Advanced	204	1	2055	2260	0.0%	90.9%
		No Score	3	0	66	69	0.0%	95.7%

Table 22
ACT & Colorado Math Readiness Benchmarks (2008) and 2007 Tenth Grade Math CSAP Proficiency Category and Percentage Requiring Remediation--Fall 2009

			Math Remediation					
Postsecondary	ACT College Ready	CSAP Reading Proficiency	Pending Review	Remediation	No Remediation	Total	% Remediation	% No Remediation
2-Year Institution	Not ACT College Ready	Unsatisfactory	199	1149	88	1436	80.0%	6.1%
		Partially Proficient	86	804	189	1079	74.5%	17.5%
		Proficient	4	37	23	64	57.8%	35.9%
		Advanced	0	0	0	0	0.0%	0.0%
		No Score	7	29	4	40	72.5%	10.0%
	Colorado College Ready--Not ACT College Read	Unsatisfactory	4	10	21	35	28.6%	60.0%
		Partially Proficient	44	55	375	474	11.6%	79.1%
		Proficient	8	10	122	140	7.1%	87.1%
		Advanced	0	0	0	0	0.0%	0.0%
		No Score	2	2	8	12	16.7%	66.7%
	ACT College Ready	Unsatisfactory	2	0	7	9	0.0%	77.8%
		Partially Proficient	10	6	226	242	2.5%	93.4%
		Proficient	36	8	512	556	1.4%	92.1%
		Advanced	11	0	49	60	0.0%	81.7%
		No Score	1	0	11	12	0.0%	91.7%
4-Year Institution	Not ACT College Ready	Unsatisfactory	34	704	233	971	72.5%	24.0%
		Partially Proficient	24	1040	768	1832	56.8%	41.9%
		Proficient	1	67	103	171	39.2%	60.2%
		Advanced	0	0	1	1	0.0%	100.0%
		No Score	1	16	17	34	47.1%	50.0%
	Colorado College Ready--Not ACT College Read	Unsatisfactory	0	2	72	74	2.7%	97.3%
		Partially Proficient	21	21	1358	1400	1.5%	97.0%
		Proficient	10	4	641	655	0.6%	97.9%
		Advanced	0	0	1	1	0.0%	100.0%
		No Score	0	0	25	25	0.0%	100.0%
	ACT College Ready	Unsatisfactory	2	0	22	24	0.0%	91.7%
		Partially Proficient	25	2	1203	1230	0.2%	97.8%
		Proficient	310	10	5085	5405	0.2%	94.1%
		Advanced	177	3	1089	1269	0.2%	85.8%
		No Score	5	0	56	61	0.0%	91.8%

Appendix C

Figure 2 All Colorado 11th Grade Students:
Colorado ACT Reading 2008 & CSAP Reading 2007



The colors in the scattergrams represent the CSAP proficiency levels. Blue=Unsatisfactory, Green=Partially Proficient, Red or Orange=Proficient and Purple=Advanced

Figure 3 Graduation Class 2009 Enrolled in College:
Colorado ACT Reading 2008 & CSAP Reading 2007

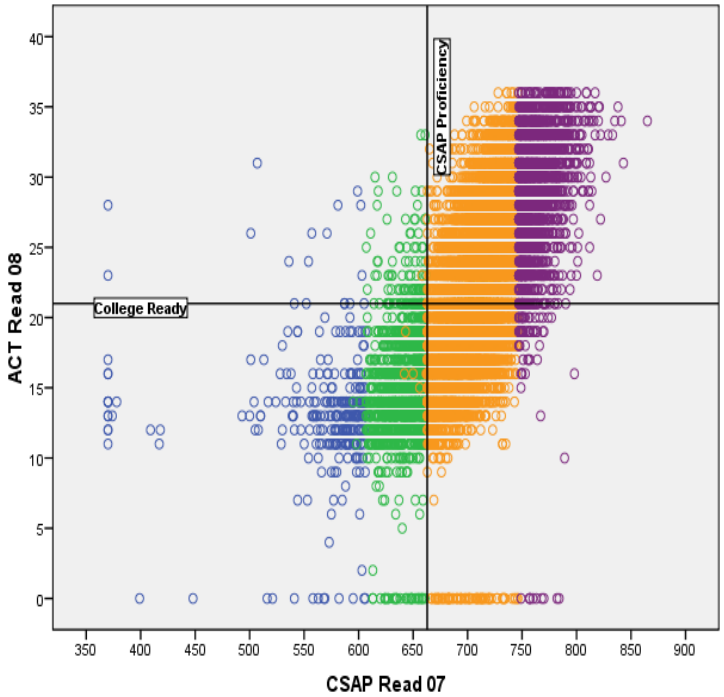


Figure 4 All Colorado 11th Graders:
Colorado ACT Math 2008 & CSAP Math 2007

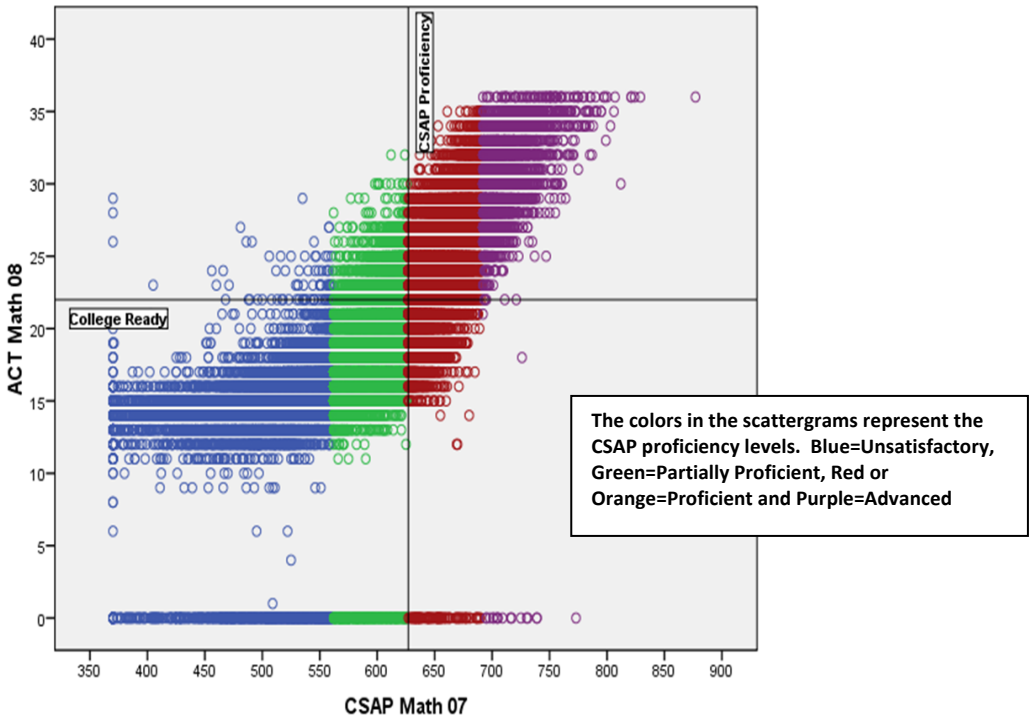
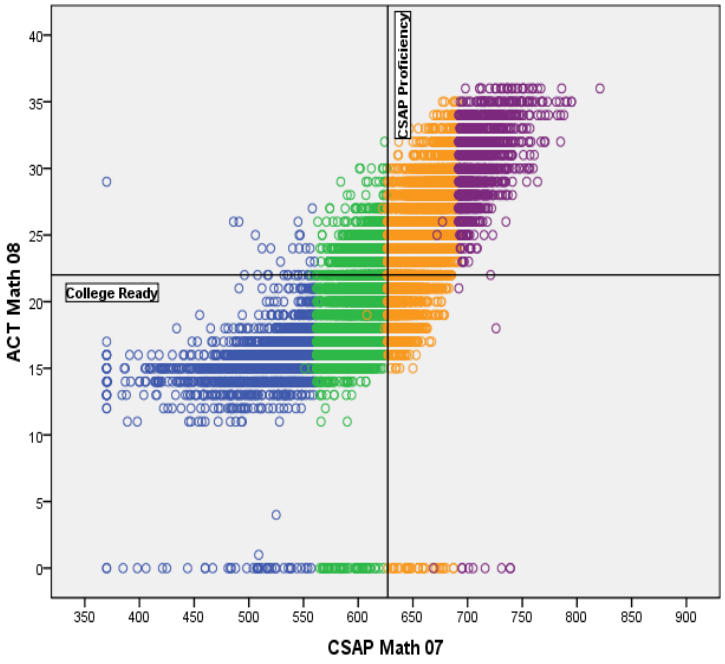


Figure 5 Colorado Graduation Class 2009 Enrolled in College:
Colorado ACT Math 2008 & CSAP Math 2007



Appendix D

Resources: ACT's College Readiness Standards

English (ACT College Readiness Benchmark score = 18)

Topic Development in Terms of Purpose and Focus

- Identify the basic purpose or role of a specified phrase or sentence
- Delete a clause or sentence because it is obviously irrelevant to the essay

Organization, Unity, and Coherence

- Select the most logical place to add a sentence in a paragraph

Word Choice in Terms of Style, Tone, Clarity, and Economy

- Delete obviously synonymous and wordy material in a sentence
- Revise expressions that deviate from the style of an essay

Sentence Structure and Formation

- Determine the need for punctuation and conjunctions to avoid awkward-sounding sentence fragments and fused sentences
- Decide the appropriate verb tense and voice by considering the meaning of the entire sentence

Conventions of Usage

- Solve such grammatical problems as whether to use an adverb or adjective form, how to ensure straightforward subject-verb and pronoun-antecedent agreement and which preposition to use in simple contexts
- Recognize and use the appropriate word in frequently confused pairs such as "there" and "their," "past" and "passed," and "led" and "lead"

Conventions of Punctuation

- Provide appropriate punctuation in straightforward situations (e.g., items in a series)
- Delete commas that disturb the sentence flow (e.g., between modifier and modified element)

Mathematics (ACT College Readiness Benchmark score = 22)

Basic Operations and Applications

- Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, and computing with a given average

Probability, Statistics, and Data Analysis

- Calculate the missing data value, given the average and all data values but one
- Translate from one representation of data to another (e.g., a bar graph to a circle graph)
- Determine the probability of a simple event
- Exhibit knowledge of simple counting techniques

Numbers: Concepts and Properties

- Exhibit knowledge of elementary number concepts including rounding, the ordering of decimals, pattern identification, absolute value, primes, and greatest common factor

Expressions, Equations, and Inequalities

- Evaluate algebraic expressions by substituting integers for unknown quantities
- Add and subtract simple algebraic expressions
- Solve routine first-degree equations
- Perform straightforward word-to-symbol translations
- Multiply two binomials

Graphical Representations

- Locate points in the coordinate plane
- Comprehend the concept of length on the number line
- Exhibit knowledge of slope

Properties of Plane Figures

- Find the measure of an angle using properties of parallel lines
- Exhibit knowledge of basic angle properties and special sums of angle measures (e.g., 90°, 180°, and 360°)

Measurement

- Compute the area and perimeter of triangles and rectangles in simple problems
- Use geometric formulas when all necessary information is given

Functions

- Evaluate quadratic functions, expressed in function notation, at integer values

Reading (ACT College Readiness Benchmark score = 21)

Main Ideas and Author's Approach

- Infer the main idea or purpose of straightforward paragraphs in uncomplicated literary narratives
- Understand the overall approach taken by an author or narrator (e.g., point of view, kinds of evidence used) in uncomplicated passages

Supporting Details

- Locate important details in uncomplicated passages
- Make simple inferences about how details are used in passages

Sequential, Comparative, and Cause-Effect Relationships

- Order simple sequences of events in uncomplicated literary narratives
- Identify clear relationships between people, ideas, and so on in uncomplicated passages
- Identify clear cause-effect relationships in uncomplicated passages

Meanings of Words

- Use context to determine the appropriate meaning of some figurative and nonfigurative words, phrases, and statements in uncomplicated passages

Generalizations and Conclusions

- Draw generalizations and conclusions about people, ideas, and so on in uncomplicated passages
- Draw simple generalizations and conclusions using details that support the main points of more challenging passages

Appendix E

CSAP Grade 6, 8 and 10 Mathematics Performance Level Descriptors for

CSAP Mathematics Grade 6

Advanced – Performance Level 4 (Score range: 589 to 830)

Students demonstrate equivalency among fractions decimals, and percent; apply number sense; solve real-world problems using geometric and numeric patters; solve problems using rations and proportions; describe the likelihood of 3events based on a set of data; identify and apply geometric attributes and coordinate geometry to describe, create, and reason about 2-dimensional figures; use standard and metric measurement, use appropriate methods to solve problems using decimals, mixed numbers, and fractions.

Proficient – Performance level 3 (Score range: 520 to 588)

Students recognize equivalency of commonly used fractions and percent; use simple geometric and numeric patters to solve real world problems; use single variables; construct, analyze, compare, and draw conclusions based on data displays; calculate mean values; make predictions based on data; identify attributes on geometric shapes; use x- and y-coordinates in quadrant 1 of a coordinate plane; apply distance in scaled diagrams; add, subtract, multiply, and divide whole numbers; apply appropriate method to solve word problems with whole numbers, calculate with decimals in monetary form.

Partially Proficient – Performance Level 2 (Score range: 454 to 519)

Students recognize, represent, and extend simple geometric, numeric patterns using pictures, tables, charts and symbols; construct bar graphs with appropriate intervals; read and plot points in quadrant 1 of a coordinate plane; determine perimeter.

Unsatisfactory – Performance Level 1 (Score range: 240 to 453)

Students recognize, represent, and extend simple geometric, numeric patters using pictures, tables, charts, and symbols, construct bar graphs with appropriate intervals; read and plot points in quadrant 1 of a coordinate plane; determine perimeter.

CSAP Mathematics Grade 8

Advanced – Performance Level 4 (Score range: 628 to 890)

Students estimate with rational numbers; use fractions, decimals, percent, rations; represent fractions graphically, communicate problem-solving reasoning; analyze patterns, sentences, functions, relations using tables, graphs, algebraic notations; solve linear equations, make multiple applications of data; interpret line graph, use measures of central tendency, determine probability of event; use permutations, combinations; find area, surface area, perimeter, volume of figures; transform figures, estimate measurement using scale drawing; find missing dimensions of rectangular prisms, work computations backwards.

Proficient – Performance Level 3 (Score range: 577 to 627)

Students analyze, use patter, function rules, evaluate equations using substitutions; use proportions, integers, decimals, translate from algebraic notation; interpret circle graphs; find mean, median, mode, range; find probability of independent events; translate set of coordinates; identify similar, congruent figures; find area, volume, of figures; estimate map distances with ruler, scale.

Partially Proficient – Performance Level 2 (Score range: 521 to 576)

Students divide figures into equal parts; apply problem-solving skills, strategies, find one measure of central tendency; determine probability of simple events; interpret double-bar graph; extend lines to intersection.

Unsatisfactory – Performance Level 1 (Score range: 310 to 520)

Students plot data on graph, construct circle graph, visualize transformations of figures.

CSAP MATHEMATICS GRADE 10

Advanced – Performance Level 4 (Score range: 692 to 950)

Students represent polynomials in equivalent forms; solve systems of linear equations; apply multiple representations to functions; determine systematic sampling methods for given situations; determine probability of independent events; describe nonlinear data using graphs, create, use lines of best fit; interpret *x*-and *y*-intercepts; recognize angle relationships, relate dimension changes to perimeter, area, volume changes; compare areas using spatial visualization; calculate volume; visualize three-dimensional figures from two-dimensional shapes; use estimate, right triangle properties to solve problems.

Proficient – Performance Level 3 (Score range: 627 to 691)

Students recognize equivalent variable expressions; perform unit conversion involving rates; choose scales, plot coordinate points on graphs, interpret nonlinear graphs; generalize patters using algebraic notation; determine measures of central tendency from graphed data; use coordinate geometry to solve problems; use computational methods, percents, proportional thinking to solve problems, apply Pythagorean theorem; work with expressions containing roots; use estimation strategies to find reasonable solutions.

Partially Proficient – Performance Level 2 (Score range: 562 to 626)

Students apply fundamental counting principle to determine possible outcomes; list sample spaces; represent functional relationships with tables or graphs; identify uniform distributions; visualize transformations of figures; read and interpret graphs; use graphs to support multiple positions, make predictions about data.

Unsatisfactory – Performance Level 1 (Score range: 370 to 561)

A 10th grade student performing in the Unsatisfactory Level demonstrates limited understanding of the concepts and ineffective application of the mathematical skills contained in the six Colorado Model Content Standards for mathematics.

CSAP GRADE 6, 8 AND 10 READING PERFORMANCE LEVEL DESCRIPTORS

CSAP Reading Grade 6

Advanced – Performance Level 4 (Score range: 696 to 970)

Students determine meaning of complex vocabulary with or without clues; locate and recall information/sequence; identify main ideas and describe details in complex text; draw inferences by creating connections within text; draw and support conclusions from complex text; identify character traits and make predictions based on character actions; distinguish fact from opinion; analyze/explain/interpret figurative language in concrete terms; solve problems with relevant details; select, locate, and organize information in a variety of ways to support/justify ideas; identify literary elements and techniques.

Proficient – Performance Level 3 (Score range: 600 to 695)

Students locate and paraphrase main idea with supporting details, use context to define words; locate and recall sequence; draw inferences form context and background information; summarize and synthesize information in fiction and nonfiction; locate and recall information in texts with different structures; locate and describe supporting details in a variety of texts; draw conclusions from phrases; analyze/interpret figurative language to draw conclusions; regroup information into a graphic organizer; identify literary elements.

Partially Proficient – Performance Level 2 (Score range: 543 to 599)

Students recall details; summarize nonfiction; recognize basic literary terms such as narrator; infer character changes and feelings; find details to determine character actions; make predictions in fictions text; synthesize information to identify theme; determine author's purpose in fiction text; draw conclusions from simple text.

Unsatisfactory – Performance Level 1 (Score range: 260 to 542)

Students identify simple main ideas and sequential order; summarize fiction; make a basic comparison between characters; assign character traits.

CSAP Reading Grade 8

Advanced – Performance Level 4 (Score range: 724 to 990)

Students demonstrate command of complex vocabulary; infer character's attitudes and motivations; evaluate information and draw conclusions; sequence complex events and details' paraphrase text; make comparisons identify main idea from sophisticated text and find supporting details; genres of text; draw conclusions and support with details from text; determine cause and effect in poetry; identify and apply descriptive language; state author's purposes; synthesize and analyz3e complex text; generate multiple solutions to problems, collect/organize data to form or defend and opinion.

Proficient – Performance Level 3 (Score range: 632 to 723)

Students sequence events; make inferences; identify important ideas, explain relationships between characters; identify meaning of more complex words; compare information from two texts; recognize correct word meaning; summarize short texts; interpret figurative language; infer author's purpose; draw conclusions; interpret characters' motives; use graphic organizers to collect and organize data; determine character traits; interpret themes; infer setting; identify descriptive language.

Partially Proficient – Performance Level 2 (Score range: 578 to 631)

Students use context clues to make inferences; define vocabulary; recall details from passages; demonstrate literal comprehension; identify main ideas; sequence stated events; identify literal or figurative language; located details in a narrative text; determine cause and effect.

Unsatisfactory – Performance Level 1 (Score range: 330 to 577)

Students are beginning to make partial predictions; locate limited information from graphs and charts; and identify some story elements.

CSAP READING GRADE 10

Advanced – Performance Level 4 (Score range: 747 to 999)

Students infer main idea/details; make connections/summarize events' support conclusions/theses/opinions with details/graphics/historical information; interpret character behavior; analyze cause/effect; infer themes/author's purpose; differentiate between factual/emotional appeals; analyze/draw conclusions by identifying tone and view point; interpret poetry and poet's viewpoint; identify paraphrases; use research tools and textual/graphic/bibliographic features to compare/contrast/locate information; discriminate amount literary techniques; and define challenging words from context.

Proficient – Performance Level 3 (Score range: 663 to 746)

Students infer/summarize main idea/plot; identify supporting details;, interpret meaning; explain cause/effect; identify author's viewpoint; draw conclusions by analyzing irony/contradictions/language sequence of events; locate relevant information in references; use basic organizational features of bibliographic information; evaluate and organize information from different sources to support arguments; evaluate sources for credibility; identify literary themes through sequence of events and interferences; apply literary terminology to poetry; and provide support for a thesis.

Partially Proficient – Performance Level 2 (Score range: 607 to 662)

Students are partially proficient when they use limited strategies to demonstrate comprehension of text by summarizing main idea in basic text and respond to literature by identifying theme through inferences about characters and their behavior.

Unsatisfactory – Performance Level 1 (Score range: 370 to 606)

Students can identify the main idea of a basic reading selection.