Relating ACT Aspire Scores to Performance in High School Courses

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SUMMARY

We examined the relationships of ACT Aspire test scores and high school course grades, AP test scores, and Partnership for Assessment of Readiness for College and Careers (PARCC) test scores, demonstrating criterion-related as well as convergent and discriminant validity evidence. We found that ACT Aspire test scores are strong predictors of success in standard, career-focused, AP, and dual enrollment courses. Moreover, ACT Aspire scores demonstrate expected convergent and divergent relations across grade levels and with other standardized measures of college and career readiness.

SO WHAT?

The results are similar across student subgroups and support five intended uses of ACT Aspire test scores:

1. To measure progress toward meeting college and career readiness standards
2. To determine if students are on target for college and career readiness
3. To provide instructionally actionable information to educators
4. To inform evaluation of school and program effectiveness
5. To inform readiness for advanced high school coursework

NOW WHAT?

We documented evidence that Arkansas' ACT Aspire scores are related as expected with other variables, supporting Critical Element 3.4 for ESSA Peer Review. Additional research is needed to understand how ACT Aspire test scores and high school coursework and grades can be used together for advising and placement.

Contents

Relating ACT Aspire Scores to Performance in High School Courses and Other Measures of College and Career Readiness

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Introduction

In this report, we provide evidence to support Critical Element 3.4 of ESSA Peer Review: "The State has documented adequate validity evidence that the State's assessment scores are related as expected with other variables" (US Department of Education, 2018). The types of evidence presented in this report are given in Table 1. Evidence is included for each subject area and grade level required for ESSA, as well as the Composite score, which is used as an indicator of career readiness. Evidence is also included for student subgroups: English Language Learner (ELL), Special Education (SPED), free/reduced lunch-eligible (FRL), and three racial/ethnic subgroups–Black, Hispanic, and White. The evidence falls into two categories: test-criterion relationships and convergent and discriminant evidence.

We argue that intended interpretations for uses of ACT Aspire test scores imply that the test scores should be related to variables external to the test; thus, predictive (test-criterion) and convergent/discriminant relationships are important sources of validity evidence (AERA, APA, NCME, 2014). Uses of Aspire test scores include (ACT, 2019):

1. To measure progress toward meeting college and career readiness standards
2. To determine if students are on target for college and career readiness
3. To provide instructionally actionable information to educators
4. To inform evaluation of school and program effectiveness
5. To inform readiness for advanced high school coursework
6. To understand student and group performance relative to national norms

In this report, we document evidence supporting the first five uses. Evidence supporting the sixth use is documented in the ACT Aspire Summative Technical Manual (ACT, 2019).

Table 1. Types of Validity Evidence, by Subject Area and Grade Level

Type of validity evidence	Subject area and grade levels			
	ELA	Math	Science	Composite
Test-criterion relationships				
Prediction of high school course grades	8-10	8-10	8-10	8-10
Prediction of AP exam scores	8-10	10	10	
Convergent and discriminant evidence				
Aspire/Aspire cross-grade correlations	3/4-9/10	3/4-9/10	3/4-9/10	
Aspire/PARCC cross-grade correlations	3/4-9/10	3/4-8/9	5/6, 7/8	

Test-Criterion Relationships: Prediction of High School Course Grades

Intended interpretations for each of the five uses covered in the report imply that Aspire test scores should be predictive of performance in high school courses – including standard, career-focused, Advanced Placement (AP), and dual enrollment courses. High school courses are geared towards helping students meet the state's academic standards and are also designed to help students prepare for college and careers. Thus, Aspire test scores, if measuring the state's academic standards and readiness for college and careers, should be predictive of high school course grades. By examining performance in courses that offer college-level curricula such as AP and dual enrollment, college readiness is directly addressed. Similarly, by examining career-focused courses, career readiness is directly addressed.

Students who are struggling in high school courses are candidates for extra academic support. Aspire test scores, if predictive of performance in high school courses, can help with early identification of students in need of support. This is a special case of providing instructionally actionable information to educators, and thus directly addresses Use #3. If the evidence suggests Aspire measures the state's academic standards and college and career readiness, then this evidence of content alignment provides a stronger rationale for using Aspire test scores for evaluating school and program effectiveness. In addition, Use #4 (To inform evaluation of school and program effectiveness) is indirectly addressed.

Aspire scores from grades 8-10 were linked to performance in high school courses, using data provided by the Arkansas Department of Education. Aspire scores from spring 2016 and spring 2017 were linked to performance in the following year's courses (e.g., academic years 2016-2017 and 2017-2018). Hierarchical logistic regression was used to relate test scores to dichotomous course success outcomes. The model accommodated school-specific intercepts, which is important because grading standards likely vary across schools.

Analyses were conducted for several different conditions, defined by:

- **Course.** The high school courses included 19 standard courses, nine career-focused courses, 10 AP courses, and 10 dual enrollment courses (Appendix Table A1).[1] For English and social science (social studies) courses, the ACT Aspire ELA score was used as the predictor. For math and science courses, the ACT Aspire math and science scores were used, respectively. For career-focused courses, the ACT Aspire Composite score was used.

- **Criterion level.** Student grades were categorized as A, B, C, D, or F. For course grade data provided on a numeric scale (0-100), grades were coded as A=90+, B=80-89, C=70-79, D=60-69, and F = < 60 or withdrawal from course. Three dichotomous course grade outcomes were defined, representing different levels of success: A, B or higher, and C or higher. Pass/fail courses were included for the C or higher outcome, but not for the A or B or higher outcomes.

- **Group.** Student subgroups included total, ELL, SPED, FRL, Black, Hispanic, and White.

With 48 courses, three criterion levels, and seven groups, there were 1,008 total conditions. However, for some conditions, the sample size was too small to produce stable results (see Appendix Table A1 for sample sizes). We restricted the analysis to conditions with a sample size of at least 100, resulting in 813 conditions for analysis. For each of the 48 courses, descriptive statistics (test score mean and standard deviation, the course grade distribution) are provided in Appendix Table A2.

For each model, Aspire scores were standardized (M=0, SD=1) with respect to the population of Arkansas examinees at the grade level prior to when the course was usually taken. For example, Biology was predominantly taken in 10th grade, and so the population was defined as all spring 9th-grade examinees. The regression coefficients (e.g., slopes) can be interpreted with respect to standard deviation increases in the test score. This makes it easier to compare predictive strength across different course/test score combinations.

To evaluate how well Aspire scores predict performance in high school courses, we used results from ACT's College Readiness Benchmarks research as points of reference (Table 2; Allen, 2013; Radunzel, Westrick, Bassiri, & Li, 2017). The logistic regression slope values presented in Table 2 were calculated using the same methods (hierarchical logistic regression) as used for this study. The slopes represent the change in the log-odds of success, associated with a standard deviation[2] increase in ACT test score. We refer to these slopes as *ACT reference slopes*.

Cohen's effect size benchmarks for correlations are *r*=0.10, 0.30, and 0.50 for *small*, *medium*, and *large* effect sizes, respectively (Cohen, 1988). We translated Cohen's correlation benchmarks to logistic regression slope benchmarks using an established formula (Table 3; Allen & Le, 2008). This provides us with more points of reference for describing how well Aspire scores predict high school course grades. For example, a logistic regression slope of 0.935 corresponds to a "large" effect size and would suggest that the test score is a strong predictor of course success. The logistic regression slopes can also be transformed to standardized odds ratios.[3] For example, for a large effect size, the odds ratio is 2.55, meaning that the odds of success increase by a factor of 2.55 for each standard deviation increase in the test score.

Table 2. ACT Reference Slopes (Logistic Regression Slopes of ACT Test Scores)

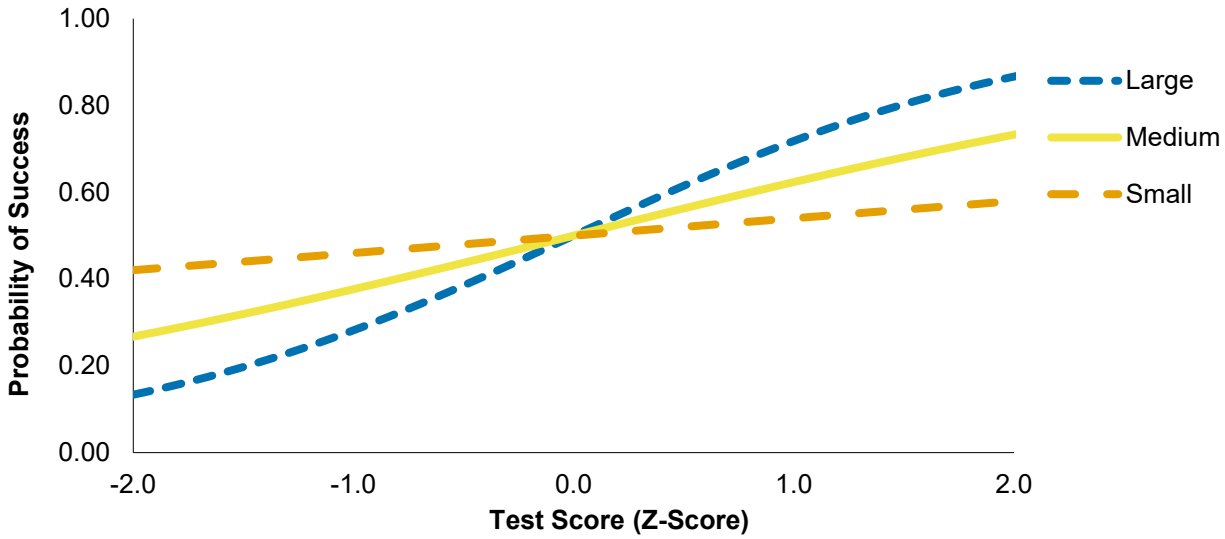
Subject area	College course(s)	Criterion level		
		A	B or higher	C or higher
ELA	English Composition	0.977	0.904	0.673
	Social science	1.246	1.229	1.083
Math	College algebra	1.369	1.119	0.865
Science	Biology	1.324	1.147	0.983

Table 3. Cohen's Effect Size Benchmarks

Effect size descriptor	*r*	Logistic regression measures	
		Slope	Odds Ratio
Small	0.10	0.160	1.17
Medium	0.30	0.504	1.66
Large	0.50	0.935	2.55

Logistic regression slopes that represent the three effect size benchmarks (small, medium, and large) are plotted in Figure 1, which shows how the probability of success changes with a change in test score. For example, when the effect size is "large," the probability of success increases from 0.50 to 0.72 with a standard-deviation increase in the test score (from a z-score of 0 to 1). When the effect size is "small," the probability of success increases from 0.50 to 0.54 with a standard-deviation increase in the test score.

Figure 1. Probabilities of Success Associated with Effect Size Benchmarks for Logistic Regression Slopes



Instead of presenting results for each condition, we used a meta-analytic approach to summarize results across the 813 conditions. We addressed the following **Research Questions:**

1. How well do Aspire test scores predict success in high school courses?
2. Does the predictive strength vary across content area?
3. Does the predictive strength vary across type of course (standard, career-focused, AP, or dual enrollment)?
4. Does the predictive strength vary across student subgroups?

To address **Question 1,** the mean slope across all courses was calculated for the total group (Table 4). The means represent the average logistic regression slopes across courses and were weighted by the course sample size. The mean slopes ranged from 1.172 for the C-or-higher criterion to 1.512 for the A criterion. The mean slopes exceeded the threshold for a "large" effect size (0.935). Thus, we conclude that, on average, Aspire test scores are strong predictors of success in high school courses.

Table 4. Total Group Predictive Strength of High School Course Grades (Logistic Regression Slopes)

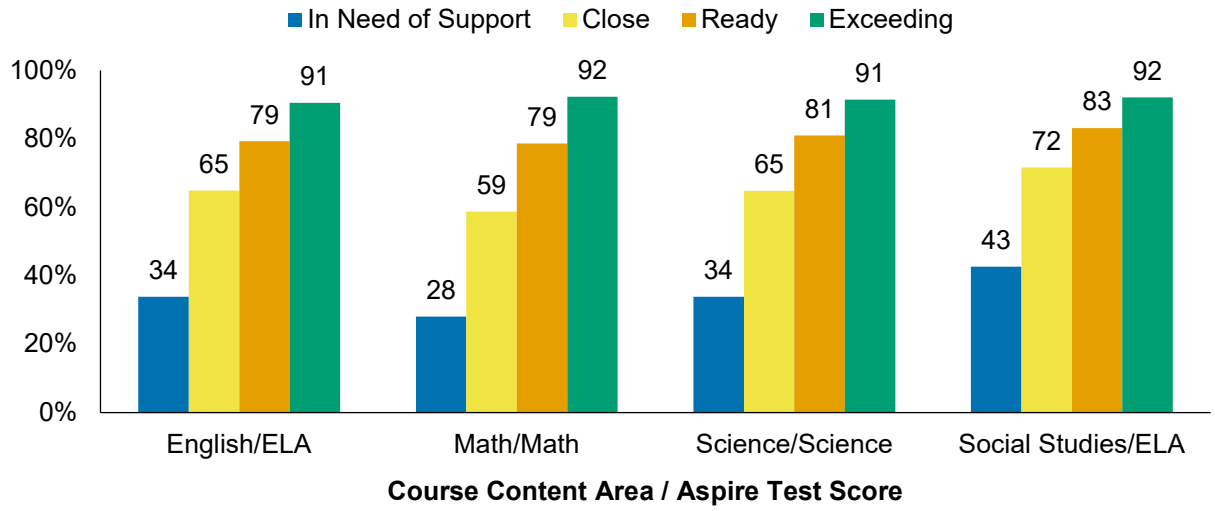
Subject area	Course Category	N courses	Criterion level		
			A	B or higher	C or higher
All	All	48	1.512	1.301	1.172
ELA	English	9	1.620	1.333	1.163
ELA	Social Studies	12	1.454	1.233	1.081
Math	Math	8	1.533	1.386	1.339
Science	Natural Science	10	1.487	1.267	1.127
Composite	Career-focused	9	1.406	1.311	1.214

To address **Question 2**, the mean slope was calculated for each course category (English, social studies, math, natural science, or career-focused; Table 4).[4] Comparing the mean slopes in Table 4 to the respective ACT reference slopes (Table 2), we find that the mean Aspire slopes usually exceeded the reference slopes. For example, the mean slope for the Aspire ELA score predicting B or higher grades in high school English courses is 1.333, which is larger than the mean slope for the ELA score predicting B or higher grades in college English Composition (0.904). For the B and C criterion levels for social studies, the mean Aspire slopes (1.233 and 1.081, respectively) are nearly identical to the respective ACT reference slopes (1.229 and 1.083, respectively). In all other cases, the mean Aspire slopes exceeded the ACT reference slopes (Table 2).

Moreover, each of the mean slopes exceeded the threshold for a "large" effect size. ANOVA was used to test for differences in mean slopes across course categories. Slopes did not vary across course category for the A and B or higher criteria. For the C or higher criterion, the mean slope for math courses (1.339) was significantly larger than the mean slope for English (1.163), social studies (1.081), and natural science (1.127). However, the mean slopes for C or higher are still similar in magnitude, ranging from 1.081 to 1.339 across course categories. We conclude that the predictive strength is strong for each subject test, and that the predictive strength is similar across content areas.

For each content area, course success rates can also be examined by Aspire Readiness Levels (In Need of Support, Close, Ready, and Exceeding). B or higher success rates, averaged across core subject area courses, are presented in Figure 2. As expected, success rates increase significantly with readiness level. Students at the "in need of support" level are least likely to earn B or higher grades, with success rates ranging from 28% for math courses to 43% for social studies courses. Students at the "exceeding" level had very high success rates: 91% to 92% across subject areas.

Figure 2. B or Higher Success Rates, by ACT Aspire Readiness Level, Averaged Across Core Subject Area Courses



Cross-tabulations of Aspire Readiness Levels and course success enable calculations of accuracy rates and other measures of predictive strength. Table 5 shows the cross-tabulation of Aspire Readiness Level and B or higher course outcomes, averaged across courses. The table gives the percentage of students with each combination of readiness level and outcome, as well as margin percentages. Classifications for "In Need of Support" are accurate for students in the lowest readiness level who are not successful in a course and for students in the other readiness levels who are successful in a course (see cells shaded in

blue). For math, the average accuracy rate for "In Need of Support" classifications is 71.1%. This can be derived by summing the percentages in Table 5 that are shaded in blue for math (31.4% + 14.7% + 13.3% + 11.7%). Similarly, the average accuracy rates are 73.7% for English courses, 72.0% for science courses, 72.7% for social studies courses, and 75.2% for career-focused courses. This evidence supports using Aspire scores to help identify the students in greatest need of academic support, which can be considered a special case of Use #3 (To provide instructionally actionable information to educators).

Table 5. Cross-Tabulation of ACT Aspire Readiness Level and B or Higher Course Outcome, Averaged Over Courses

Course content area / ACT Aspire test score	Readiness level[5]	Course outcome		Total
		B or higher	C or lower	
English/ELA	In Need of Support	12.9%	25.4%	38.3%
	Close	13.4%	7.2%	20.7%
	Ready	15.9%	4.2%	20.1%
	Exceeding	18.9%	2.0%	20.9%
	Total	61.2%	38.8%	100.0%
Math/Math	In Need of Support	13.2%	31.4%	44.6%
	Close	14.7%	10.7%	25.4%
	Ready	13.3%	3.9%	17.2%
	Exceeding	11.7%	1.1%	12.8%
	Total	52.9%	47.1%	100.0%
Science/Science	In Need of Support	15.1%	29.1%	44.2%
	Close	14.5%	7.9%	22.3%
	Ready	16.4%	3.9%	20.3%
	Exceeding	12.1%	1.1%	13.2%
	Total	58.0%	42.0%	100.0%
Social studies/ELA	In Need of Support	16.3%	21.9%	38.2%
	Close	14.8%	5.9%	20.7%
	Ready	16.8%	3.4%	20.2%
	Exceeding	19.3%	1.6%	20.9%
	Total	67.2%	32.8%	100.0%
Career-focused/ Composite	Bronze or below	18.3%	13.1%	31.4%
	Silver	29.3%	5.1%	34.4%
	Gold	21.7%	1.2%	22.9%
	Platinum	11.1%	0.2%	11.3%
	Total	80.4%	19.6%	100.0%

Note: Classifications for "In Need of Support" are accurate for students in the lowest readiness level who are not successful in a course and for students in the other readiness levels who are successful in a course (see cells shaded in blue).

To address **Question 3**, the mean slopes were examined for each course type (Table 6). For all course types and criterion levels, the mean slopes exceed the threshold for a "large" effect size (0.935). ANOVA was used to test for differences in mean slopes across course types. For the A and B criterion levels, we found that the mean slopes were greater for AP courses relative to the other course types. We conclude that Aspire test scores are strong predictors of grades across all course types and that Aspire test scores are especially useful for predicting how well students will perform in AP courses.

Table 6. Total Group Predictive Strength, by Course Type

Course Type	N courses	Criterion level		
		A	B or higher	C or higher
All	48	1.512	1.301	1.172
Standard	19	1.499	1.287	1.159
Career-focused	9	1.406	1.311	1.214
AP	10	2.071	1.596	1.365
Dual enrollment	10	1.276	1.103	0.980

To address **Question 4**, the mean slopes were examined for each student subgroup (Table 7). For each student subgroup, weights were applied to make the subgroup's distribution of test scores similar to the total group's distribution.[6] For most student subgroups, the mean slopes exceeded the threshold for a "large" effect size (0.935). The one exception occurred for the C or higher criterion for the SPED subgroup, where the mean slope approached a "large" effect size (0.896). Thus, we conclude that Aspire test scores are strong predictors of success in high school courses for student subgroups.

Table 7. Average Predictive Strength (Logistic Regression Slopes), by Subgroup

Group	N courses	Criterion level		
		A	B or higher	C or higher
Total	48	1.512	1.301	1.172
ELL	29	1.196	1.051	0.940
SPED	26	1.130	0.980	0.896
FRL	48	1.412	1.212	1.078
Black	36	1.479	1.305	1.208
Hispanic	36	1.385	1.196	1.067
White	48	1.515	1.302	1.172

Using ANOVA, we found significant variation across student subgroups in the predictive strength of Aspire test scores. Mean slopes were largest for the total, Black, and White subgroups; slopes were smallest for the SPED and ELL subgroups. We conclude that the predictive strength of Aspire scores varies by student subgroup but that Aspire test scores are strong predictors of success in high school courses for all student subgroups.

Test-Criterion Relationships: Prediction of AP Exam Scores

If Aspire test scores are predictive of AP exam scores, there is additional evidence that Aspire measures college readiness. And such evidence would directly support another use of Aspire scores: to identify students who are ready for the additional challenges associated with advanced high school coursework (Use #5).

Aspire scores from grades 8-10 were linked to performance on AP exams, again using data provided by the Arkansas Department of Education. Hierarchical logistic regression was used to relate Aspire scores to success on the AP exam, defined as earning a 3 ("qualified for doing the work of an introductory-level college course") or higher.

Analyses were conducted for different conditions defined by AP course and group. There were 10 AP courses, and the same student groups as used for the course grade analysis. Appendix Table A4 shows the sample size for each course/group combination. For AP exams for English and social studies courses, the Aspire ELA score was used as the predictor. For AP exams in math and science, the Aspire math and science scores were used, respectively. For each of the 10 courses, descriptive statistics (test score mean and standard deviation, the distribution of AP exam scores) are provided in Appendix Table A5.

With 10 courses and seven groups, there are 70 possible conditions. We restricted the analysis to conditions with a sample size of at least 100, resulting in 45 conditions for analysis. Similar to the course grade analysis, Aspire scores were standardized (M=0, SD=1) with respect to the population of Arkansas examinees at the grade level prior to when the course was usually taken.

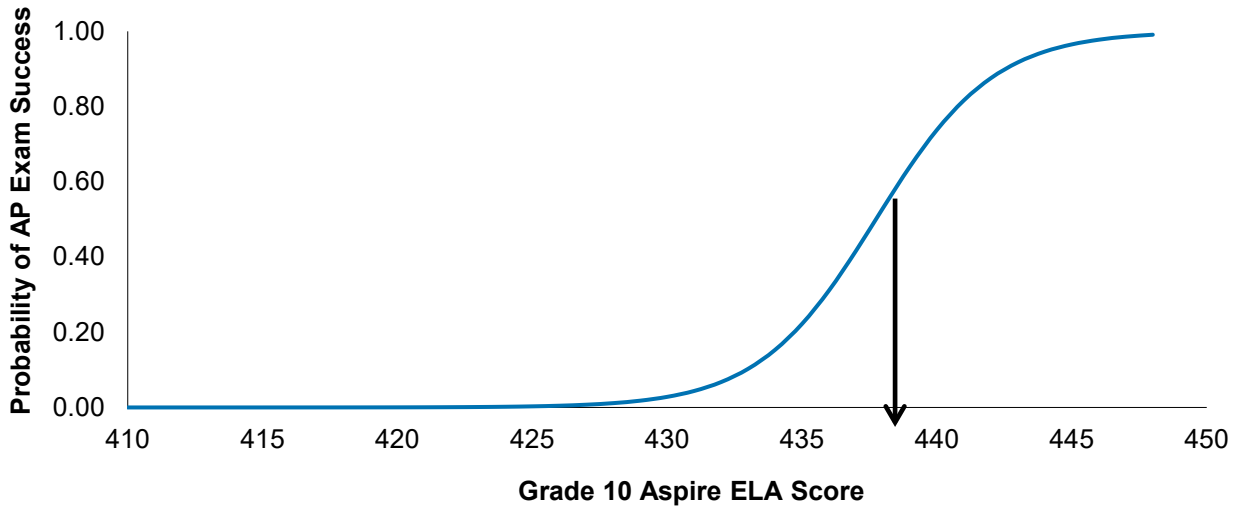
The analysis addressed the following **Research Questions**:

5. How well do Aspire test scores predict success on AP exams?
6. Does the predictive strength vary across content area?
7. Does the predictive strength vary across subgroups?

To address **Question 5**, the mean slope across all AP exams was calculated for the total group (Table 8). The means represent the average logistic regression slopes across AP exams and were weighted by sample size. The mean slope is 3.010, far exceeding the threshold for a “large” effect size (0.935) and all ACT reference slopes (Table 2). We conclude that Aspire test scores are very strong predictors of success on AP exams.

Because Aspire scores are such strong predictors of success on AP exams, Aspire scores can be used to identify students who are ready to succeed in AP courses and exams. Figure 3 shows the estimated probability of success on the AP English Language & Composition Exam, by grade 10 Aspire ELA score. Students with scores of 438 and higher have more than a 0.50 probability of succeeding on the AP exam.

Figure 3. Probability of Success on AP English Language & Composition Exam



To address **Question 6**, the mean slope was calculated for each course category (Table 8). The mean slope was largest for Aspire ELA score predicting success on AP English exams (3.518), followed by Aspire science score predicting success on AP science exams (2.886). ANOVA was used to test for differences in mean slopes across course category. Slopes were significantly higher for English relative to the other course categories. We conclude that Aspire test scores are very strong predictors of success on AP exams across all content areas and that the predictive relationship is strongest for English courses.

Table 8. Total Group Predictive Strength (Logistic Regression Slopes) of AP Exam Success by Subject Area

Subject area	Course Category	N courses	Mean slope
All	All	10	3.010
ELA	English	2	3.518
ELA	Social Studies	3	2.404
Math	Math	2	2.640
Science	Natural Science	3	2.886

To address **Question 7**, the mean slopes were examined for each subgroup (Table 9). Results are not available for the SPED subgroup because no AP exams met the sample size requirement.[7] For all subgroups, the mean slopes far exceeded the threshold for a “large” effect size and all ACT reference slopes (Table 2). Using ANOVA, we did not find significant differences in predictive strength across the included subgroups. We conclude that, across all student subgroups, Aspire test scores are very strong predictors of success on AP exams.

Table 9. Average Predictive Strength (Logistic Regression Slopes) for AP Exam Success by Group

Group	N courses	Mean slope
Total	10	3.010
ELL	2	3.343
SPED	0	--
FRL	10	3.012
Black	6	3.329
Hispanic	7	2.885
White	10	2.952

Note: Results are not available for the SPED subgroup due to small sample size

Convergent and Discriminant Evidence: ACT Aspire/PARCC Cross-Grade Correlations

Students (and groups of students) may have academic needs that vary by subject area. For example, some students need more help in math, relative to ELA. For each use of Aspire scores, it’s important for the assessment to distinguish areas of academic need. This implies that Aspire test scores should exhibit convergent and discriminant relationships with other test scores.

If Aspire test scores are highly correlated across grade levels, we have greater confidence that the constructs measured by the test are very similar across grade levels. Moreover, if the cross-grade

correlations demonstrate expected patterns of convergence and divergence, we have greater confidence in using Aspire scores to identify academic needs.

Partnership for Assessment of Readiness for College and Careers (PARCC) test scores are established measures of the Common Core State Standards. If Aspire test scores are correlated with PARCC test scores, the evidence further supports using Aspire test scores to measure progress toward meeting college and career readiness standards (Use #1).

We first examined cross-grade correlations of Aspire scores, linking scores in adjacent grades (e.g., 3-4, 4-5, etc.). Test scores from 2016 through 2018 are used. For each group, the sample size varies by grade level and subject (Appendix Table A6). To examine convergence, we examined same-subject correlations for ELA, math, and science. To evaluate whether the relationships varied by student subgroup, we examined whether a subgroup's correlation was different than the total group's correlation by 0.10 ("small" effect, using Cohen's correlation benchmarks) or more, which we consider a substantial difference.

We then examined correlations of Aspire and PARCC test scores for PARCC tests taken in spring 2015 and Aspire tests taken in spring 2016.[8] To examine convergence, PARCC ELA tests taken in grades 3-9 are paired with Aspire ELA scores for grades 4-10, PARCC math tests taken in grades 3-8 are paired with Aspire math tests taken in grades 4-9, and PARCC science tests taken in grades 5 and 7 are paired with Aspire science tests taken in grades 6 and 8. For each group, the sample size varies by grade level and subject (Appendix Table A7).

Lastly, we explored convergence/divergence by comparing math/ELA correlations to ELA/ELA and math/math correlations. Aspire ELA scores are paired with Aspire math scores from adjacent grades (e.g., grade 3 ELA with grade 4 math). Similarly, PARCC ELA tests taken in grades 3-9 are paired with Aspire math tests taken in grades 4-10. If ELA/math correlations are smaller than ELA/ELA and math/math correlations by 0.10 or more, we conclude that there is evidence of divergent relationships.

We addressed the following **Research Questions**:

8. Are Aspire scores highly correlated across grade levels?
9. Do Aspire cross-grade correlations vary across subgroups?
10. Are Aspire and PARCC scores for ELA, math, and science highly correlated?
11. Do Aspire/PARCC correlations vary across subgroups?
12. Do Aspire and Aspire/PARCC correlations show patterns of convergence and divergence?

For the total group and each subgroup, Aspire cross-grade correlations are presented in Table 10. The correlations were disattenuated[9] and then averaged across grade levels. For each subgroup, weights were applied to make the subgroup's distribution of lower-grade scores similar to the total group's distribution.

To address **Question 8**, we computed the average total group cross-grade correlations. The results indicated a correlation of 0.933 for ELA, 0.938 for math, and 0.912 for science (Table 10). Because the correlations are disattenuated, we would expect them to approach 1.000 for tests that measure identical constructs at the same point in time. The Aspire cross-grade correlations are expected to be less than 1.000 because the measured construct is not identical across grade levels and because the measures

occur one year apart, with variation in student growth. Because the correlations are near perfect (all *rs* > .90), we conclude that Aspire scores are highly correlated across grade levels and that the measured construct is very similar across grade levels.

Table 10. ACT Aspire Cross-Grade Correlations (Disattenuated), Averaged Across Grade Levels

Group	Subject		
	ELA	Math	Science
Total	0.933	0.938	0.912
ELL	0.917	0.886	0.895
SPED	0.937	0.941	0.910
FRL	0.926	0.923	0.902
Black	0.928	0.930	0.910
Hispanic	0.930	0.903	0.906
White	0.929	0.931	0.898

To address **Question 9**, we computed the Aspire correlations across subgroups (Table 10). For ELA and science, there is very little variation across subgroups. For math, the correlations for ELL (0.886) and Hispanic (0.903) were slightly lower than the total group correlation (0.938). All of the subgroup correlations were within 0.100 of the total group's correlation. We conclude that the ELA and science correlations do not vary across subgroups and that the math correlations are slightly lower for ELL and Hispanic students.

Aspire/PARCC cross-grade correlations are presented in Table 11 for the total group and each subgroup. The correlations were again disattenuated[10] and weighted and then averaged across grade levels.

To address **Question 10**, we computed the average total group Aspire/PARCC correlations. The results indicated a correlation of 0.891 for ELA, 0.856 for math, and 0.845 for science (Table 11). As expected, the Aspire/PARCC correlations were lower than the cross-grade Aspire correlations, due to differences in test design and content coverage. Because the correlations are still very large, we conclude that Aspire and PARCC scores are highly correlated, and that the two assessments measure related constructs.

Table 11. ACT Aspire/PARCC Cross-Grade Correlations (Disattenuated), Averaged Across Grade Levels

Group	Subject		
	ELA	Math	Science
Total	0.891	0.856	0.845
ELL	0.863	0.820	0.808
SPED	0.881	0.836	0.765
FRL	0.883	0.837	0.823
Black	0.872	0.816	0.813
Hispanic	0.889	0.831	0.829
White	0.890	0.859	0.837

To address **Question 11**, we computed the Aspire/PARCC correlations across subgroups (Table 11). For ELA, there was very little variation across subgroups, with correlations ranging from 0.863 (ELL) to 0.891 (Total group). For math, there was slightly more variation with correlations ranging from 0.816 (Black) to 0.859 (White). For science, the correlation for the SPED subgroup was 0.765, which is less than the Total

group correlation (0.845). All of the subgroup correlations are within 0.100 of the total group's correlation. We conclude that Aspire and PARCC scores are highly correlated for all subgroups with some minor variation in correlations across subgroups.

To address **Question 12**, we computed ELA/math cross-grade correlations for the total group. The average correlation between the Aspire ELA score and the Aspire math score was 0.817 (results not tabled). Because this correlation is smaller than the Aspire math (0.938) and ELA (0.933) correlations by more than 0.100, there is evidence of convergent-divergent relationships. Similarly, the average correlation of PARCC ELA score with Aspire math score was 0.770. Because this correlation is smaller than the Aspire/PARCC math (0.856) and ELA (0.891), there is further evidence of convergent-divergent relationships.

Summary

In this paper, we have documented evidence that Arkansas' Aspire scores are related as expected with other variables, supporting Critical Element 3.4 for ESSA Peer Review. We argue that the evidence supports five primary uses of Aspire scores; table 12 lists how each use is supported by each piece of evidence. The number of check marks indicates whether the use is directly or indirectly supported: √ = indirect support (shaded blue), √√ = direct support (shaded orange).

Table 12. Summarizing Uses of ACT Aspire Test Scores and Supporting Evidence

Use of ACT Aspire	Test-criterion relationships		Convergent/ divergent relationships	
	HS course grades	AP exams	ACT Aspire	ACT Aspire/ PARCC
1. To measure progress toward meeting college and career readiness standards	√		√	√
2. To determine if students are on target for college and career readiness	√√	√√	√	√
3. To provide instructionally actionable information to educators	√√		√	√
4. To inform evaluation of school and program effectiveness	√		√	√
5. To inform readiness for advanced high school coursework	√√	√√		

Note: √ indicates indirect support for the use of Aspire, √√ indicates direct support for the use of Aspire

Specific findings that support these uses of Aspire scores include:

- On average, Aspire test scores are strong predictors of success in high school courses across all content areas, including standard, AP, and dual enrollment courses.
- Aspire scores are strong predictors of success for all student subgroups examined.
- Students at the “In Need of Support” achievement level have the lowest probability of success in high school courses. Accuracy rates for “In Need of Support” classifications range from 71% to 75% across content areas.
- Aspire test scores are very strong predictors of success on AP exams, and this finding holds for all student subgroups examined.
- Aspire scores are highly correlated across grade levels, suggesting that the measured constructs are very similar across grade levels.
- ELA and science correlations do not vary across student subgroups, and math correlations are all within 0.10 of the total group correlation.
- Aspire and PARCC scores are highly correlated across grade levels, suggesting that the two assessments measure related constructs.
- Aspire and PARCC scores are highly correlated for all student subgroups, with only minor variation in correlations across student subgroups.
- Correlations of Aspire and PARCC scores show expected convergent/divergent patterns. ELA/math correlations are notably lower than ELA/ELA and math/math correlations.

Notes

1. Course categorizations were provided by the Arkansas Department of Education.
2. The ACT high school graduating class of 2018 is used as the population basis for standard deviations.
3. Odds Ratio = exp(slope)
4. For each course, the total group logistic regression slope estimates are presented in Appendix Table A3.
5. For career-focused courses, career readiness levels based on the Progress Toward Career Readiness Indicator (Allen, 2018) are used instead of ACT Readiness Levels.
6. The weights are designed to correct for artificial differences across groups in mean slopes that can be attributed to the distribution of test scores.
7. If the sample size requirement is relaxed for the SPED group, the mean slope for the SPED group is 2.406 across three AP exams.
8. Arkansas administered the PARCC assessments in spring 2015, followed by Aspire beginning in spring 2016.
9. The disattenuated correlation of variables x and y is calculated as the simple correlation of x and y, divided by the square root of the product of the reliability of x and reliability of y.
10. To calculate disattenuated correlations, the reliability estimates for the PARCC ELA and math tests were obtained from the PARCC 2015 technical report obtained at https://parcc-assessment.org/wp-content/uploads/2018/02/PARCC-2015-Tech-Report.pdf. For PARCC science, reliabilities of 0.90 were assumed for this report, which is slightly lower than the typical reliabilities reported for ELA and math.

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Appendix

Table A1. High School Courses and Sample Size, by Group

High school course	Subgroup						
	Total	ELL	SPED	FRL	Black	Hispanic	White
English 9	61,575	4,180	3,320	35,427	12,019	7,419	39,229
Oral Communication	40,886	3,326	3,705	22,585	6,817	5,431	26,512
English 10	59,460	3,645	3,050	32,528	11,593	6,775	38,341
English 11	39,232	2,729	2,712	22,878	8,450	4,573	24,533
Algebra I	46,635	3,934	2,437	29,280	9,820	6,263	28,481
Geometry	58,471	3,829	2,344	31,984	11,068	6,922	37,691
Algebra II	51,459	2,683	1,411	26,101	9,846	5,760	33,385
Pre-Calculus	9,220	120	30	3,294	1,306	580	6,733
Physical Science	60,569	4,617	5,706	37,143	12,445	7,347	38,123
Biology	62,629	4,283	5,052	35,359	12,385	7,462	39,850
Chemistry	40,715	2,179	1,094	19,680	7,582	4,722	26,464
Environmental Science	10,399	867	2,497	7,234	2,388	1,087	6,511
Physics	4,859	289	154	2,018	607	656	3,262
Civics	58,940	4,176	5,192	34,808	12,150	7,073	37,027
Economics	55,474	4,016	4,756	32,987	11,573	6,720	34,683
World History	50,440	3,573	4,782	30,410	10,937	5,826	31,547
Psychology	8,127	395	455	4,439	1,417	893	5,463
Sociology	6,364	332	422	3,728	1,373	677	4,055
US History	45,650	3,467	4,357	26,616	9,268	5,857	28,555
CF: Computerized Business Applications	22,688	1,089	2,305	14,564	5,507	2,098	14,291
CF: Family and Consumer Sciences	19,315	1,361	2,517	12,704	4,596	2,224	11,684
CF: Survey of Agriculture Systems	12,707	494	1,764	7,909	1,056	906	10,395
CF: Technology Design and Applications	3,471	216	358	2,286	1,169	402	1,799
CF: Agricultural Mechanics	5,001	175	691	2,888	293	306	4,284
CF: Child Development	8,722	509	1,081	5,737	2,675	913	4,833
CF: Financial Literacy	5,481	333	620	3,154	1,221	565	3,424
CF: Food and Nutrition	8,829	627	1,135	5,441	2,257	1,001	5,143
CF: Marketing	1,310	95	65	616	233	184	820
AP English Language and Composition	14,874	289	64	5,441	2,423	1,206	10,414
AP English Literature and Composition	2,200	95	9	1,077	142	401	1,492
AP Calculus AB	1,011	7	2	166	99	72	663
AP Statistics	912	16	3	234	95	76	638
AP Biology	3,197	75	5	1,121	424	298	2,219
AP Chemistry	1,144	16	1	281	108	99	792
AP Physics	1,815	46	9	495	138	213	1,248
AP Human Geography	1,566	59	17	363	99	216	1,065
AP World History	9,052	426	54	3,242	1,364	1,189	5,880
AP Psychology	1,662	67	7	447	142	236	1,088

High school course	Subgroup						
	Total	ELL	SPED	FRL	Black	Hispanic	White
DE: English Comp I	737	3	4	300	56	59	591
DE: English Comp II	348	3	3	157	14	36	279
DE: Oral Communication	1,739	31	76	800	102	99	1,484
DE: College Algebra	1,088	6	2	274	69	67	894
DE: Pre-Calculus/Trig	515	5	2	134	22	27	437
DE: Biology	568	70	45	310	48	143	357
DE: Anatomy and Physiology	330	3	7	148	54	18	245
DE: World History	735	3	35	305	27	42	641
DE: Psychology	232	1	4	116	12	13	199
DE: US History	1,084	3	35	382	57	41	930

Note: AP = Advanced Placement, DE = Dual Enrollment, CF = Career Focused (according to Arkansas's common course code list)

Table A2. Descriptive Statistics for Analysis of Success in High School Courses

High school course	Primary grade level	Subject area	Test Score		Course grade distribution				
			Mean	SD	A	B	C	D	F
English 9	9	ELA	425.7	6.3	0.292	0.320	0.220	0.113	0.054
Oral Communication	9	ELA	425.8	6.9	0.435	0.293	0.152	0.077	0.044
English 10	10	ELA	426.2	6.8	0.292	0.328	0.223	0.107	0.051
English 11	11	ELA	425.6	6.4	0.218	0.332	0.262	0.131	0.056
Algebra I	9	Math	422.4	6.5	0.200	0.285	0.254	0.165	0.097
Geometry	10	Math	424.8	7.4	0.260	0.287	0.229	0.146	0.077
Algebra II	11	Math	426.6	7.4	0.292	0.300	0.224	0.128	0.057
Pre-Calculus	11	Math	433.7	6.7	0.473	0.318	0.142	0.049	0.019
Physical Science	9	Science	423.4	7.7	0.255	0.323	0.239	0.125	0.058
Biology	10	Science	425.0	8.1	0.257	0.318	0.241	0.126	0.058
Chemistry	11	Science	428.6	8.1	0.278	0.336	0.236	0.108	0.043
Environmental Science	11	Science	420.6	7.2	0.179	0.332	0.288	0.142	0.060
Physics	11	Science	429.9	7.9	0.322	0.344	0.209	0.088	0.037
Civics	9	ELA	425.1	6.6	0.360	0.315	0.198	0.091	0.037
Economics	9	ELA	425.2	6.7	0.373	0.308	0.188	0.089	0.042
World History	10	ELA	424.7	6.8	0.300	0.319	0.223	0.107	0.050
Psychology	11	ELA	427.5	6.7	0.443	0.283	0.159	0.069	0.046
Sociology	11	ELA	426.9	7.0	0.464	0.272	0.143	0.072	0.049
US History	11	ELA	425.6	6.8	0.315	0.336	0.213	0.094	0.042
CF: Computerized Business Applications	9	Composite	424.0	7.2	0.427	0.276	0.157	0.079	0.062
CF: Family and Consumer Sciences	9	Composite	423.3	6.9	0.471	0.292	0.145	0.056	0.037
CF: Survey of Agriculture Systems	9	Composite	423.2	6.9	0.525	0.282	0.124	0.045	0.025
CF: Technology Design and Applications	9	Composite	423.5	7.2	0.400	0.263	0.160	0.097	0.080
CF: Agricultural Mechanics	10	Composite	423.5	7.1	0.619	0.273	0.076	0.022	0.009
CF: Child Development	10	Composite	423.5	6.9	0.455	0.286	0.155	0.067	0.037
CF: Financial Literacy	11	Composite	424.8	7.5	0.400	0.282	0.175	0.091	0.052
CF: Food and Nutrition	11	Composite	424.0	7.2	0.486	0.306	0.133	0.053	0.023
CF: Marketing	11	Composite	426.8	7.1	0.450	0.291	0.165	0.066	0.029
AP English Language and Composition	11	ELA	432.8	5.0	0.360	0.411	0.165	0.050	0.014
AP English Literature and Composition	11	ELA	433.2	4.6	0.385	0.375	0.171	0.051	0.019
AP Calculus Ab	11	Math	439.5	5.2	0.486	0.309	0.151	0.043	0.012
AP Statistics	11	Math	436.0	6.5	0.464	0.330	0.139	0.050	0.016
AP Biology	11	Science	434.3	6.8	0.381	0.356	0.184	0.053	0.026
AP Chemistry	11	Science	437.6	6.2	0.462	0.340	0.142	0.045	0.010

High school course	Primary grade level	Subject area	Test Score		Course grade distribution				
			Mean	SD	A	B	C	D	F
AP Physics	11	Science	436.4	6.4	0.354	0.358	0.215	0.058	0.015
AP Human Geography	9	ELA	432.9	5.0	0.426	0.311	0.161	0.075	0.027
AP World History	10	ELA	431.8	5.3	0.309	0.377	0.202	0.083	0.029
AP Psychology	11	ELA	433.7	5.1	0.418	0.343	0.148	0.058	0.034
DE: English Comp I	11	ELA	433.6	4.0	0.449	0.364	0.138	0.033	0.016
DE: English Comp II	11	ELA	433.7	4.3	0.489	0.336	0.121	0.029	0.026
DE: Oral Communication	11	ELA	429.7	6.5	0.503	0.311	0.122	0.042	0.022
DE: College Algebra	11	Math	434.6	5.4	0.464	0.352	0.139	0.032	0.013
DE: Pre-Calculus/Trig	11	Math	436.6	5.2	0.441	0.317	0.173	0.052	0.017
DE: Biology	10	Science	425.9	8.3	0.197	0.324	0.292	0.127	0.060
DE: Anatomy and Physiology	11	Science	428.9	7.9	0.376	0.355	0.173	0.073	0.024
DE: World History	10	ELA	429.2	6.2	0.297	0.331	0.241	0.116	0.016
DE: Psychology	11	ELA	431.2	5.9	0.470	0.250	0.155	0.073	0.052
DE: US History	11	ELA	431.9	5.5	0.553	0.310	0.101	0.026	0.010

Note: AP = Advanced Placement, DE = Dual Enrollment, CF = Career Focused (according to Arkansas's common course code list)

Table A3. Total Group Logistic Regression Slope Estimates for Success in High School Courses

High school course	Primary grade level	Subject area	Logistic regression slope estimates					
			A		B or higher		C or higher	
			EST	SE	EST	SE	EST	SE
English 9	9	ELA	1.767	0.017	1.475	0.014	1.283	0.016
Oral Communication	9	ELA	1.308	0.016	1.103	0.015	1.003	0.018
English 10	10	ELA	1.666	0.017	1.397	0.014	1.236	0.016
English 11	11	ELA	1.407	0.022	1.159	0.017	0.994	0.019
Algebra I	9	Math	1.556	0.020	1.438	0.017	1.362	0.019
Geometry	10	Math	1.636	0.017	1.519	0.015	1.477	0.017
Algebra II	11	Math	1.412	0.016	1.240	0.015	1.220	0.018
Pre-Calculus	11	Math	1.410	0.042	1.130	0.044	1.048	0.061
Physical Science	9	Science	1.618	0.016	1.371	0.013	1.197	0.015
Biology	10	Science	1.450	0.015	1.285	0.013	1.161	0.015
Chemistry	11	Science	1.460	0.020	1.192	0.016	1.073	0.019
Environmental Science	11	Science	0.960	0.039	0.820	0.031	0.729	0.037
Physics	11	Science	1.310	0.056	1.181	0.049	1.024	0.058
Civics	9	ELA	1.451	0.015	1.237	0.013	1.097	0.016
Economics	9	ELA	1.387	0.015	1.191	0.013	1.035	0.016
World History	10	ELA	1.496	0.017	1.237	0.014	1.082	0.017
Psychology	11	ELA	1.292	0.040	1.188	0.038	1.068	0.045
Sociology	11	ELA	1.294	0.043	1.178	0.043	1.004	0.049
US History	11	ELA	1.405	0.018	1.162	0.015	1.009	0.018
CF: Computerized Business Applications	9	Composite	1.567	0.024	1.461	0.024	1.283	0.029
CF: Family and Consumer Sciences	9	Composite	1.370	0.024	1.243	0.026	1.150	0.035
CF: Survey of Agriculture Systems	9	Composite	1.238	0.029	1.180	0.035	1.180	0.035
CF: Technology Design and Applications	9	Composite	1.557	0.063	1.442	0.062	1.397	0.073
CF: Agricultural Mechanics	10	Composite	0.987	0.047	0.921	0.069	1.020	0.109
CF: Child Development	10	Composite	1.435	0.038	1.380	0.043	1.297	0.056
CF: Financial Literacy	11	Composite	1.479	0.049	1.408	0.050	1.182	0.058
CF: Food and Nutrition	11	Composite	1.387	0.037	1.276	0.044	1.191	0.061
CF: Marketing	11	Composite	1.604	0.112	1.495	0.119	1.280	0.146
AP English Language and Composition	11	ELA	2.248	0.047	1.605	0.041	1.319	0.056
AP English Literature and Composition	11	ELA	2.196	0.123	1.640	0.112	1.243	0.145
AP Calculus Ab	11	Math	1.813	0.170	1.387	0.158	1.292	0.226
AP Statistics	11	Math	1.507	0.143	1.218	0.154	1.344	0.218
AP Biology	11	Science	1.868	0.090	1.453	0.079	1.181	0.103
AP Chemistry	11	Science	1.498	0.144	1.190	0.141	1.102	0.209
AP Physics	11	Science	1.866	0.123	1.395	0.097	1.284	0.133

High school course	Primary grade level	Subject area	Logistic regression slope estimates					
			A		B or higher		C or higher	
			EST	SE	EST	SE	EST	SE
AP Human Geography	9	ELA	2.076	0.126	1.867	0.122	1.605	0.147
AP World History	10	ELA	2.005	0.057	1.693	0.048	1.502	0.057
AP Psychology	11	ELA	2.163	0.140	1.795	0.134	1.646	0.163
DE: English Comp I	11	ELA	1.250	0.177	0.992	0.193	0.394	0.309
DE: English Comp II	11	ELA	1.189	0.223	0.749	0.249	0.569	0.389
DE: Oral Communication	11	ELA	1.205	0.081	1.069	0.085	0.994	0.114
DE: College Algebra	11	Math	1.418	0.124	1.158	0.136	1.103	0.219
DE: Pre-Calculus/Trig	11	Math	1.753	0.206	1.387	0.197	1.173	0.284
DE: Biology	10	Science	1.641	0.185	1.209	0.129	1.104	0.142
DE: Anatomy and Physiology	11	Science	1.166	0.198	1.179	0.203	1.164	0.252
DE: World History	10	ELA	1.560	0.169	1.466	0.134	1.332	0.151
DE: Psychology	11	ELA	0.961	0.230	0.932	0.227	0.633	0.260
DE: US History	11	ELA	0.784	0.109	0.868	0.126	0.984	0.193

Note: AP = Advanced Placement, DE = Dual Enrollment, CF = Career Focused (according to Arkansas's common course code list)

Table A4. AP Exams and Sample Size, by Group

AP course/exam	Subgroup						
	Total	ELL	SPED	FRL	Black	Hispanic	White
AP English Lang & Comp	13,373	237	44	4,666	2,001	1,057	9,560
AP English Lit & Comp	1,923	75	0	918	124	322	1,333
AP Calculus AB	802	0	0	133	87	57	515
AP Statistics	813	0	0	197	70	64	586
AP Biology	2,841	59	0	954	347	244	2,023
AP Chemistry	1,025	0	0	246	89	94	718
AP Physics	1,657	0	0	454	144	184	1,139
AP Human Geography	1,347	44	11	283	73	171	944
AP World History	7,873	340	33	2,704	1,077	1,001	5,264
AP Psychology	1,459	45	0	351	117	194	975

Table A5. Descriptive Statistics for Analysis of Success on AP Exams

AP exam	Primary grade level	Subject area	Test Score		Exam score distribution				
			Mean	SD	5	4	3	2	1
AP English Lang & Comp	11	ELA	433.0	4.9	0.032	0.083	0.203	0.364	0.318
AP English Lit & Comp	11	ELA	433.5	4.6	0.010	0.048	0.182	0.517	0.243
AP Calculus Ab	11	Math	439.5	5.2	0.168	0.166	0.227	0.281	0.158
AP Statistics	11	Math	436.2	6.3	0.080	0.141	0.199	0.193	0.386
AP Biology	11	Science	434.7	6.6	0.016	0.092	0.284	0.396	0.211
AP Chemistry	11	Science	437.8	6.1	0.038	0.102	0.168	0.320	0.372
AP Physics	11	Science	436.6	6.3	0.012	0.046	0.141	0.300	0.501
AP Human Geography	9	ELA	433.3	4.8	0.114	0.203	0.232	0.159	0.292
AP World History	10	ELA	432.2	5.1	0.032	0.107	0.205	0.363	0.293
AP Psychology	11	ELA	434.2	4.7	0.119	0.222	0.219	0.167	0.273

Table A6. ACT Aspire Cross-Grade Correlation Sample Size, by Group

Subjects	Grade level pair	Subgroup						
		Total	ELL	SPED	FRL	Black	Hispanic	White
ELA	3/4	70,577	6,908	7,773	47,508	14,517	9,475	42,788
	4/5	68,328	6,531	7,913	45,179	13,510	9,261	41,928
	5/6	66,176	6,180	7,773	42,983	12,914	8,673	41,108
	6/7	66,160	5,830	7,368	42,042	12,978	8,377	41,380
	7/8	66,236	5,511	6,890	40,818	12,992	8,344	41,587
	8/9	66,104	5,200	6,500	39,645	13,118	8,129	41,759
	9/10	65,014	4,694	5,897	37,564	12,951	7,602	41,462
Math	3/4	70,713	6,983	7,792	47,616	14,540	9,528	42,820
	4/5	68,427	6,584	7,925	45,269	13,529	9,302	41,940
	5/6	66,300	6,239	7,785	43,081	12,934	8,722	41,136
	6/7	66,296	5,882	7,396	42,155	13,012	8,418	41,420
	7/8	66,360	5,576	6,906	40,922	13,013	8,402	41,616
	8/9	66,244	5,255	6,526	39,755	13,155	8,175	41,806
	9/10	65,217	4,776	5,920	37,720	12,984	7,687	41,527
Science	3/4	70,708	6,979	7,793	47,617	14,543	9,529	42,812
	4/5	68,420	6,583	7,920	45,259	13,525	9,302	41,937
	5/6	66,283	6,239	7,782	43,067	12,929	8,722	41,128
	6/7	66,293	5,879	7,402	42,147	13,008	8,416	41,424
	7/8	66,331	5,567	6,899	40,899	13,013	8,395	41,598
	8/9	66,231	5,253	6,515	39,741	13,150	8,177	41,797
	9/10	65,186	4,768	5,918	37,703	12,982	7,681	41,506
ELA/Math	3/4	70,596	6,912	7,776	47,526	14,525	9,476	42,794
	4/5	68,352	6,531	7,921	45,201	13,522	9,262	41,935
	5/6	66,209	6,180	7,778	43,013	12,933	8,676	41,118
	6/7	66,186	5,833	7,370	42,064	12,992	8,380	41,388
	7/8	66,270	5,518	6,902	40,853	13,006	8,350	41,596
	8/9	66,153	5,200	6,512	39,677	13,131	8,128	41,794
	9/10	65,074	4,696	5,904	37,619	12,973	7,603	41,495

Table A7. ACT Aspire/PARCC Correlation Sample Size, by Group

Subjects	Grade level pair	Subgroup						
		Total	ELL	SPED	FRL	Black	Hispanic	White
ELA	3/4	32,557	3,080	3,812	20,800	6,281	4,269	19,940
	4/5	32,891	2,927	3,691	20,638	6,407	4,081	20,315
	5/6	32,691	2,731	3,380	20,444	6,361	4,035	20,296
	6/7	32,810	2,582	3,288	19,851	6,353	3,974	20,439
	7/8	33,295	2,434	3,148	19,654	6,566	3,879	20,918
	8/9	32,725	2,080	2,832	18,848	6,400	3,522	20,636
	9/10	31,708	1,799	2,635	17,503	6,079	3,399	20,104
Math	3/4	32,995	3,157	3,929	21,141	6,385	4,341	20,159
	4/5	33,137	2,977	3,822	20,817	6,465	4,122	20,440
	5/6	33,103	2,814	3,548	20,758	6,451	4,103	20,503
	6/7	32,950	2,628	3,335	19,958	6,384	4,012	20,490
	7/8	33,201	2,496	3,193	19,692	6,544	3,917	20,840
	8/9	26,816	2,021	2,864	16,814	5,614	3,141	16,355
Science	5/6	33,219	2,817	3,557	20,834	6,474	4,105	20,580
	7/8	33,554	2,514	3,209	19,831	6,638	3,946	21,014
ELA/Math	3/4	32,947	3,097	3,930	21,093	6,387	4,297	20,168
	4/5	33,110	2,938	3,824	20,793	6,467	4,097	20,444
	5/6	33,059	2,755	3,551	20,714	6,455	4,063	20,511
	6/7	32,923	2,587	3,343	19,932	6,389	3,981	20,499
	7/8	33,374	2,442	3,194	19,709	6,598	3,890	20,954
	8/9	32,904	2,099	2,905	18,977	6,443	3,550	20,728
	9/10	31,906	1,830	2,695	17,635	6,134	3,424	20,200

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