ACT Research & Policy

TECHNICAL BRIEF

Influence of Achievement in Core High School Courses on ACT® Scores

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Introduction

The ACT® test is designed to measure the academic skills needed to perform college-level work and is oriented toward the general content areas of college and high school instructional programs.[1] If performance on the ACT test is influenced by mastery of high school courses, one would expect that standardized measures of achievement in specific high school courses would be predictive of performance on the ACT. Moreover, the predictive relationship should exist after controlling for a student's level of achievement before high school. To test this proposition, this study was conducted to examine the extent to which ACT scores are predicted by measures of achievement in specific core high school courses, controlling for pre-high school academic achievement.

Data

ACT Explore® scores were used as measures of pre-high school educational achievement and ACT QualityCore® scores were used as measures of high school course achievement. For both the ACT and ACT Explore, the philosophical basis for the tests are that (a) the tests should measure the academic skills necessary for education and work after high school and (b) the content of the tests should be related to major curriculum areas.[2] The ACT focuses on the knowledge and skills attained as the cumulative effect of school experience. ACT Explore is intended for all students in grades 8 and 9 and focuses on the knowledge and skills that are usually attained by grade 8. ACT QualityCore includes course-specific end-of-course assessments that measure performance against empirically-derived course standards.[3] Students who took the ACT Explore tests in grade 8; ACT QualityCore end-of-course exams in grades 9, 10, or 11; and the ACT in grade 11 or grade 12 were included in the study.

For each subject area of the ACT, same-subject ACT QualityCore end-of-course exams were used in the analysis. For English, ACT QualityCore scores from English 9, English 10, and English 11 were used; for mathematics, ACT QualityCore scores from Algebra 1, Geometry, and Algebra 2 were used; for reading, ACT QualityCore scores from US History were used; and for science, ACT QualityCore scores from Biology and Chemistry were used. Scores from other ACT QualityCore courses (English 12, Pre-Calculus, and Physics) were not used because few students took these courses, or a majority took them after taking the ACT. For students who took the ACT more than once, their last set of scores was used for analysis. ACT QualityCore scores were only used if the student took the ACT QualityCore course before or concurrently with the ACT (e.g., students who took an ACT QualityCore end-of-course exam and

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the ACT in spring grade 11 were included). The students included in the analyses were scheduled to complete high school between 2011 and 2016. Table 1 summarizes the samples used for each analysis.

Method

Multiple linear regression was used to relate the measures of pre-high school educational achievement (ACT Explore scores) and high school course achievement (ACT QualityCore scores) to ACT scores. Regression coefficients, standard errors, p-values, and standardized beta weights are presented. The regression coefficients represent estimates of how much the mean ACT score increases for each one-point increase in the predictor. The standardized beta weights estimate how many standard deviations the mean ACT score increases for each one-standard-deviation increase in the predictor and allow for comparisons of the strengths of the relationships across predictors. If a student's mastery of high school courses influences their ACT scores, the regression coefficients for the ACT QualityCore scores should be positive and statistically significant (e.g., p-value less than 0.05).

Results

End-of-course achievement in English 9, English 10, and English 11 was predictive of performance on the ACT English test, after controlling for pre-high school academic achievement (Table 2). This suggests that performance on the ACT English test is influenced by mastery of English courses in high school. With the exception of the ACT Explore reading score, all of the measures were significantly predictive of ACT English score. The strongest predictive weights were observed for ACT QualityCore English 11 scores (beta = 0.290), grade 8 ACT Explore English scores (beta = 0.269), ACT QualityCore English 10 scores (beta = 0.166), and ACT QualityCore English 9 scores (beta = 0.107). The findings suggest that level of achievement in courses with the closest time proximity (e.g., English 11) to the ACT is more predictive.

End-of-course achievement in Algebra 1, Geometry, and Algebra 2 was predictive of performance on the ACT mathematics test, after controlling for pre-high school academic achievement (Table 3). Performance on the ACT mathematics test is influenced by mastery of core mathematics courses in

Table 1. Study Samples

	Subject area of analysis			
Sample Characteristic	English	Mathematics	Reading	Science
N (students)	4,336	5,732	134,470	7,573
% Male	53	47	49	45
% Female	47	53	51	55
% African American	8	6	8	6
% Asian	1	1	1	1
% Hispanic	3	3	3	5
% White	80	81	77	78
% Other race/ethnicity	4	4	4	4
% Race unknown	4	5	7	6
N (schools)	44	109	335	99
ACT Composite, mean (SD)	21.2 (4.9)	20.6 (4.5)	20.0 (5.0)	22.3 (5.0)

Table 2. Predicting ACT English Score

Predictor	EST	SE	P	BETA
ACT Explore English	0.403	0.020	<.001	0.269
ACT Explore Mathematics	0.153	0.020	<.001	0.089
ACT Explore Reading	0.035	0.020	.077	0.022
ACT Explore Science	0.078	0.024	.002	0.040
ACT QualityCore English 9	0.100	0.013	<.001	0.107
ACT QualityCore English 10	0.172	0.015	<.001	0.166
ACT QualityCore English 11	0.266	0.013	<.001	0.290

Note: N = 4,336, R^2 = 0.732

Table 3. Predicting ACT Mathematics Score

Predictor	EST	SE	P	BETA
ACT Explore English	0.102	0.013	<.001	0.090
ACT Explore Mathematics	0.290	0.016	<.001	0.209
ACT Explore Reading	0.044	0.013	<.001	0.037
ACT Explore Science	0.139	0.017	<.001	0.095
ACT QualityCore Algebra 1	0.162	0.010	<.001	0.161
ACT QualityCore Geometry	0.238	0.010	<.001	0.236
ACT QualityCore Algebra 2	0.231	0.010	<.001	0.227

Note: N = 5,732, R^2 = 0.690

high school. All of the measures of pre-high school and end-of-course achievement were significantly predictive of ACT mathematics score. The strongest predictive weights were observed for ACT QualityCore Geometry scores (beta = 0.236), ACT QualityCore Algebra 2 scores (beta = 0.227), grade 8 ACT Explore mathematics scores (beta = 0.209), and ACT QualityCore Algebra 1 scores (beta = 0.161). Level of achievement in courses with the closest time proximity (e.g., Algebra 2 and Geometry) to the ACT is more predictive.

End-of-course achievement in US History was predictive of performance on the ACT reading test, after controlling for pre-high school academic achievement (Table 4). The strongest predictive weights were observed for ACT QualityCore US History score (beta = 0.347), grade 8 ACT Explore English score (beta = 0.252), and grade 8 ACT Explore reading score (beta = 0.220). The results suggest that performance on the ACT reading test is influenced by mastery of high school courses that require and cultivate reading skills, such as US History.

End-of-course achievement in Biology and Chemistry was predictive of performance on the ACT science test, after controlling for pre-high school academic achievement (Table 5). Performance on the ACT science test is influenced by mastery of science courses in high school. The strongest predictive weights were observed for ACT QualityCore Chemistry scores (beta = 0.267), ACT QualityCore Biology scores (beta = 0.229), grade 8 ACT Explore mathematics score (beta = 0.150), and grade 9 ACT Explore science score (beta = 0.131).

Table 4. Predicting ACT Reading Score

Predictor	EST	SE	P	BETA
ACT Explore English	0.371	0.004	<.001	0.252
ACT Explore Mathematics	0.094	0.004	<.001	0.055
ACT Explore Reading	0.355	0.004	<.001	0.220
ACT Explore Science	0.141	0.005	<.001	0.073
ACT QualityCore US History	0.395	0.002	<.001	0.347

Note: N = 134,470, R^2 = 0.650

Table 5. Predicting ACT Science Score

Predictor	EST	SE	P	BETA
ACT Explore English	0.121	0.014	<.001	0.097
ACT Explore Mathematics	0.222	0.016	<.001	0.150
ACT Explore Reading	0.102	0.014	<.001	0.076
ACT Explore Science	0.214	0.019	<.001	0.131
ACT QualityCore Biology	0.199	0.009	<.001	0.229
ACT QualityCore Chemistry	0.223	0.009	<.001	0.267

Note: N = 7,573, R^2 = 0.624

Table 6. Contrasting Variance Explained of ACT Scores Across Studies

	Predictor variables used to explain ACT scores	
	Prior achievement, achievement in core high school courses	High school grades and courses taken, high school characteristics, noncognitive characteristics, SES, demographics
Subject Area	**Current Study**	**McNeish, Radunzel, & Sanchez (2015)**
English	0.73	0.56
Mathematics	0.69	0.60
Reading	0.65	0.44
Science	0.62	0.49

Summary

The results of the analyses support the proposition that performance on the ACT is influenced by achievement in high school courses from the core subject areas (English, mathematics, social studies, and natural science). The study results can be used as a source of evidence for validating the use of ACT scores as measures of educational achievement.

The predictive weight of the course achievement measure with the closest time proximity to the ACT was larger than the predictive weight of the pre-high school achievement measure (ACT Explore) from the same subject area. While ACT Explore scores are strong predictors of ACT scores, the results show that achievement in core high school courses also has a strong bearing on ACT scores. Students who master core high school courses are more likely to demonstrate high academic growth during high school.

Previous studies have examined predictors of ACT scores.[4] The current study differs from the previous studies in the predictor set used—namely pre-high school academic achievement (measured by ACT Explore

scores) and achievement in core high school courses (measured by ACT QualityCore scores). Table 6 contrasts the variance explained of ACT scores (R^2) for the current study with those from another recent study that used a completely different set of predictors (McNeish, Radunzel, and Sanchez, 2015). Prior achievement and achievement in core high school courses explained ACT scores better than high school course grades and courses taken, high school characteristics, noncognitive characteristics, SES, and demographic variables. This may be due to the standardized measures of prior achievement and achievement in core high school courses being more directly related to the outcome, which is also a standardized measure of academic achievement, relative to other variables such as high school coursework and grades. Additional research is needed to determine the extent that the two sets of predictor variables could be combined to predict ACT scores and later college outcomes. ■

Notes

1 ACT. (2014a). *The ACT Technical Manual.* Iowa City, IA: Author.

2 ACT. (2013). *ACT Explore Technical Manual.* Iowa City, IA: Author.

3 ACT. (2014b). *ACT QualityCore Technical Manual.* Iowa City, IA: Author.

4 McNeish, D.M., Radunzel, J., & Sanchez, E. (2015). *A multidimensional perspective of college readiness: Relating student and school characteristics to performance on the ACT.* (ACT Research Report 2015-6). Iowa City, IA: ACT, Inc.; Noble, J.P., Roberts, W.L., & Sawyer, R.L. (2006). *Student achievement, behavior, perceptions, and other factors affecting ACT scores.* (ACT Research Report 2006-1). Iowa City, IA: ACT, Inc.; Noble, J.P., & Schnelker, D. (2007). *Using hierarchical modeling to examine course work and ACT score relationships across high schools.* (ACT Research Report 2007-2). Iowa City, IA: ACT, Inc.; Sawyer, R. (2008). *Benefits of additional high school course work and improved course performance in preparing students for college.* (ACT Research Report 2008-1). Iowa City, IA: ACT, Inc.