Validity Considerations for 10th-Grade ACT State and District Testing

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EXECUTIVE SUMMARY

States and districts have expressed interest in administering the ACT® to 10th-grade students. Given that the ACT was designed to be administered in the spring of 11th grade or fall of 12th grade, the appropriateness of this use should be evaluated. As such, the focus of this paper is to summarize empirical evidence evaluating the use of the ACT as a measure of college readiness for 10th graders. In alignment with a Standards for Educational and Psychological Testing (AERA, APA, & NCME, 2014), empirical evidence related to five sources of validity evidence (response processes, internal structure, content, relation to other variables, and consequences) are summarized. As compared to 11th-grade test administrations, the results indicate that when the ACT is administered to all 10th graders:

- Students are similarly motivated (response process)
- Scores are only slightly less reliable (internal structure)
- ACT scores and test completion rates are predictably lower for 10th graders relative to 11th graders

Additionally, the results indicate that:

- The content of the test is aligned to college readiness standards based on what students learn in high school and need to know to succeed in college (content)
- How students perform on the ACT in 10th grade is comparable to other 10th-grade measures (i.e., PreACT®) of college readiness
- ACT scores from 10th grade are predictive of high school grades and 11th grade ACT scores (relation to other variables)

Unlike other 10th grade tests, the ACT provides a college-reportable score and greater test security (relative to the PreACT test). Relative to 11th-grade ACT testing, the primary drawback of 10th-grade ACT testing is that students have less time for academic development and are less likely to have taken courses that can contribute to higher ACT scores. While most uses of 10th-grade ACT test scores are also possible with other assessments, the primary benefit of ACT testing is that it provides a secure measure for admissions to postsecondary programs. Collectively, the evidence supports the use of the ACT as a measure of college readiness or academic preparation level for 10th-grade students.

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Introduction

Since 1959, ACT® scores have been used for many purposes, including college admissions, placement, scholarship eligibility, and talent identification. In some states, the ACT is also used as a measure of school accountability – either as an academic achievement indicator, a college readiness indicator, or both. Because the ACT is often associated with high-stakes decisions for students, those students are motivated to perform their best. In addition, other members of educational communities (e.g., parents, school leaders, community leaders, and policymakers) have a vested interest in how their students perform on the test.

The ACT is administered on national test dates, testing primarily college-bound students, and through state and district testing programs, testing all students. In both cases, students are usually in the spring of 11th grade or fall of 12th grade when they take the test. There is also some interest among state and district leaders in spring grade 10 testing. This interest has multiple reasons:

- To give all students an early opportunity to place into college (dual enrollment) courses
- To provide authentic practice for students to take the ACT again in grade 11
- To obtain information from a secure and reliable test that students take seriously
- To determine if students are on target for college and career readiness
- To help with evaluation of school/district programs and curricula

However, given that the ACT is typically given in 11th and 12th grade, there may be concerns that ACT scores for a 10th-grade testing program would not be appropriate measures of academic achievement. Further, assessments such as the PreACT™, ACT Aspire®, and other state assessments can fulfill some of these 10th-grade testing needs. Thus, there is a need to evaluate, for different assessment goals and contexts, if and when the ACT test is an appropriate measure for 10th-grade populations and to examine the merits of the ACT relative to other 10th-grade assessments.

Evidence from Early Adopters of 10th-grade ACT Testing

Some schools and districts across the United States have already adopted the ACT test for both 10th and 11th graders. We have analyzed data from these early adopters to better understand differences in the validity and reliability of ACT scores for 10th grade relative to 11th grade.

In the spring of the 2016–2017 or 2017–2018 academic years, 53 schools from 15 states administered the ACT to virtually all of their 10th- and 11th-grade students through state or district testing programs. Of the 53 schools, 19 are located in rural locales, nine in towns, eight in suburbs, and 17 in urban locales; 34 were public schools and 19 were non-public.

The schools tested 5,415 10th-grade students and 5,712 11th-grade students.[1] The sample was 52% female, 48% male, 65% White, 20% African American, 8% Hispanic, 2% Asian, and 5% other race/ethnicity. Approximately one-third (33%)

were low-income (<$36K), 36% had parental income from $36K-$80K, and 31% had family income greater than $80K. The 10th- and 11th-grade samples were very similar in terms of the demographic distribution by sex, race/ethnicity, and parents' income. The average 11th-grade ACT Composite score was 19.8, which is slightly higher than the average across all schools that participated in 11th-grade state or district testing programs in spring 2018 (19.0). We use this sample of schools and students to make comparisons of 10th- and 11th-grade ACT administrations on:

- Course-taking rates for courses most related to higher ACT scores
- College reporting (score-sending and enrollment in ACT's Educational Opportunity Service)
- Test completion and guessing patterns
- Score reliability
- Test performance (score averages and college readiness rates)

Course-Taking

End-of-course assessments typically measure content knowledge tied to a specific high school course. Conversely, the ACT measures achievement with respect to college and career readiness in general and requires examinees to integrate knowledge, skills, and abilities (KSAs) from a variety of courses. In particular, ACT administers the National Curriculum Survey® (ACT, 2016) every three to five years, and the results of the survey inform test design and content. Teachers respond to a series of questions regarding the importance and coverage of specific skills for courses in elementary school, middle school, high school, and college. Because the ACT is designed to measure the most essential content, skills, and concepts taught in high school and needed for success in college and career, content evidence exists supporting the use of the ACT to measure high school students' academic preparation level.

Research shows that students who take challenging courses during high school and perform well in those courses tend to achieve higher ACT scores (McNeish, Radunzel, & Sanchez, 2015). In particular, students tend to perform significantly better after taking upper-level math and science coursework. One reason for this is that the ACT tests not only concepts that are introduced in Algebra 1 and Geometry, but also concepts taught in Algebra 2 courses. And, the science test draws content for its passages from Biology, Chemistry, and Physics. While the science test does not focus on course-specific content knowledge, there are several questions that do require this knowledge, and ACT's research shows that students who have taken more science courses tend to perform better on the test. Students' ACT scores also increase with additional English and social studies coursework. However, upper-level courses in these areas are less likely to introduce new and specific concepts that are tested by the ACT.

Testing later in high school (e.g., spring of 11th grade or fall of 12th grade) helps students achieve higher ACT scores because they have more time for coursework and more time to develop the skills needed to integrate knowledge from multiple courses and apply it to different contexts. Table 1 compares math and science course-taking rates for the 10th- and 11th-grade student groups. The vast majority of students in both groups took Algebra 1, but 11th graders were more likely to have taken Geometry (95% vs. 85%), Algebra 2 (88% vs. 52%), Biology (98% vs. 88%), Chemistry (78% vs. 53%), and Physics (30% vs. 13%). As expected, the differences are largest for courses that are commonly taken in 11th grade (Algebra 2 and Chemistry). The differences in course-taking suggest that 10th graders are more likely to encounter some unfamiliar ACT test content than are 11th graders.

Table 1 also compares the correlation of high school GPA and ACT Composite score for the two groups. The correlation is slightly higher for 11th graders (0.55 vs. 0.51). The correlations confirm the expectation that students who perform better in high school courses tend to perform better on the ACT test, and this is true for 10th- and 11th-grade ACT administrations. The correlation may be slightly higher for 11th graders due to having taken more courses and thus having a more reliable measure of high school GPA.

College-Reporting

As a way to increase access (consequential validity evidence), students can send their ACT scores to up to four colleges at no additional cost.[2] In addition, students can opt into ACT's Educational Opportunity Service (EOS) to increase their exposure to, and knowledge of, postsecondary opportunities. One might expect these college reporting behaviors to be different for the 10th- and 11th-grade groups. For example, 10th-grade students might be more hesitant to send scores, knowing that they will likely perform better on the ACT when they're in 11th grade. Students who are not motivated to perform their best on the ACT might also be less likely to report their scores. However, we found that college reporting behaviors are very similar for the two groups. The majority of 10th graders (66%) and 11th graders (70%) sent scores to at least one college, and differences in EOS opt-in rates were small (61% for 10th graders, 66% for 11th graders). This suggests that 10th graders are only slightly less likely to engage in college reporting, and these data do not suggest lower motivation for 10th graders.

Test Completion and Guessing Patterns

Some students are not able to complete the ACT test in the allotted time. Others resort to guessing to complete as much of the test as possible, which is what ACT advises since there is no penalty for guessing. Incomplete tests or guessing patterns could be due to difficulty working through the test items, low motivation, or other factors. Such indicators provide evidence in relation to response processes. If test incompletion rates or guessing indicators were markedly higher for the 10th-grade group, it could signal that the ACT test is too difficult for 10th graders or that 10th grade students are not as motivated.

Test Completion

We found that test completion rates were high for both groups, ranging from 84% for English grade 10 to 94% for science grade 11 (Table 1). The largest difference between the two groups was for English (89% for 11th grade, 84% for 10th grade). The data show that 11th graders are slightly more likely to complete the test, which may be due to their additional coursework, higher academic achievement, increased test familiarity, and/or higher motivation. As a contrast, we also compared completion rates for the 10th-grade PreACT test and 11th-grade ACT test (Table 2). The PreACT/ACT comparisons in Table 2 are based on a sample of 55,450 students who took the PreACT in spring grade 10 and the ACT in spring grade 11, thus is a comparison of the same students. Test completion rates are very similar for the 10th-grade PreACT and 11th-grade ACT, with the largest difference observed for reading (93% for PreACT, 91% for ACT). Note that the PreACT tests are shorter than their ACT counterparts, which could explain the smaller difference in completion rates between 10th-grade PreACT and 11th-grade ACT as compared to 10th-grade ACT and 11th-grade ACT. Because 10th-grade test completion rates are lower than 11th-grade completion rates when the ACT is used as the 10th-grade test (as compared to the PreACT), we can conclude that taking the ACT in 10th grade results in a speeded experience for more students as compared to taking the PreACT in 10th grade, but the effect is small.

Guessing Rates

To estimate the extent to which guessing occurs, we computed the percentage of examinees with rapid guessing response patterns.[3] Across subjects, guessing patterns ranged from 10% (science grade 11) to 23% (English grade 10; Table 1). The percentage of examinees with rapid guessing response patterns was not appreciably higher for 10th graders as compared to 11th graders, with the exception of the English results (23% for 10th as compared to 18% for 11th graders). Because the test completion and guessing rates are similar for the two groups, the evidence suggests similar levels of motivation for 10th and 11th graders.

Score Reliability

As evidence of internal structure, reliability of ACT scale scores are estimated for both 10th and 11th graders in Table 1.[4] The reliability of the ACT test scores were only slightly lower for the 10th-grade sample as compared to the 11th-grade sample with the largest observed difference for science (.77 for 10th grade, .81 for 11th grade). The reliability estimates for the ACT Composite score were .95 and .96 for 10th graders and 11th graders, respectively. These results suggest that the ACT is a reliable measure of college readiness for 10th-grade students.

Test Performance

Relative to 10th-grade students, 11th-grade students are expected to perform better on the ACT test due to having additional time for coursework and development of the skills needed to integrate knowledge across different learning experiences. However, because the ACT is not designed to assess the specific curricula of any given course or set of courses (and instead is based on curricula across the national landscape of courses), we might not expect large differences between the two groups. We found that the 11th-grade group scored higher, with an average Composite score of 19.8 compared to 18.5 for the 10th-grade group. This difference is comparable to the average one-year Composite score gain from the 10th-grade PreACT to the 11th-grade ACT of 1.7 (Table 2). Across subject tests, the differences ranged from 1.0 for Math to 1.8 in English.

The percentage of students meeting the ACT College Readiness Benchmarks is an indicator of the percentage of students who would likely be considered ready for a college-level high school course (e.g., dual enrollment). As expected, the percentages are lower for 10th graders relative to 11th graders. The difference is largest for English (57% for 11th grade, 47% for 10th grade). For the other subjects, the 11th-grade group is higher by 8-9 percentage points. As a contrast to the grade 10 ACT/grade 11 ACT comparison, we also examined grade 10 PreACT/grade 11 ACT college readiness differences using the 55,450 students who took the PreACT in spring grade 10 and the ACT test in spring grade 11 (Table 2). If the two sets of differences are similar, it suggests that students are equally likely to demonstrate readiness on 10th-grade ACT and 10th-grade PreACT administrations. Across subjects, the grade 11 ACT readiness rates were higher than the grade 10 PreACT readiness rates by 10-12 percentage points, very similar to the first set of differences. Collectively, these results suggest that a considerable percentage of 10th graders are ready for college courses, with room to improve as 11th graders. The results also suggest that if a state decides to use the ACT to assess 10th graders' academic achievement levels and college readiness, it would obtain similar results to what would be obtained if it chose to use the PreACT for the same purpose.

Table 1. Same-School Comparison of 10th- and 11th-Grade ACT Spring Administrations

Measures		Grade Level 10 (N=5,415)	Grade Level 11 (N=5,712)	Difference
Courses Taken	Algebra 1	98%	99%	1%
	Geometry	85%	95%	10%
	Algebra 2	52%	88%	37%
	Biology	88%	98%	10%
	Chemistry	53%	78%	25%
	Physics	13%	30%	17%
College Reporting	Score sending	66%	70%	4%
	EOS participation	61%	66%	5%
Test Completion	English	84%	89%	5%
	Math	86%	87%	1%
	Reading	89%	90%	1%
	Science	92%	94%	1%
Guessing Patterns	English	23%	18%	-5%
	Math	19%	19%	-1%
	Reading	14%	14%	0%
	Science	11%	10%	-1%
Score Reliability	English	0.89	0.92	0.02
	Math	0.83	0.87	0.04
	Reading	0.84	0.86	0.02
	Science	0.77	0.81	0.05
	Composite	0.95	0.96	0.01
Score Averages	English	17.9	19.7	1.8
	Math	18.1	19.1	1.0
	Reading	18.6	20.0	1.4
	Science	18.7	19.7	1.0
	Composite	18.5	19.8	1.3
College Readiness	English	47%	57%	11%
	Math	21%	29%	8%
	Reading	28%	37%	9%
	Science	20%	28%	8%
Correlation with HSGPA	Composite	0.51	0.55	0.04

Table 2. Same-Student Comparison of 10th-Grade PreACT and 11th-Grade ACT Spring Administrations[5]

Measures		Test / Grade Level		
		PreACT 10	ACT 11	Difference
Test completion	English	90%	89%	-1%
	Math	86%	86%	0%
	Reading	93%	91%	-2%
	Science	92%	93%	0%
Score averages	English	18.6	21.1	2.5
	Math	19.4	20.9	1.5
	Reading	20.2	21.7	1.5
	Science	19.9	21.3	1.4
	Composite	19.7	21.4	1.7
College readiness	English	55%	66%	11%
	Math	32%	43%	11%
	Reading	38%	48%	10%
	Science	29%	41%	12%

Table 3. PreACT and ACT Reliability Estimates[6]

Subject	PreACT Grade 10	ACT	Difference
English	0.88	0.92	0.04
Math	0.88	0.91	0.03
Reading	0.83	0.87	0.04
Science	0.82	0.85	0.03
Composite	0.96	0.97	0.01

Benefits of 10th-grade ACT Testing, Relative to Other Assessments

Tenth grade administration of the ACT test could fulfill multiple needs, including college placement, practice for the ACT test, accountability reporting, and measuring student growth. Next, we discuss the benefits of using the ACT for these purposes, relative to other 10th grade assessments.

College placement. Tenth grade ACT testing could give all students, including underserved learners who may not have considered college as an option, an early opportunity to be placed in college courses (e.g., dual enrollment). Because it's a secure test, an established measure of college readiness, and is designed to measure skills important for success in college (ACT, 2016, 2017), the ACT test may be preferred over other tests for this purpose. Scores from other tests would likely be predictive of success in college courses, though less predictive than ACT test scores.

Practice. Tenth grade ACT testing provides the most authentic practice for the 11th-grade ACT test. The PreACT test also provides an ACT practice experience, but the test length and other specifications are different. On the other hand, the PreACT may provide a more engaging practice experience than the ACT test, given that it is designed with 10th graders in mind. To a lesser extent, ACT Aspire Interim and Summative Assessments can also serve as a practice experience for the ACT test, as they

test the same subject areas and domains (and have the same reporting categories, plus more) as both the PreACT and ACT tests. All three tests identify students who are on target for readiness for first-year college courses, providing ample time for students to skill up while still in high school. Free resources are also available to help students prepare for the ACT test. ACT Academy™ is an online tool that includes two full-length ACT practice tests, quizzes, and a diagnostic and recommendation system that directs students to online resources tailored to their needs (https://academy.act.org/). Outside of a high-stakes standardized testing event, students could gain valuable practice and further develop skills important for college success through ACT Academy. While the testing experience is not the same as an actual ACT test administration, engaged students are likely to benefit from the additional support offered through ACT Academy.

Accountability. The ACT Aspire Summative Assessments and the ACT test are both used to meet state and federal testing requirements for accountability. Both tests require secure test administrations and produce reliable measures of academic achievement. Tenth grade students may be more motivated to perform their best on the ACT test, given its use for admissions, course placement, scholarships, and talent recognition. On the other hand, ACT Aspire and state assessments may be more appropriate tests for 10th-grade populations, given that they are designed to test KSAs for that grade level. Any test used for federal accountability needs to meet requirements for alignment to state standards. ACT Aspire has been used as an accountability test for grades 3-10, and the ACT test has been used for 11th grade.

Growth. ACT Aspire, PreACT, and the ACT test can all be administered in 10th grade to gauge whether students are on target for meeting college and career readiness benchmarks in 11th grade. Both ACT Aspire and PreACT have readiness benchmarks, indicating whether students are on target to meet the ACT College Readiness Benchmarks in grade 11. ACT Aspire and the PreACT also report predicted ACT score ranges. Tenth grade PreACT and ACT test scores are equally predictive of grade 11 ACT test scores, with ACT Aspire scores nearly as predictive (Table 4). All three tests can also be used to measure student growth for purposes of research and evaluation. Because PreACT and ACT scores are reported on the same scale, growth from grade 10 to grade 11 is easier to conceptualize when the PreACT or ACT test is used in 10th grade. However, student growth percentiles can be produced for all three assessments and do not require a common scale. Currently, grade 10 to grade 11 ACT student growth percentiles are available for ACT Aspire and PreACT (ACT, 2019).

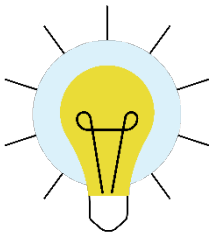
Table 4. Correlations With 11th-Grade ACT Test Scores

	10th Grade Test		
Subject	ACT Aspire[7]	PreACT[8]	ACT[9]
English	0.82	0.85	0.85
Math	0.82	0.86	0.86
Reading	0.70	0.78	0.78
Science	0.75	0.76	0.76
Composite	0.88	0.91	0.91
ELA	0.83	--	0.89
STEM	0.85	0.87	0.88

While 10th-grade administration of the ACT offers some benefits over ACT Aspire, PreACT, and other state assessments, cost is another important consideration for testing programs. The ACT test is generally more expensive than ACT Aspire Summative, and ACT Aspire Summative is generally more expensive than the PreACT and ACT Aspire Interim.

Conclusions

In sum, the evidence summarized in this document supports the use of the ACT as a measure of student's college readiness or academic preparation level for 10th-grade students.



In building a validity argument for this use case, we didn't rely on a single source of evidence but rather took a comprehensive approach, documenting evidence as it relates to all five sources of validity evidence.

Relative to 11th-grade ACT administrations, the primary drawback of 10th-grade ACT test administrations is that students are less likely to have taken courses linked to higher ACT scores and would have less time for academic development. While most uses of 10th-grade ACT test scores are also possible with other assessments, the primary benefit of ACT testing is that it provides a secure measure for admissions to postsecondary programs. These results can help inform state and district choices for a 10th-grade assessment.

Notes

1. Of the 53 schools, seven administered the ACT in 2016-2017 only, 43 administered the ACT in 2017-2018 only, and three administered the ACT both years. For schools that administered the ACT both years, there are students who took the ACT in both 10th grade (2016-2017) and 11th grade (2017-2018). However, we compare all 10th-grade administrations to all 11th-grade administrations.
2. Students with an ACT Fee Waiver can send their ACT scores to up to six colleges (at the time of registration) and an additional 20 regular score reports after registration at no additional cost.
3. Rapid guessing patterns include long strings of item responses using the same response option, various repetitive patterns, or consecutive blanks.
4. The reliability analyses were conducted only for one test form which had sufficiently large sample sizes (>1000) for both grades 10 and 11. These statistics were estimated with a four-parameter beta compound binomial model, taking into account the content specifications (Kolen, Hanson, & Brennan, 1992). The reliability of the composite scores was calculated based on the SEMs of the English, mathematics, reading, and science test scores, assuming that the measurement errors of these tests are independent (ACT, 2016).
5. Statistics based on a sample of 55,450 students who took the ACT in spring grade 11 in 2018 and the PreACT in spring grade 10 in 2017.
6. Reliability estimates are obtained from the ACT technical manual (ACT, 2017) and from estimates obtained from PreACT tests administered during the 2016-2017 academic year.
7. Correlation estimates based on students who took the ACT in 11th grade (from 2014 through 2018) and ACT Aspire in 10th grade (from 2013 through 2017).
8. Correlation estimates based on a sample of 55,450 students who took the ACT in spring grade 11 in 2018 and the PreACT in spring grade 10 in 2017.
9. Correlation estimates based on a sample of students who took the ACT in spring grade 11 as part of a state or district testing program in 2018 and also took the ACT in spring grade 10 in 2017. N=2,771 for ELA; N=34,429 for the other subject areas.

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