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Development and Validation of a Preliminary ELA Readiness Benchmark based on the ACT ELA Score

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Abstract

Although about 77% of ACT-tested high school graduates express an intention of earning a bachelor's degree or higher (ACT, 2016a), the percentage of students who achieve academic success in their first-year courses, persist in college, and ultimately earn a bachelor's degree within six years is substantially lower. Approximately 60% of students who initially enroll at a four-year institution graduate with a bachelor's degree, and only 30% of students who initially enroll at a two-year institution earn an associate's degree or certificate from their initial institution of attendance within six years (Kena et al., 2016). A lack of academic preparation in English and reading as evidenced by a significant percentage of incoming college students being required to take remedial coursework in these subject areas has been offered as one explanation for the low college graduation rates.

The purpose of this research was to develop a preliminary English Language Arts (ELA) Readiness Benchmark to provide prospective students with information on the level of knowledge and skills needed to have a reasonable chance of success in ELA-related first-year courses. This is a preliminary study on ELA readiness as the data used to derive the ELA Benchmark was based on earlier freshman cohorts who took the former ACT® writing test; that is, ELA scores for these students were estimated based on their English, reading, and concorded writing scores (empirical evidence supporting this approach and more information on the former and current ACT writing tests are provided in Appendix A).

This research had three components: Study 1 identified the English and social science courses that college students take most often in the first year of college, overall and by general major categories. In English, the most prevalent course was English Composition I. In the social sciences, multiple courses were identified as typically taken by students: American History, Other History, Psychology, Sociology, Political Science, and Economics. These patterns were seen irrespective of students' general major categories. These are the same courses that were used to derive the ACT College Readiness Benchmarks in English and reading, respectively.

Study 2 derived a preliminary empirically-based ELA Readiness Benchmark in English and social science courses by identifying the ACT ELA score associated with a 50% probability of earning a grade of B or higher in the seven ELA courses identified from Study 1. When combining grade data for these seven courses into a single course success model that included an indicator for content area (English vs. the social sciences), the typical ACT ELA score that was associated with at least a 50% chance of earning a B grade or higher in ELA-related courses was determined to be 20. Moreover, this cutoff score was also associated with an approximate 75% chance of earning a C grade or higher.

Study 3 validated the ELA Readiness Benchmark on more distal indicators of success. Results demonstrated that students who met the ELA Readiness Benchmark were more likely to earn a cumulative grade point average (GPA) of 3.0 or higher over time, persist in college, and ultimately earn a degree. Providing prospective students with ELA readiness information based on their English, reading, and writing skills may help facilitate the transition to college by raising their awareness of the literacy skills that are required to meet the demands of the array of ELA-related courses they will face in college. Such feedback can send a signal to students as to the level of readiness that is needed to avoid having to take remedial coursework in English and reading that can impede students' progress towards earning a college degree.

Development and Validation of a Preliminary ELA Readiness Benchmark based on the ACT ELA Score

English Language Arts (ELA), the integration of reading, writing, and speaking skills, has become increasingly important as the United States aims to develop students with strong and adaptable skills that can be applied to a rapidly changing world economy. The *Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects* (Common Core State Standards Initiative (CCSSI), 2010) exemplifies the broad consensus that the nation needs students with integrated literacy skills that can be drawn upon across an array of academic subjects and career areas. In recognition of the importance of these integrated skills in both academics and the workplace, ACT has developed a Holistic Framework that includes core academic skills, such as ELA, as well as cross-cutting capabilities, behavioral skills, and educational and career navigation skills considered important for college and career readiness (Camara, O'Connor, Mattern, & Hanson, 2015; Mattern et al., 2014). According to this framework, to attain the necessary literacy skills for success, "students must learn to engage with complex print and digital texts written for a variety of purposes, think critically about what they read and hear, articulate their thoughts in a range of spoken and written genres, and communicate collaboratively with others" (Camara et al., 2015; p. 13). Lacking adequate literacy proficiency, students will be unable to handle the quantity and complexity of reading tasks required in college. Similarly, they are likely to struggle as they transition into the workforce (Schoenbach, Greenleaf, & Murphy, 2012).

The increased emphasis on ELA skills for college and career success can be traced to research findings on the costs associated with low levels of academic achievement of high school graduates transitioning to college and the workforce. In particular, *A Nation at Risk* (Gardner, Larsen, Baker, Campbell, & Crosby, 1983) identified a lowering of academic standards in K–12 that ultimately led to an excessively high number of high school graduates requiring remediation once in college. Unfortunately, additional studies over the ensuing decades have continued to find that too many high school graduates in the United States find themselves underprepared for college-level coursework. In the 2011–2012 school year, nearly one-third of first- and second-year undergraduate students at public postsecondary institutions reported taking at least one remedial course (Skomsvold, 2014), slightly higher than the percentages reported in previous NCES reports (Lewis & Farris, 1996; Mansfield & Farris, 1991; Parsad & Lewis, 2003). Remediation rates based on actual transcripts, however, are even higher. More than 39% of students who initially enrolled at 4-year public institutions and 68% of students who initially enrolled at 2-year public institutions in 2003–04 took at least one remedial course (Radford & Horn, 2012). Focusing specifically on ELA-related courses, nearly 11% of the students at 4-year institutions and 28% of the students at 2-year institutions took a remedial English or reading course (Radford & Horn, 2012).

Students do not generally receive college credits for remedial courses, and a recent longitudinal NCES study that tracked students' college experience over six years found that students who did not take any remedial English or reading courses were more likely to complete credit-bearing English courses than those who took the remedial courses (Chen, 2016). Being placed into first-year, credit-bearing courses in college generally depends on students' performance on admission tests and/or placement tests, as well as high school grades and the strength of their high school curriculum. Research on the relationship between ACT scores and academic performance in college has found that students with higher

ACT scores tend to earn higher grades in individual courses, including English Composition and reading-intensive courses (Allen, 2013; Allen & Sconing, 2005; Westrick, 2016). Furthermore, academic preparedness for college as measured by standardized test scores such as the ACT© and high school coursework and grades is positively related to college success indicators such as first-year grade point average (FYGPA), academic persistence, and, ultimately, degree completion (Radunzel & Noble, 2012; Westrick, Le, Robbins, Radunzel, & Schmidt, 2015). Similarly, students who were not required to take remedial English/reading courses were also more likely to persist and complete a bachelor's degree at four-year public institutions regardless of whether students started at two-year or four-year public institutions (Chen, 2016).

The ACT ELA Score

To provide students with an aggregate measure of their readiness in English, reading, and writing, ACT introduced the ACT ELA score in fall 2015 for ACT-tested students who take the optional ACT writing test. The ACT ELA score is a combination of the ACT English, reading, and writing scores; it ranges between 1 and 36.

The optional ACT writing test was first introduced in 2005, and in fall 2015, a number of enhancements from the former version were introduced. The enhancements included redesigning the writing prompts, extending the testing time from 30 minutes to 40 minutes, and using an analytical rubric on four writing domains for scoring instead of using a holistic six-point rubric. To help with transitioning from the former to the current ACT writing test, a concordance table between the former and the current writing scores was developed, allowing researchers to estimate ELA scores for graduating cohorts prior to 2015 (ACT, 2015). For a more detailed discussion of differences between the former and current ACT writing tests, and empirical evidence supporting the use of the concordance table for estimating ELA scores on earlier cohorts for specific purposes, refer to Appendix A.

Many states and independent school districts see the value in providing students with an aggregate achievement measure that captures combined skills measured by the English, reading, and writing tests, such as the ACT ELA score. Currently, 11 of the 16 states that administer the ACT statewide include the optional ACT writing test, and roughly one-half of the independent school districts that offer the ACT to their high school students include the ACT writing test. For accountability purposes, states are now requesting information about the ACT ELA scores that are associated with a reasonable chance of graduating from high school with the literacy skills that are needed to be successful in college.

Readiness Benchmarks

To provide students with information about their readiness for first-year college courses, ACT developed empirically-derived benchmarks to identify students who had a high likelihood of being successful once in college based on their performance on the ACT (Allen, 2013; Allen & Sconing, 2005). ACT derived subject-specific benchmarks by estimating the ACT subject score associated with a 50% probability of earning a grade of B or higher in the typical credit-bearing, first-year course completed by students in the respective subject matter. For example, the ACT English Benchmark of 18 was derived based on the relationship between ACT English scores and course grades in English Composition I; for the other three subject areas, the

courses examined were College Algebra, Biology, and social science courses for the ACT mathematics, science, and reading tests, respectively.[1, 2]

Recently, ACT developed the ACT STEM (Science, Technology, Engineering, and Mathematics) Benchmark to provide students with an indication of their readiness for mathematics and science courses typically taken during the first year by students entering STEM disciplines. These courses included Calculus, Chemistry, Biology, Physics, and Engineering (Mattern, Radunzel, & Westrick, 2015) and differed from those used to develop the ACT College Readiness Benchmarks in mathematics (College Algebra) and science (Biology). The ACT STEM Readiness Benchmark based on the ACT STEM score was found to be a 26 (Radunzel, Mattern, Crouse, & Westrick, 2015).[3]

Given the importance of integrated literacy skills for academic and workplace success, the focus of the current study was to explore ELA readiness and what that means in relation to being successful in first-year ELA-related courses that include English and social science courses. Similar to establishing the ACT STEM Benchmark, we first wanted to explore whether there was empirical evidence to suggest that an ELA Readiness Benchmark should be tied to specific majors and therefore informed strictly by the typical first-year courses taken by ELA-related majors. This approach would be supported if students majoring in ELA-related fields of study are taking substantially different English and social science courses than the typical first-year student.

If this was not found to be the case, we would then take an approach different from that used in the ACT STEM Benchmark study. Rather than developing an ELA Readiness Benchmark specifically based on the academic requirements of ELA-related majors, we would develop an ACT ELA Readiness Benchmark based on the ACT ELA score associated with a high probability of succeeding in the most common first-year ELA-related courses taken by students across all academic majors (this latter scenario was suggested by Study 1 results).

Providing students with an indicator of their ELA readiness has a practical benefit. If provided early enough, students who intend to attend college but are not on track to be ready for relevant college-level coursework can take preemptive action to increase their ELA readiness, and thereby reduce their chances of needing to take remedial coursework in English and reading.

Another purpose of establishing an ELA Readiness Benchmark for the ACT assessment is to develop ACT Aspire ELA Benchmarks for earlier grades by linking early-grade test scores

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[1] The ACT College Readiness Benchmarks were updated in 2013 utilizing more current data. The new analyses revealed no change in the ACT English and Mathematics Benchmarks of 18 and 22, respectively. The ACT Reading Benchmark increased from 21 to 22, and the ACT Science Benchmark decreased from 24 to 23 (Allen, 2013).

[2] Two years after ACT's College Readiness Benchmarks were announced, the College Board followed with their own benchmarks for the SAT that were based on first-year grade point average (Kobrin, 2007; Wyatt, Kobrin, Wiley, Camara, & Proestler, 2011). Later, they updated their benchmarks to be based on success in first-year college courses (College Board, 2017). More recently, two multistate consortia, the Partnership for Assessment of Readiness for College and Careers (PARCC) and Smarter Balanced, have developed new assessments aligned to the Common Core State Standards (CCSS). PARCC has their own "college and career ready" cut-scores based on earning a C or better average in college (n = 476; Nichols-Barrer, Place, Dillon, & Gill, 2015, p.16) for ELA and mathematics. Smarter Balanced has achievement-level descriptors for ELA and mathematics (Smarter Balanced Assessment Consortium, 2013).

[3] The study by Mattern et al. (2015) related the ACT mathematics score to course success in Calculus and the ACT science score to course success in the combined first-year science courses of Chemistry, Biology, Physics, and Engineering. The study by Radunzel et al. (2015) developed an ACT STEM Benchmark based on the ACT STEM score (the rounded average of the ACT mathematics and science scores) using a combined model that included an indicator for content area (mathematics vs. science) and was based on the five mathematics and science courses identified as being typically taken by STEM majors.

to the ACT ELA Benchmark. In 2014, ACT launched ACT Aspire®, a battery of assessments which assess students' mastery of math, ELA, and science in grades 3 through 10.[4] Readiness benchmarks have been developed for ACT Aspire that indicate whether students are on target to meet the ACT College Readiness Benchmarks in grade 11,[5] allowing for the articulation of what students need to know and be able and willing to do at key transition points along the K-Career continuum. Such information helps students and teachers know if a student is on track for college and career readiness. An ELA Readiness Benchmark for early grades will help educators identify students who are at risk of not having the literacy skills that are needed to be successful in college by the time they complete high school.

Current Study

The purpose of the current study was to develop a preliminary indicator or benchmark of ELA readiness based on the ACT ELA score. To accomplish this, three studies were conducted. The goal of Study 1 was to determine the typical first English and social science courses taken by students during their first year of college, overall and by general major categories. Building on Study 1, Study 2 empirically derived an ELA Readiness Benchmark based on the relationship between the ACT ELA score and performance in the identified typical first-year courses taken in English and the social sciences. Finally, Study 3 was conducted to examine the validity of the ELA Readiness Benchmark for predicting other college outcomes including earning a cumulative GPA of 3.0 or higher, persisting in college, and completing a college degree.

Study 1: Course Taking Patterns in English and the Social Sciences

Sample

Data were available on first-year courses at 59 two-year and 44 four-year postsecondary institutions from four states for a total of 103 institutions. All but two of the institutions are public institutions, with the other two being private institutions. Of the 44 four-year institutions, 10 have highly selective or selective admissions policies. The remaining 34 institutions have traditional, open, or liberal admissions policies. All of the two-year institutions have open admissions policies.[6] The median average ACT Composite score across institutions was 19.7 (1st Quartile = 18.8; 3rd Quartile = 21.2).[7] Course information was available for 397,861 ACT-tested students who had enrolled in college as first-time entering students from the 2006 through 2014 freshman cohorts.[8]

[4] Since the introduction of the ACT Aspire assessments, students who completed the ACT Aspire English, reading, and writing assessments have received an ELA Composite score.

[5] Benchmarks had previously been developed for ACT Explore® (grades 8 and 9) and ACT Plan® (grade 10).

[6] Admission policy was reported by institutions according to the high school class ranks of their accepted freshmen: the majority of freshmen at *highly selective* schools are in the top 10%, *selective* in the top 25%, *traditional* in the top 50%, and *liberal* in the top 75% of their high school class. Institutions with *open* admissions policies accept all high school graduates to limit of capacity. In this study, four-year institutions were classified as more selective (*selective* or *highly selective*) or less selective.

[7] The median average ACT Composite score across institutions was 21.6 for the four-year institutions and 19.1 for the two-year institutions.

[8] Seventy-two percent of the students were enrolled at a four-year institution and 28% were enrolled at a two-year institution.

Course Content Coding. Partnering institutions provided ACT with course transcript data that included such information as the grades earned, course titles, and course content codes.[9] For courses that were not assigned a content code by the participating institution, ACT research staff assigned a code based on the course title and description from the institution's course catalog. We then identified for each student the first English and social science courses taken in the first year. Based on this coding, 344,518 students were identified as taking an English course in their first year. Of these students, 12% took more than one English course in the same semester. Essentially, these students had multiple "first" English courses in college, and as such, all of the "first" English courses taken were included in the Study 1 analyses. For the social sciences, 355,869 students were identified as taking a social science course in their first year. Students were much more likely to take more than one social science course in the same semester—36%. As was the case with the English results, all of the "first" social science courses were included in the analyses.

Coding General Major Categories. Institutions also provided students' declared majors over time by reporting a six-digit Classification of Instruction Program (CIP) code for each term enrolled for most students. The first-year CIP codes were used to classify students into the following seven general major categories: Arts & Humanities, Social & Behavioral Sciences, General Studies, Life Sciences, Science & Engineering, Career Related, and Other Non-Science Related Majors such as Education and Business. These general major categories are similar to those used by the National Academies of Sciences, Engineering, and Medicine taxonomy of fields (The National Academies of Science, Engineering, and Medicine, 2006). The first two digits of the CIP codes were used to classify students into one of the general major categories if their declared major from both the fall and spring terms of year one came from the same general category (see Appendix B, Table B1). There was interest in examining whether the typical first-year courses taken in English and the social sciences differed across major categories, with a primary focus on comparing ELA-related major categories such as Arts & Humanities, Social & Behavioral Sciences, and General Studies to other major categories such as Life Sciences and Science & Engineering. Using the course grade information, the most prevalent first English and social science courses taken in the first-year for each general major category were identified. Characteristics of the students included in the English and social science samples (overall and by major category) are summarized in Tables 1 and 2, respectively.

[9] A common course content code list was developed by ACT and used to identify similar content-related courses across institutions, e.g., English Composition I, Psychology, etc.

Table 1. Summary of Student Characteristics of English Sample for Study 1

Characteristics	All Students	Arts & Humanities	Social & Behavioral Sciences	General Studies	Life Sciences	Science & Engineering	Career Related	Other Non-Science Related Majors
N (Students)	344,518	12,277	24,285	60,378	47,503	22,530	8,064	50,017
Gender								
Female	53.5%	56.4%	58.6%	53.5%	71.8%	21.6%	20.9%	52.8%
Male	45.8%	42.7%	40.7%	45.5%	27.6%	77.7%	78.4%	46.4%
Missing	0.8%	0.9%	0.7%	1.0%	0.6%	0.7%	0.7%	0.8%
Race/Ethnicity								
African American	12.9%	10.4%	15.4%	11.0%	11.7%	8.2%	9.8%	12.3%
Asian American	1.9%	1.3%	1.2%	2.0%	2.3%	3.5%	1.9%	1.6%
Hispanic	6.6%	5.9%	9.9%	4.9%	7.4%	9.7%	5.6%	5.5%
Other	7.2%	6.7%	7.1%	9.3%	7.4%	5.3%	6.7%	6.6%
White	67.0%	70.5%	62.0%	68.2%	67.4%	68.2%	71.2%	69.8%
Missing	4.4%	5.2%	4.5%	4.6%	3.9%	5.0%	4.7%	4.2%
ACT Composite Score								
Mean	20.8	22.3	21.0	20.1	20.8	23.7	20.0	21.0
Standard Deviation	4.4	4.5	4.4	4.1	4.3	4.8	4.3	4.4
HSGPA								
Mean	3.25	3.29	3.25	3.19	3.36	3.48	3.13	3.30
Standard Deviation	0.56	0.54	0.54	0.57	0.52	0.50	0.58	0.54
Missing	14.2%	14.2%	13.6%	16.0%	11.1%	12.5%	17.1%	13.7%

Note. Percentages may not sum to 100% due to rounding. The number of students in the All Students column is not the sum across the general major category columns since results are not shown for students who changed their majors during the first year (n = 33,014), those with undeclared majors during at least the fall term of their first year (n = 35,510), those who were not enrolled during the spring term of their first year (n = 37,316), and those for whom institutions did not provide students' major information (n = 13,624).

Table 2. Summary of Student Characteristics of Social Science Sample for Study 1

Characteristics	All Students	Arts & Humanities	Social & Behavioral Sciences	General Studies	Life Sciences	Science & Engineering	Career Related	Other Non-Science Related Majors
N (Students)	355,869	11,684	27,221	62,584	51,543	23,133	6,990	52,749
Gender								
Female	54.5%	57.3%	59.5%	53.9%	72.3%	23.7%	24.2%	53.3%
Male	44.6%	41.6%	39.7%	45.1%	27.1%	75.3%	74.9%	45.8%
Missing	0.9%	1.1%	0.8%	1.0%	0.6%	1.0%	0.9%	0.9%
Race/Ethnicity								
African American	12.1%	9.5%	14.2%	10.4%	10.8%	7.7%	9.8%	11.4%
Asian American	2.0%	1.3%	1.3%	2.1%	2.6%	3.6%	2.1%	1.8%
Hispanic	6.8%	6.1%	10.0%	4.9%	7.7%	10.3%	5.9%	5.7%
Other	7.1%	6.6%	6.8%	9.3%	7.1%	5.7%	6.8%	6.5%
White	67.5%	71.2%	62.8%	68.7%	67.8%	67.4%	70.2%	70.3%
Missing	4.5%	5.4%	4.8%	4.6%	4.0%	5.4%	5.2%	4.4%
ACT Composite Score								
Mean	21.2	22.9	21.4	20.4	21.3	24.2	20.5	21.4
Standard Deviation	4.6	4.7	4.6	4.2	4.5	4.9	4.6	4.5
HSGPA								
Mean	3.30	3.34	3.30	3.22	3.41	3.53	3.20	3.34
Standard Deviation	0.56	0.53	0.53	0.56	0.51	0.48	0.52	0.53
Missing	13.9%	14.4%	13.3%	15.8%	10.8%	12.3%	16.5%	13.5%

Note. Percentages may not sum to 100% due to rounding. The number of students in the All Students column is not the sum across the general major category columns since results are not shown for students who changed their majors during the first year (n = 35,448), those with undeclared majors during at least the fall term of their first year (n = 37,354), those who were not enrolled during the spring term of their first year (n = 34,311), and those for whom institutions did not provide students' major information (n = 12,852).

Results

The percentage of students who took an English and social science course by content area was computed for the total sample and by major category.[10] The results for English and the social sciences are summarized in Tables 3 and 4, respectively.[11]

English Results. Across all students in the sample irrespective of their major, English Composition I was the most common first course (68%) taken in English. This finding also

[10] Weighted percentages based on institution representation are reported. The weights were applied at the institution level and were determined by comparing the distribution of the institutions included in the sample to those included in the ACT-tested college-enrolled population with respect to institution type and admission selectivity (two-year vs. four-year/less selective vs. four-year/more selective). The selectivity of institution's admission policies were self-reported by the institutions using five levels that classified their level according to the typical ACT Composite score and high school ranks of their accepted freshmen. Specifically, the population included a larger proportion of more selective four-year institutions and fewer two-year institutions (26% four-year/more selective, 39% four-year/less selective, vs. 35% two-year) as compared to the sample (10% four-year/more selective, 33% four-year/less selective, vs. 57% two-year). See Tables 5 and 6 for more details about the population.

[11] The same general conclusions for the overall samples concerning the typical first English and social science courses taken emerged when the distributions were evaluated (1) by institution type or (2) among students who had taken the former ACT writing test so that an ELA score could be computed.

held within each of the major categories examined with the percentage of students taking English Composition I as their first English course ranging from 63% for those majoring in Arts & Humanities to 75% for those majoring in Science & Engineering.[12] Moreover, an additional 13% of all students first enrolled in a Developmental English course, a course that is often considered a non-credit bearing course. These results coincide with the ACT College Readiness Benchmark research that derived the ACT English Benchmark using course grades in English Composition I (Allen, 2013; Allen & Sconing, 2005). Even when focusing exclusively on students majoring in English Language and Literature/Letters (N=2,294; a subset of Arts & Humanities; data not shown in table), the typical first English course taken was English Composition I (43%) with an additional 5% taking a Developmental English course as their first English course.[13]

Table 3. Distribution (%) of Students' First College English Course by Major Category

English Content Area	All Students	Arts & Humanities	Social & Behavioral Sciences	General Studies	Life Sciences	Science & Engineering	Career Related	Other Non-Science Related Majors
Developmental English	12.5	7.4	10.0	13.9	11.1	5.4	15.2	11.1
ESL English	0.1	0.0	0.0	0.0	0.1	0.1	0.3	0.1
English Composition I	67.7	63.4	65.6	72.7	68.0	75.2	67.0	67.5
English Composition II	6.9	8.9	7.1	6.2	8.3	9.9	6.0	6.2
English Literature	5.1	11.6	5.5	2.5	5.4	4.0	1.2	4.5
Speech	15.4	12.4	15.5	12.6	13.0	7.5	11.4	19.6
Other Writing Intensive	1.3	2.7	2.9	1.1	0.6	1.1	3.4	2.3
Other English	3.4	5.9	4.5	3.2	2.5	2.6	3.1	4.7
Multiple courses	12.2	12.2	11.1	11.0	8.6	4.9	7.2	15.3

Note. Data are based on 103 two- and four-year postsecondary institutions from four states (2006 through 2014 freshman cohorts). There were 344,518 total students. See Table 1 for the number of students by general major category. Examples of courses included in Other Writing Intensive courses include Technical Writing and Creative Writing. Examples included in the Other English category include Introduction to Poetry, Introduction to Shakespeare, and Introduction to Fiction. Percentages will sum to above 100% due to the fact that some students took multiple English courses in the same term.

[12] This finding held even among students who were not categorized into one of the seven major categories presented in Table 3 (English Composition I at 65%); see footnote to Table 1 for reasons why these 119,464 students were not categorized into one of the seven major categories.

[13] Students were identified as majoring in English Language and Literature/Letters if the first two-digits of their CIP major code was 23 in both the fall and spring terms of their first year.

Table 4. Distribution (%) of Students' First College Social Science Course by Major Category

English Content Area	All Students	Arts & Humanities	Social & Behavioral Sciences	General Studies	Life Sciences	Science & Engineering	Career Related	Other Non-Science Related Majors
Developmental Reading	6.6	3.7	4.3	7.5	5.2	2.8	8.9	5.3
General Humanities	2.5	3.2	2.4	3.2	2.6	2.1	1.3	2.4
American History	21.8	21.1	17.5	25.1	21.6	23.8	24.7	21.4
Other History	10.3	17.9	9.6	7.7	6.9	8.8	5.8	9.3
Psychology	31.6	23.2	37.5	32.0	42.0	21.2	23.1	27.5
Sociology	15.9	13.1	19.7	15.1	17.7	10.0	12.2	14.8
Geography	5.5	5.2	4.6	7.0	3.4	6.0	9.0	7.4
Anthropology	3.8	7.9	6.3	2.3	3.2	3.5	2.3	3.7
Archaeology	0.2	0.6	0.5	0.2	0.2	0.4	0.3	0.2
Political Science	16.9	15.9	21.5	19.4	13.9	21.1	21.5	15.4
Economics	8.4	3.2	5.3	6.1	3.2	10.2	5.6	20.6
Law	2.4	0.6	5.5	0.6	0.3	0.8	0.4	4.1
Philosophy/Logic	8.2	13.7	12.0	9.2	6.7	8.4	5.5	5.9
Religion	1.7	2.7	2.5	1.8	1.4	1.4	1.1	1.3
Ethics	1.3	1.1	1.6	1.3	1.5	1.9	3.2	1.2
Human Growth & Development	0.4	0.1	0.2	0.2	1.0	0.0	0.0	0.6
Other Social Science	4.0	4.6	5.4	3.8	4.0	4.0	2.6	3.5
Multiple courses	35.9	32.8	45.7	38.8	29.2	22.2	25.3	39.4

Note. Data are based on 103 two- and four-year postsecondary institutions from four states (2006 through 2014 freshman cohorts). There were 355,869 total students, See table 2 for the number of students by general major category. Examples of courses included in the Other History course included World History and Western Civilization. Examples of courses included in Other Social Science courses include Introduction to Social Work, Mythology, and Social Problems. Percentages will sum to above 100% due to the fact that some students took multiple social science courses in the same term.

Social Science Results. Across all students in the sample irrespective of their major, the most prevalent social science courses taken during their first year included Psychology (32%), American History (22%), Political Science (17%), Sociology (16%), Other History (10%), and Economics (8%). These same courses tended to be the most prevalent social science courses within each of the major categories examined (Table 4).[14] These results coincide with the ACT College Readiness Benchmark research that derived the ACT Reading Benchmark using course grades in these same courses (Allen, 2013; Allen & Sconing, 2005).

In conclusion, the results from Study 1 did not find substantial differences across major categories in the typical first-year English and social science courses taken. Therefore, the results supported using the same English and social science courses to develop the ACT ELA Readiness Benchmark that were used to develop the individual ACT College Readiness Benchmarks in English and reading.

[14] The most prevalent social science courses taken for students who were not categorized into one of the seven major categories presented in Table 4 were Psychology (31%), American History (21%), Sociology (17%), Political Science (15%), Other History (14%), and Developmental Reading (9%); see footnote to Table 2 for reasons why these 119,965 students were not categorized into one of the seven major categories.

Study 2: Development of an ELA Readiness Benchmark

Sample

Course grade data used in the current study were provided by both two- and four-year postsecondary institutions who participated in research services offered by ACT, including state partnerships, the Course Placement Service, and Prediction Service. Data included in the analyses were limited to students from the 2006 through 2014 freshman cohorts who took the former ACT writing test. The ACT writing test is optional; for reference, the former ACT writing test was taken by 62% of 2014 ACT-tested high school graduates during any test administration, whereas 53% of 2014 ACT-tested high school graduates took the writing test during their last test administration prior to enrolling in college (ACT, 2014). Using a concordance table, students' ACT writing scores were converted to current ACT writing scores that are used to calculate the ACT ELA score (ACT, 2015; see Table 4 of the 2015 ACT report for the concordance table). Students' ELA scores were calculated as the rounded average of the ACT English, reading, and concorded writing scores from the student's latest test record when the student took the ACT with writing (see Appendix A for empirical evidence supporting the use of the concorded writing scores in calculating an ACT ELA score for earlier cohorts to be used in the development of a preliminary ACT ELA Benchmark).

The specific courses included in this study were those that were identified as being the typical first-year courses in English and the social sciences from Study 1. These courses included English Composition I, Psychology, American History, Political Science, Sociology, Other History, and Economics, which coincide with those used to develop the ACT College Readiness Benchmarks in English and reading (Allen, 2013). Similar to Study 1, students' first English and social science courses taken during the first year were used in the analyses.[15] For students who were enrolled in multiple ELA-related courses during the same term, grade information for a single course was randomly selected for inclusion in the analyses.

The number of institutions and students varied based on the data available by course content area; these numbers along with additional information on key institutional and student characteristics of the sample are summarized in Tables 5 and 6. Compared to the population of postsecondary institutions where 2015 ACT-tested high school graduates enrolled in the fall of the same year, the study sample included more public than private institutions and more institutions from the Midwest and Southwest regions as compared to being located in the East and West regions (Table 5). The study sample also included slightly fewer four-year institutions and highly selective/selective institutions than the reference population group.

[15] This criterion is also used in ACT's Course Placement Research services to avoid having intervening coursework influence test score-course outcome relationships.

Table 5. Summary of Institutional Characteristics of Study 2

Characteristic	English Composition I	Combined Social Science	Total Sample[1]	Population
# of institutions	200	154	233	1,955
Type of institution				
Four-year	58%	57%	60%	65%
Two-year	42%	43%	40%	35%
Admissions Policy				
Highly selective, selective	12%	12%	12%	26%
Traditional, open, liberal	88%	88%	88%	74%
Sector				
Private	11%	6%	12%	41%
Public	89%	94%	88%	59%
Region				
East	13%	7%	12%	43%
Midwest	33%	41%	36%	25%
Southwest	44%	46%	42%	12%
West	10%	6%	10%	20%
Average ACT Composite score				
Median	20.2	20.3	20.4	20.5
1st Quartile to 3rd Quartile	18.9 to 21.7	19.2 to 22.1	19.0 to 21.9	18.9 to 23.0

Note. Combined social science courses include American History (74 institutions), Other History (57 institutions), Psychology (121 institutions), Sociology (75 institutions), Political Science (60 institutions), and Economics (33 institutions). Fifty-eight of the institutions had grades available for only one social science course; 96 institutions had grades available for more than one social science course (25 institutions had 2 courses; 19 had 3 courses; 21 had 4 courses; 15 had 5 courses; and 16 had all 6 courses). Population includes postsecondary institutions where 2015 ACT-tested graduates initially enrolled in fall 2015 (determined using enrollment records from the National Student Clearinghouse). This graduating class was selected because it was the most recent cohort with enrollment information available at the time of these analyses.

[1] The total number of institutions in the sample does not equal the sum of institutions across the two content areas since 121 institutions had course grade data available in both content areas.

Relative to the population of 2015 ACT-tested high school graduates, the study sample had fewer African American and Hispanic students (Table 6). Students in the study sample also tended to have slightly higher ACT Composite scores than the reference population, on average. To address some of these student and institutional differences between the sample and population, weights based on ACT Composite score, high school GPA (HSGPA), and race/ethnicity were applied at the student level, while weights based on the student representation by institution type and institution selectivity were applied at the institution level.

Table 6. Summary of Student Characteristics of Study 2

Characteristics	English Composition I	Combined social science	Total sample	Population
N (Students)	107,142	91,133	198,275	1,360,170
Gender				
Female	53%	57%	55%	52%
Male	46%	42%	44%	47%
Missing	1%	1%	1%	1%
Race/Ethnicity				
African American	11%	9%	10%	15%
Asian American	2%	2%	2%	3%
Hispanic	6%	9%	7%	12%
Other	3%	5%	4%	5%
White	72%	70%	71%	58%
Missing	5%	5%	5%	7%
ACT Composite Score				
Mean	21.6	22.9	22.2	20.5
Standard Deviation	3.8	4.7	4.3	5.3
ACT ELA Score				
Mean	20.6	21.8	21.2	20.0
Standard Deviation	3.9	4.7	4.3	6.0
HSGPA				
Mean	3.26	3.42	3.33	3.17
Standard Deviation	0.52	0.51	0.52	0.66

Note. Population includes ACT-tested high school graduates of 2015 from states where at least 50% of students took the ACT. For the population, 50% of the students had taken the former ACT writing test. Combined social science courses include American History (14,576 students), Other History (8,025 students), Psychology (35,905 students), Sociology (12,842 students), Political Science (11,594 students), and Economics (8,191 students).

Analyses

The same methodology employed to derive the ACT STEM Benchmark was used in the current study (Radunzel et al., 2015). To determine the ACT ELA Benchmark, course success was defined as earning a grade of B or higher. We also examined students' chances of earning a grade of C or higher. Course grade data for English Composition I and the social science courses were combined into a single course success model that included an indicator for content area (0 for English and 1 for social science courses). To account for students being nested within institution and course, hierarchical logistic regression models were run to estimate the relationship between ACT ELA scores and course success in ELA-related courses. Student weighting was employed when estimating the models to ensure that the sample was representative of a larger population of ACT-tested high school graduates in terms of race/ethnicity, ACT Composite score, and HSGPA.[16] The NLMIXED procedure within

[16] This is the population to which the ACT College Readiness Benchmarks are reported on, and thus, is the envisioned group to who the ELA Benchmark would be conveyed to provide an indicator of their readiness for typical, first-year, ELA-related courses.

SAS 9.2 statistical software was used to fit the models and obtain the parameter estimates for each college and course combination.

The estimated parameter estimates derived for each course within an institution was used to compute institution-specific probabilities of success as a function of ACT ELA scores.[17] First, to combine the results across the multiple social science courses, the median probability of success at each ACT ELA score was computed across the available social science courses for each institution. Then, after applying institutional weighting,[18] the weighted typical score-specific probabilities of success for each content area (English and the social sciences) were computed across institutions. Finally, giving equal weight to the two content areas, the typical score-specific probabilities of success across the content areas were computed. Based on these final typical probabilities of success, the ELA Benchmark score was determined as the score associated with at least a 50% chance of earning a grade of B or higher in an ELA-related course.

Results

Descriptive Results

The distribution of course grades in English Composition I and each of the social science courses was examined. Overall, 52% of the students earned a grade of B or higher in the ELA-related courses. The percentage of students earning a B or higher was higher for English Composition I than for the combined social science courses (55% vs. 49%).[19]

Model-Based Results

Figure 1 provides the typical chances of earning a grade of B or higher in first-year ELA-related courses based on combining grade data for English Composition I and multiple social science courses into a single course-success model.[20] The lowest ACT ELA score associated with at least a 50% chance of earning a grade of B or higher in a typical ELA-related course is 20 and therefore is determined to be the ACT ELA Readiness Benchmark.[21] As illustrated in the figure, a student's chances of earning a grade of B or higher in ELA-related courses increase as their ACT ELA score increases. For example, students with an ACT ELA score of 27 or higher have greater than a 75% chance of earning a B or higher. The probability of earning a C or higher is also plotted in Figure 1. For students with an ACT ELA score of 20 or higher, their chances of earning a C or higher in a typical first-year ELA-related course are greater than 75%.

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[17] The fixed effect intercept and slope estimates associated with the content area indicator were incorporated into the estimates of the institution-specific intercepts, slopes, and probabilities for the social science courses.

[18] Institutional weighting consisted of applying weights to the institution specific cut scores to make the sample of students similar to an ACT-tested college enrollee population with respect to the type and selectivity of the institutions attended.

[19] Across the six social science courses examined, roughly one-half (49%) of the students earned a B or higher, though this percentage did vary by course (from 41% in Economics to 54% in American History and Political Science).

[20] The parameter estimates for the single-course success model are provided in Table B2 of Appendix B. The estimated probabilities obtained from this model differ slightly from those presented in Figure 1. The reason for this is that the probabilities shown in Figure 1 incorporated both the student and institutional weighting; the institutional weighting was applied to determine the typical probabilities across institutions. In contrast, only the student weighting was incorporated to obtain the parameters estimates for the single-course success model.

[21] The median of the content-specific median cut scores derived from the single course-success model was also a 20 (median Q1=18; median Q3 = 22). The model correctly classified whether a student would earn a B or higher in ELA-related courses for 61% of the cases, which is a 17% increase over chance. Of those who earned a B or higher in an ELA-related course, 72% were predicted to earn a B or higher. Of those who earned below a B in an ELA-related course, 49% were predicted to earn below a B.

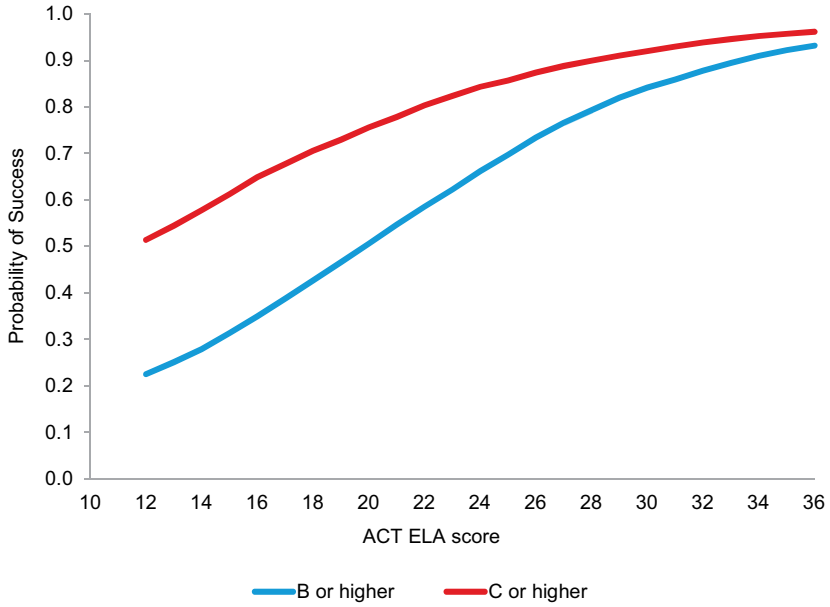

Figure 1. The typical probability of success in ELA-related courses by ACT ELA score. The English related course was English Composition I. The social science courses included Psychology, American History, Political Science, Sociology, Other History, and Economics.

In supplementary analyses, an ACT ELA cut score was also derived based on first computing the weighted median probabilities of success across institutions that were obtained from separate content-specific course success models. Then the typical probabilities of success were averaged across the two content areas and the score associated with at least a 50% chance of success was determined.[22] The separate models employed the same approach that was used to derive the individual ACT College Readiness Benchmarks (Allen, 2013), but they used the ACT ELA score instead of the individual ACT English and reading scores. Based on this alternative approach, the same ACT ELA cut score was obtained. Results from this alternative approach are not presented here.

Study 3: Validation of ACT ELA Readiness Benchmark

In Study 3, we examined whether students who met the ACT ELA Benchmark were more successful later in college than students who did not meet the Benchmark. Multiple indicators of later success in college were examined: Earning a cumulative GPA of 3.0 or higher in years one through four; persisting in college to the second, third, and fourth year; and graduating with a degree in four, five, or six years.

[22] The cut score of 20 was also obtained by taking the median of the two individual content-specific ELA cut scores that were identified to be associated with at least a 50% chance of earning a grade of B or higher in the corresponding content-related course(s). The individual content-specific ELA cut scores were calculated as the weighted median cut scores across institutions that were obtained from separate content-specific course success models (English Composition I as one and combined social science courses as the other).

Sample

Longitudinal college outcomes data used in the current study were provided by two and four-year postsecondary institutions who have participated in state partnerships and research services offered by ACT. Data included in the analyses were students from the 2006 through 2009 cohorts who took the former ACT writing test.[23] Student outcomes were tracked for at least four years at the initial institution attended, and, where possible, across in-state institutions.[24] Two state systems provided data on all of their two- and four-year public institutions, representing 100% of the two-year student sample and 39% of the four-year student sample. Tracking across a state system is particularly relevant for the two-year sample given that many students beginning at two-year institutions transfer to a four-year institution without first receiving a credential from the two-year institution (Shapiro, Dundar, Ziskin, Chiang, Chen, Harrell, & Torres, 2013). Because students from the four-year sample were primarily tracked at the initial institution attended, while students from the two-year sample were tracked across in-state institutions, the definitions of the persistence and degree completion outcomes that were used in this study differed between the two samples. For the four-year sample, persistence was defined as remaining enrolled at the initial institution attended. In comparison, persistence for the two-year sample was defined as remaining enrolled at an in-state two- or four-year institution. For the four-year sample, bachelor's degree completion from the initial institution attended was evaluated. For the two-year sample, completion of an associate's or bachelor's degree from an in-state institution was examined.

College outcomes data were available for 69,498 students from 49 four-year institutions and 5,967 students from 34 two-year institutions. Students' ELA scores were calculated as the rounded average of the ACT English, reading, and concorded writing scores from the student's latest test record when the student took the ACT with writing. The sample for the study does not represent students and institutions nationally. A large majority of both the two- and four-year institutions came from the southwest region (Table 7). Additionally, about three-fourths of the four-year institutions and all of the two-year institutions were public institutions. Students from the four-year sample tended to be better prepared academically than those from the two-year sample (Table 8). For example, more than three-fourths (78%) of the four-year sample and fewer than one-half (45%) of the two-year sample met the ACT ELA Benchmark of 20. Additional information on key institutional and student characteristics of the sample is summarized in Tables 7 and 8.

[23] Forty-three percent of the full ACT-tested four-year sample of 163,366 students took the former ACT writing test. Only 14% of the full ACT-tested two-year sample of 43,875 students took the former ACT writing test.

[24] For earlier cohorts, up to eight years of outcome data were available. For the most recent cohorts, at least four years of longitudinal data were available. For two state systems, students were tracked across in-state institutions.

Table 7. Summary of Institutional Characteristics of Study 3

Characteristic	Four-year institutions	Two-year institutions
# of four-year institutions	49	34
Admissions Policy		
Highly selective, selective	24%	0%
Traditional, open, liberal	76%	100%
Sector		
Private	29%	0%
Public	71%	100%
Region		
East	12%	0%
Midwest	10%	0%
Southwest	73%	100%
West	4%	0%
Average ACT Composite score		
Median	21.5	18.6
1st Quartile to 3rd Quartile	20.3 to 23.2	18.2 to 19.1

Note. Percentages may not sum to 100% due to rounding.

Table 8. Summary of Student Characteristics of Study 3

Characteristics	Four-year institutions	Two-year institutions
N (Students)	69,498	5,967
Gender		
Female	55%	58%
Male	42%	41%
Missing	4%	2%
Race/Ethnicity		
African American	8%	12%
Asian American	3%	2%
Hispanic	11%	5%
Other	3%	8%
White	65%	66%
Missing	9%	7%
ACT ELA Benchmark attainment		
Not met	22%	55%
Met	78%	45%
Academic Performance	Mean (SD)	Mean (SD)
ACT Scores		
Composite	23.6 (4.6)	19.5 (3.9)
English	23.6 (5.6)	19.2 (5.2)
Mathematics	23.3 (5.0)	18.6 (3.6)
Reading	24.1 (5.8)	20.2 (5.4)
Science	22.9 (4.5)	19.4 (4.0)
ELA	23.2 (4.7)	19.1 (4.3)
HSGPA		
Overall	3.53 (0.45)	3.09 (0.57)

Note. Percentages may not sum to 100% due to rounding.

Analyses

Due to the nested structure of the data, various hierarchical logistic regression models were used to estimate students' chances of succeeding in college as a function of ELA Benchmark attainment. To examine cumulative course performance, we used hierarchical logistic regression models to predict the probability of earning a 3.0 (equivalent to a B grade) or higher cumulative GPA at the end of year one through the end of year four as a function of whether the ELA Readiness Benchmark was met. Parameter estimates for both the intercept and slope of the Benchmark indicator (met/not met) were allowed to vary across institutions. Analyses of cumulative grades beyond year one were based on the subsample of students who remained enrolled in college. For students who were not enrolled during the second term of their first year, their GPAs from the first term were carried forward and used in the year one cumulative GPA analyses.

For the retention/persistence outcome, hierarchical logistic regression models were used to estimate students' chances of remaining enrolled in college. Students who were no longer

enrolled but who had completed a degree were categorized as being retained. Similar to the cumulative GPA outcome, both the intercept and the slope of the Benchmark indicator were allowed to vary across institutions.

Hierarchical discrete-time survival models under the proportional hazards assumption were developed to predict degree completion from ELA Benchmark attainment (Singer & Willett, 1993; Reardon, Brennan, & Buka, 2002). This approach simultaneously models all time periods, while also accounting for censored observations due to the various freshman cohorts being tracked for differing lengths of time. In these models, the logit of the conditional probability of degree completion in a particular term, given that no degree was earned prior to that term, was modeled as a linear function of term indicators and the ELA Benchmark indicator. The discrete-time analyses focused on fall and spring terms. There were very few degrees given in the summer terms; summer term degree completion was therefore combined with that for the prior spring term. Term indicators for term 6 (spring/summer term of year three) through term 12 (spring/summer term of year six) were included in the bachelor's degree completion models for the four-year sample. For the two-year sample where completion of an associate's or bachelor's degree was examined, term indicators for term 4 through term 12 were included in the models. Parameter estimates for the term indicators and the ELA Benchmark indicator were allowed to vary across institutions (the latter for the four-year sample only).

The GLIMMIX procedure for generalized mixed models, available in SAS 9.2, with the Laplace estimation method was used to fit the models. The ELA readiness indicator was a statistically significant predictor for all outcomes across all time points, $p < 0.0001$, unless otherwise indicated in the tables of the parameter estimates provided in Appendix B.

Results

Cumulative GPA. Summarized in Table 9, the results indicate that the likelihood of earning a cumulative GPA of 3.0 or higher was strongly related to meeting the ACT ELA Benchmark of 20 at both four- and two-year institutions (refer to Table B3 in Appendix B for parameter estimates for the models). For example, for students at a four-year institution who met the ELA Benchmark, their chances of earning a cumulative GPA of 3.0 or higher in year one was 57%. Their chances rose to a high of 69% in year four. In contrast, for students not meeting the ELA Benchmark, their chances of earning a cumulative GPA of 3.0 or higher across the four years was much lower, ranging from a low of 27% for year one to a high of 37% in year four.

Table 9. Students' Estimated Probability of Earning a Cumulative GPA of 3.0 or higher by ELA Benchmark Attainment

	Year 1		Year 2		Year 3		Year 4	
	N	Pr	N	Pr	N	Pr	N	Pr
Four-year institutions								
Not met	14,747	0.27	10,089	0.29	8,607	0.32	7,923	0.37
Met	50,647	0.57	40,812	0.63	36,985	0.66	35,792	0.69
Two-year institutions								
Not met	3,006	0.32	1,804	0.34	1,337	0.32	1,086	0.33
Met	2,554	0.48	1,615	0.54	1,266	0.50	1,025	0.53

Note. Cumulative GPA for year 2 and beyond is based only on students who remained enrolled in college. N = sample size; Pr = probability.

Persistence. Similar to what was found for cumulative GPA, students who met the ELA Readiness Benchmark were more likely than those who did not meet the Benchmark to persist in college (see Figure 2; parameter estimates are provided in Table B4 of Appendix B). For the four-year sample, students' chances of remaining enrolled in the initial institution attended in year two was 76% for those who met the ACT ELA Benchmark as compared to 65% for those who did not meet the ELA Benchmark. By year four, 56% of four-year students who met the Benchmark remained enrolled at their initial institution as compared to only 41% for those who did not meet the Benchmark. For the two-year sample, students' chances of remaining enrolled in an in-state institution at year two were similar between those who met and those who did not meet the ACT ELA Benchmark. However, by year four, students from the two-year sample who met the Benchmark were more likely than those who did not to remain enrolled in college (44% vs. 36%).

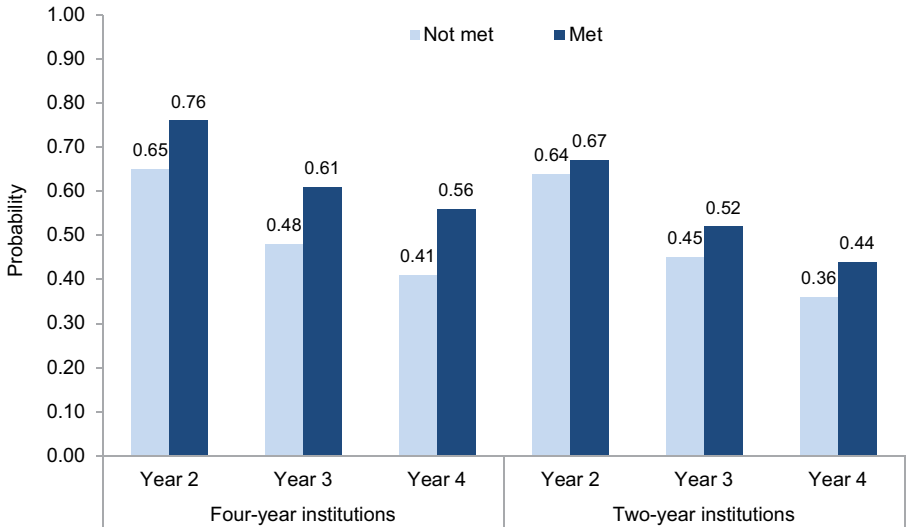

Figure 2. Probability of remaining enrolled in college by ELA Benchmark attainment. Returning to the initial institution was examined for the four-year sample. Remaining enrolled in an in-state college was examined for the two-year sample to account for student transfer.

Degree completion. Finally, the results indicate that students entering college academically ready for ELA-related coursework were more likely to complete a college degree than those who were not (see Figure 3; Table B5 of Appendix B includes the parameter estimates from the models). For the four-year sample, students' chances of completing a bachelor's degree within six years from their initial institution attended was greater than one-half (51%) for those who met the ELA Benchmark. In comparison, only about one-third (32%) of those who did not meet the Benchmark did so. For the two-year sample where students were tracked across in-state public institutions, students' chances of earning an associate's or bachelor's degree within six years was 42% for those who met the Benchmark as compared to only 29% for those who did not met the ELA Benchmark.

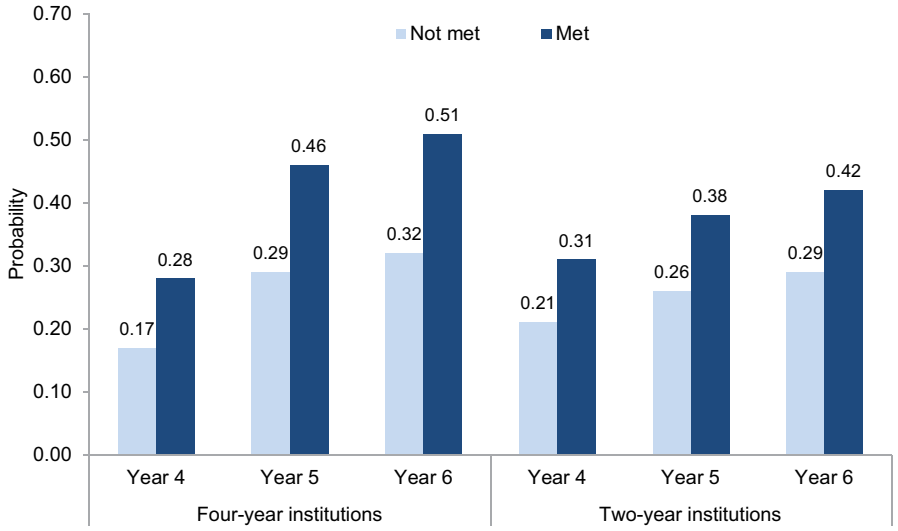

Figure 3. Probability of completing a degree in four, five, or six years by ACT ELA Benchmark attainment. Bachelor's degree completion primarily from the initial institution was examined for the four-year sample. Associate's or bachelor's degree completion within the state public higher education system was examined for the two-year sample.[25]

In sum, the ELA Readiness Benchmark not only provides information to students about their likelihood of earning a grade of B or higher in typical first-year English and social science courses, but it is also related to a variety of important long-term academic outcomes such as earning a cumulative GPA of 3.0 or higher through the fourth year of college, persisting in college, and ultimately earning a degree.

ACT ELA Benchmark Attainment for Recent ACT-Tested High School Graduates

In the academic year of 2015–16, 519,922 students (25%) from the 2016 ACT-tested high school graduating class took the current ACT writing test and so they had an official ACT ELA score. Of these students, 71% met the ACT English Benchmark, 55% met the ACT Reading Benchmark, and 61% would be classified as meeting the ACT ELA Benchmark of 20 (see Table 10). For this subset of the 2016 ACT-tested high school graduating class, the percentage of students meeting the ACT ELA Benchmark varied across the racial/ethnic groups but not by gender (Figure 4). By race/ethnicity, the highest percentages for ACT ELA Benchmark attainment were seen among Asian and White students, while the lowest percentages were seen for African American and American Indian students.

[25] The degree completion rates between the four- and two-year samples are not directly comparable given that different definitions of degree completion were examined.

Table 10. ACT College Readiness Benchmark Attainment for 2016 ACT-Tested High School Graduates

Group of 2016 ACT-tested high school graduating class	Percentage meeting ACT Benchmark		
	ACT English Benchmark	ACT Reading Benchmark	ACT ELA Benchmark
Total class (N=2,090,342)	61%	44%	--
Subset that took the current ACT writing test (N=519,922)	71%	55%	61%

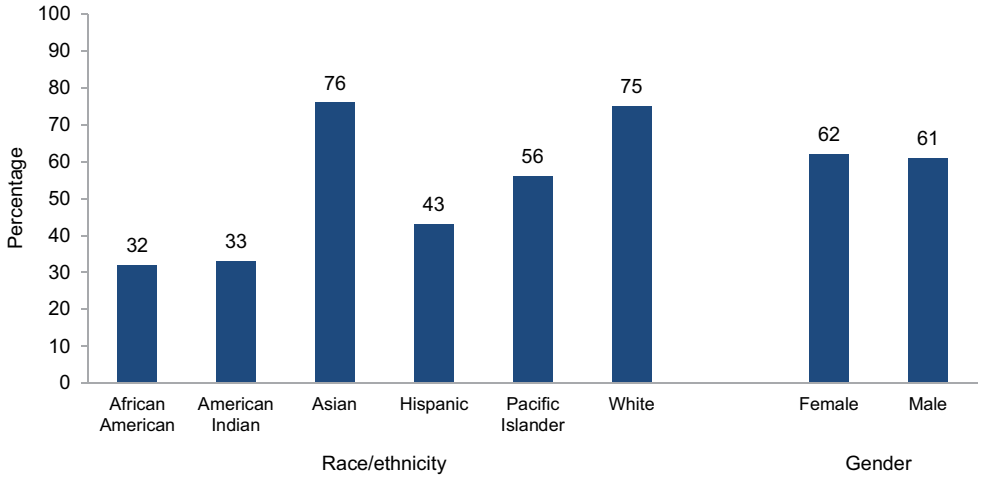

Figure 4. ACT ELA Benchmark attainment by race/ethnicity and gender for 2016 ACT-tested high school graduates who took the current ACT writing test in 2015–16.

Given that the ACT ELA Benchmark was based on the same courses that were used to derive the ACT College Readiness Benchmarks in English and reading, ACT ELA Benchmark attainment (met; not met) was compared to ACT English and Reading Benchmark attainment (met both; met English only; met reading only; met neither) for the subset of 2016 ACT-tested high school graduates who took the current ACT writing test (Table 11). For the 2016 ACT-tested high school graduating class, 88% of the students would be classified consistently on ELA, English, and reading readiness according to (1) the ACT ELA Benchmark of 20 and (2) the individual ACT College Readiness Benchmarks in English and reading of 18 and 22, respectively. For those classified consistently, 51% would be identified as being academically ready for typical first-year English and social science courses (cell shaded in dark blue in Table 11), while 37% would be identified as not being ready for those courses (cells shaded in light blue in Table 11). For the remaining 12% of students, 10% met the ELA Benchmark but did not meet at least one of the English and Reading Benchmarks and 2% did not meet the ELA Benchmark but met both the English and Reading Benchmarks. The disparities among students who met the ELA Benchmark but did not meet both the English and Reading Benchmarks was due primarily to students not earning an ACT reading score of 22 or higher. For the 2% who met both the English and Reading Benchmarks but did not meet the ELA Benchmark, it was due to lower ACT writing scores.[26]

[26] These students did not meet the ACT ELA Benchmark because of their relatively lower scores on the ACT writing test: 65% earned a 5 or below and 33% earned a 6 (out of a possible 12 points).

Table 11. Cross-tabulation of ACT ELA Benchmark Attainment by ACT English and Reading Benchmark Attainment for 2016 ACT-Tested High School Graduates who Took the Current ACT Writing Test

	ACT ELA Benchmark			
	Met		Not met	
ACT English and Reading Benchmarks	N	%	N	%
Met both	263,659	50.7%	9,683	1.9%
Met English only	47,406	9.1%	50,660	9.7%
Met reading only	4,257	0.8%	8,835	1.7%
Met neither	2,763	0.5%	132,659	25.5%

Note. Dark blue shaded cells highlight the scenario where there is consistency in meeting the two sets of ELA-related Benchmarks, while the light blue shaded cells highlight the scenarios where there is consistency in not meeting the two sets of ELA-related Benchmarks.

Discussion

The current study establishes a preliminary ACT ELA Readiness Benchmark to help identify students who have a high probability of succeeding in the first-year ELA-related courses typically taken by all college students regardless of their chosen academic major. Similar to what was done in the development of the ACT STEM Readiness Benchmark (Mattern et al., 2015; Radunzel et al., 2015), the first study examined first-year, ELA-related course-taking patterns of students using actual course transcript data. The results indicated that the ELA-related first-year courses commonly taken by students were the same courses used in the establishment of the ACT College Readiness Benchmarks for the ACT English and reading tests (Allen, 2013) and that this was consistently seen across students' major categories, including among students from more specific ELA-related majors. These courses were English Composition I, American History, Other History, Psychology, Sociology, Political Science, and Economics. So unlike results from the Mattern et al. (2015) study that found significant differences in the typical mathematics and science courses taken between STEM and non-STEM majors, this study did not find substantial differences across major categories in the typical English and social science courses taken during the first year. These findings suggest that there is less of an emphasis on the ELA Benchmark being associated with course success for specific major fields of study, unlike the case for the STEM Benchmark. These results are corroborated by other studies showing that well-developed literacy skills are important for all students to be able to successfully read and write across the college curriculum (Defazio, Jones, Tennant, & Hook, 2010; Thompson, 2011).

The current study also found that based on students' actual course grades, the ELA score needed to ensure a reasonable probability of success (50% for a B or higher) in first-year English and social science courses was estimated to be 20. We also evaluated the importance of meeting the ELA Readiness Benchmark for success beyond first-year ELA-related courses. The findings indicated that meeting the ELA Readiness Benchmark is associated with greater chances of earning a cumulative GPA of 3.0 or higher over time, persisting in college, and earning a college degree.

Providing students with this type of information early on will help them determine their preparedness for success in a wide array of ELA-related courses typically taken during the first

year of college. Hopefully, this will help students develop their literacy skills prior to entering college, thereby preventing the need to take remedial English and reading courses. Moreover, early grade readiness benchmarks can be linked to the ACT ELA Benchmark, providing an early signal to students on their ELA readiness so that there is time to intervene well before they graduate from high school.

A limitation of the current study was that this preliminary Benchmark was based on estimated ELA scores that used concorded ACT writing scores. The data used to derive the ELA Benchmark was based on college outcomes of freshman cohorts who took the former ACT writing test prior to the introduction in 2015 of the current ACT writing test. For these students, ELA scores were estimated based on their ACT English, reading, and concorded writing scores, and then compared to student outcomes in specific first-year college courses. Supplemental analyses conducted to evaluate the use of concorded writing scores in estimating ELA scores suggested that this method is reasonable for the development of a preliminary ELA Benchmark (see Appendix A for further details). There are plans to re-evaluate the ELA Benchmark once sufficient college course-transcript data become available for students who took the current ACT writing test that includes freshman cohorts of 2016 and later.

The representativeness of the samples used to develop and validate the ELA Readiness Benchmark is another limitation of the current study. Study 1 used data from just four states, and Studies 2 and 3 drew heavily upon institutions in the Southwest region. At the student level, the ACT writing test is optional, so not all ACT-tested students have all the scores needed to calculate an ELA score. Research suggests that students who take the ACT writing test tend to be better prepared academically than the average ACT-tested student (Table 10; ACT, 2015; ACT, 2016a). To mitigate these issues, both institutional and student weighting was employed to ensure that the sample was representative of the larger population of ACT-tested students nationally, and not only to the subset of students who took the ACT writing test.

Clearly, both cognitive and non-cognitive factors contribute to academic and workplace performance (e.g., Allen & Robbins, 2010; Barrick & Mount, 1991; Le, Robbins, & Westrick, 2014; Nye, Su, Rounds, & Drasgow, 2012; Poropat, 2009; Richardson, Abraham, & Bond, 2012; Robbins, Lauver, Le, Davis, Langley, & Carlstrom, 2004; Van Iddekinge, Putka, & Campbell, 2011). For example, motivation and interest-major congruence have been shown to be predictive of timely degree completion after taking academic preparation into consideration (Allen & Robbins, 2010). Besides using the ACT ELA score, future research should include non-cognitive factors, high school coursework, and high school grades to help predict student success in ELA-related courses in the first year of college. That being said, the ELA Readiness Benchmark still provides valuable information for providing feedback on students' literacy skills and is useful for tracking ELA proficiency rates across time and entities (e.g., schools, districts, states).

The need for the integration of English, reading, and writing skills has become more widely recognized (CCSSI, 2010; Camara et al., 2015; Mattern et al., 2014), and the development of the preliminary ACT ELA Readiness Benchmark provides educators an estimate of the ELA skill level needed to succeed in seven ELA-related courses commonly taken by first-year college students. Previous research has demonstrated the difficulty of students catching up academically (Dougherty, 2014; Mattern et al., 2014), and with early-grade readiness benchmarks linked to the ACT ELA Benchmark, educators and parents will be able to see if

students are on track as early as the third grade. This will allow time for educators, parents, and students to take action well before students approach high school graduation. Ideally, efforts to develop students' literacy skills will lead to fewer college students needing remedial English and reading coursework, and, ultimately, will lead to enhanced overall performance in college courses and higher college graduation rates.

For students who do not take the optional ACT writing test and hence are not provided with an ACT ELA score, students can use the ACT Benchmarks in English and reading to gauge their ELA readiness.[27] A comparison between ACT ELA Benchmark attainment and ACT English and Reading Benchmark attainment (met both; met English only; met reading only; met neither) suggested that there is relatively high consistency in the message being provided on ELA readiness between these alternative definitions. That being said, the writing test does contribute unique information and together with the other two domains, provides a clear picture of a student's strengths and weaknesses in ELA.

Another important skill discussed in ACT's ELA framework focuses on the ability to handle complex texts. To provide students with information on their proficiency in understanding complex texts, students who take the ACT reading test are also provided with an indicator for Understanding Complex Texts that assesses their ability to make global bridging inferences across a range of increasingly complex texts (Allen, Bolender, Fang, Li, & Thompson, 2016). Based on this indicator, students' performance is categorized into the following three levels: below proficient, proficient, and above proficient. These categories were empirically derived based on students' typical chances of being successful in college courses where more complex texts are often encountered such as American History, English Literature, Other History, Other Natural Science, Physics (without Calculus), Sociology, and Zoology. For more details about this other ELA-related measure, see the full report by Allen et al. (2016).

In sum, given the exceeding importance of ELA skills in both education and the workplace (Camara et al., 2015; Mattern et al., 2014), this newly developed indicator of ELA readiness will provide useful diagnostic information to students, parents, and educators. The ultimate goal is that this information will be used to identify at-risk students and provide academic interventions in order to support all students in achieving educational and workplace success.

[27] Note that the ELA Benchmark of 20 also corresponds to the average of the ACT Benchmarks in English (18) and reading (22).

Appendix A

An Empirical Validation of the Use of Concorded Writing Scores in Estimating ELA Scores for Students with Former ACT Writing Test Scores

ACT began reporting English Language Arts (ELA) scores in September 2015 when the current ACT writing test was first launched. While the former ACT writing test consisted of a 30-minute test using a holistic six-point rubric, the current ACT writing test was enhanced by redesigning the writing prompts, extending the testing time to 40 minutes, and using an analytical rubric for scoring on four writing domains. In addition, the score scale used for reporting the overall writing test score changed from the previous 2 to 12 scale to a 1 to 36 scale. Beginning in September 2016, although the writing test (task) had not changed, ACT introduced a new way to report the overall writing test score as the rounded average of the four domain scores that ranges from 2 to 12 (ACT, 2016c). However, the 1 to 36 writing scale scores that were introduced in fall 2015 continue to be used in the calculation of students' ACT ELA scores. The ACT ELA score is the rounded average of the English, reading, and writing scores; it ranges from 1 to 36. See ACT (2016b) for more information about the ACT writing test.

To help with transitioning from the former to the current ACT writing test, a special study was conducted in fall 2014 to examine the relationships between scores on the former ACT writing test and scores on the current ACT writing test. Based on scores from approximately 800 students who took both a former ACT writing test prompt and a current ACT writing test prompt, a concordance table between the 2 to 12 scores of the former ACT writing test and the 1 to 36 scale scores of the current ACT writing test was developed and made available to test users (ACT, 2015). The concordance is not intended to be used for making high-stakes decisions for individual students. However, it may serve other purposes when the distributions of group level scores are considered. The intent of these supplemental analyses is to provide empirical support for some uses of the concordance table. For this study, the use of the concordance table is to estimate ELA scores for the purpose of developing a preliminary ELA Readiness Benchmark.

As described in the body of the paper, the development of the preliminary ELA Readiness Benchmark was based on data from students who took the ACT writing test prior to September 2015 when ELA scores were not reported. ELA scores were estimated for these students using the concordance table between the former and current ACT writing scores. It was not known whether or how much the estimated ELA score distributions based on the concorded writing scores would differ from the actual ELA score distributions had the current ACT writing test been taken. It was also not known how using estimated ELA scores might affect the relationship between ELA scores and course grades. This appendix describes the supplemental analyses and corresponding results that provide empirical support for the use of the estimated ELA scores in large samples.

Data and Method

Matched samples were obtained from students who took the former ACT writing test in the 2014–15 academic year and from those who took the current ACT writing test in the 2015–16 academic year. First, a random sample was drawn from the pool of students who took the

writing test in 2014–15 to establish the English and reading bivariate score distribution for the sample. Then, from the pool of students who took the writing test in 2015–16, a frequency-matched sample was drawn to ensure that the 2014–15 and 2015–16 samples had the same English and reading bivariate score distribution. Next, ELA scores were estimated for students who took the former writing test using the concorded writing score values. Several different sample sizes were used for each of the following analyses to examine the extent that the sample size might affect the results.

To examine how well the ELA score distribution can be estimated using concorded writing scores, the distribution of the estimated ELA scores for the sample of students who took the former writing test was compared to the distribution of actual ELA scores for the sample of students who took the current writing test. It was assumed that if the concordance table was not appropriate to use for the purposes of this study, then there would be detectable differences in the distributions of ELA scores between the two samples matched on the ACT English and reading bivariate distribution. The sample sizes used for these analyses included 50, 100, 500, 1,000, 2,000, and 5,000.

To validate the use of estimated ELA scores in examining relationships between ELA scores and course grades, the relationship between high school grade point average (HSGPA; another academic performance outcome) and the estimated or actual ELA scores was examined for each sample. More specifically, the ELA score that was associated with at least a 50% chance of earning a specific HSGPA threshold was identified from a simple logistic ELA score/HSGPA regression model. HSGPA instead of first-year course grades was used as the outcome variable in these analyses. This was because college outcomes data were not available for students who took the current ACT writing test in the 2015–16 academic year. HSGPA has been found in prior research to be moderately correlated (0.47) with first-year college GPA (Westrick et al., 2015). The HSGPA thresholds included 3.0 or higher, 3.25 or higher, and 3.50 or higher. The models were run using sample sizes of 5,000, 10,000, and 100,000 per sample.

Results

The cumulative relative frequency distributions of the estimated ELA scores of the 2014–15 sample and the reported ELA score distributions of the 2015–16 sample are presented in Figure A1, with each graph presenting results for a different sample size (50, 100, 500, 1,000, 2,000, and 5,000, respectively). Recall that these samples were frequency-matched based on the English and reading bivariate score distribution. As shown in Figure A1 and Table A1, although minor differences exist for small samples, the estimated ELA score distribution for students who took the former ACT writing test (using the concorded writing scores) was almost identical to the distribution obtained for the matched sample of students who took the current ACT writing test for large samples (1,000 or higher).

Based on the results from the ELA score/HSGPA logistic regression models, the ELA cut scores associated with at least a 50% chance of attaining a specific HSGPA threshold were determined at the various threshold values and sample sizes for each sample. For each scenario, the estimated ELA cut score (based on the 2014–15 sample) was similar to or within one point of that for the actual ELA score (based on the 2015–16 sample).

In conclusion, findings from these supplemental analyses provide evidence to support the use of estimated ELA scores in developing a preliminary ACT ELA Readiness Benchmark. However, it is important to note that ACT does not recommend the use of the concordance table for high stakes decisions for an individual student.

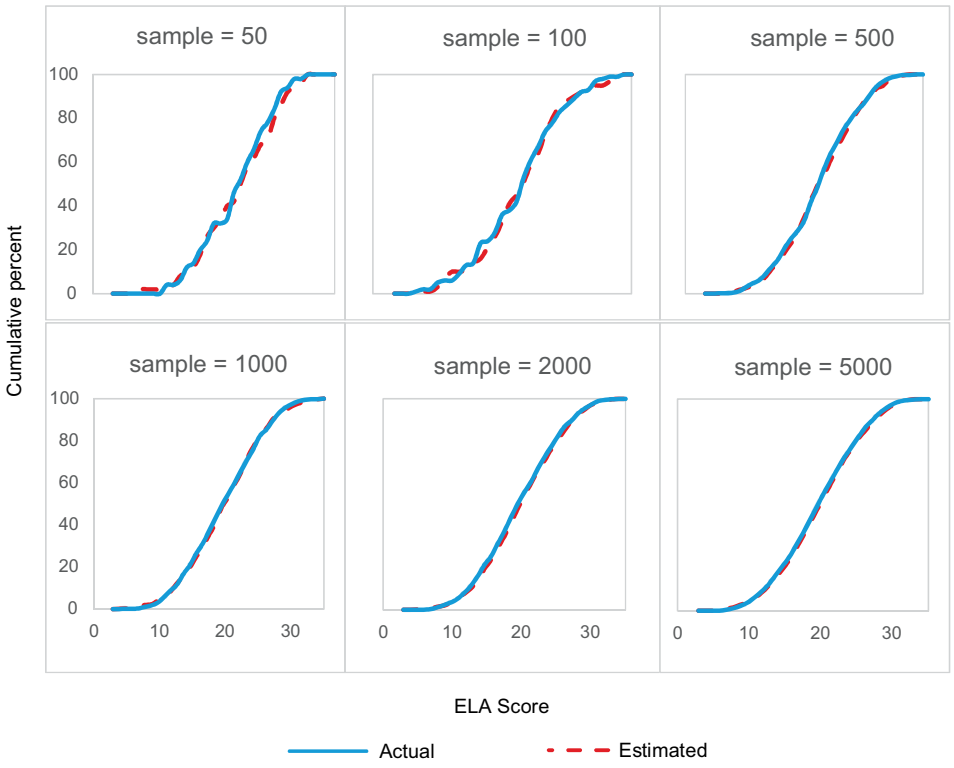

Figure A1. Comparison of distributions of the estimated ELA scores and the reported ELA scores for frequency-matched samples.

Table A1. Cumulative Frequency Distributions of Estimated Versus Actual ELA Scores from Matched Samples by Sample Size

ACT ELA Score	N=50		N=100		N=500		N=1000		N=2000		N=5000	
	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual	Estimated	Actual
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	1	0	0	0	0	0	0	0	0
7	2	0	1	2	0	0	1	0	1	0	1	0
8	2	0	1	2	2	1	2	1	1	1	2	1
9	2	0	3	5	2	3	2	2	2	2	3	2
10	2	0	7	6	4	4	4	3	3	3	4	4
11	4	4	10	6	5	6	5	6	5	5	6	6
12	4	4	10	9	7	8	8	9	8	8	8	9
13	8	6	11	13	11	12	12	12	10	11	12	12
14	10	12	14	14	14	15	16	17	14	16	15	17
15	12	14	16	23	19	21	20	21	19	21	19	21
16	18	20	21	24	23	25	25	26	24	25	24	25
17	26	24	26	28	28	29	29	31	29	31	29	31
18	30	32	33	36	35	33	35	37	35	37	35	37
19	34	32	41	38	42	42	41	43	41	44	42	43
20	40	34	45	42	49	48	48	49	48	50	48	49
21	42	46	51	53	54	57	53	55	54	56	54	56
22	50	52	59	61	61	64	59	60	60	61	60	61
23	58	60	64	67	67	69	65	65	66	67	66	67
24	62	66	73	74	72	75	72	71	71	73	72	73
25	68	74	80	78	78	79	77	76	76	78	77	78
26	70	78	86	83	83	83	82	82	81	83	82	82
27	80	84	88	86	87	87	86	85	85	87	85	87
28	86	92	90	89	90	91	90	90	90	90	89	90
29	92	94	92	92	94	95	93	93	93	93	93	93
30	94	98	94	93	95	97	95	96	95	96	95	96
31	96	98	95	97	98	98	96	97	97	97	97	98
32	100	100	95	98	99	99	98	99	98	99	99	99
33	100	100	97	99	100	100	99	99	99	99	100	100
34	100	100	100	99	100	100	100	100	100	100	100	100
35	100	100	100	100	100	100	100	100	100	100	100	100
36	100	100	100	100	100	100	100	100	100	100	100	100

Appendix B

Table B1. Classification of General Major Categories

General major category	CIP codes
Arts & Humanities	05, 16, 23, 38, 39, 50, 54
Social & Behavioral Sciences	09, 42, 43, 44, 45
General Studies	24
Life Sciences	01, 03, 19, 26, 51
Science & Engineering	11, 14, 27, 40
Career Related	04[1], 10, 12, 15, 41, 46, 47, 48, 49
Other Non-Science Related Majors	13, 22, 30, 31, 52

Note. The two-digit CIP codes encompass all codes under them in the hierarchy unless otherwise denoted. For more information on specific CIP codes, go to the National Center for Education Statistics website at https://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55 (National Center for Education Statistics, 2002; 2010).

[1] Excludes six-digit CIP codes 040800 (Architectural History and Criticism) and 040801 (Architectural History and Criticism, General) per NSF taxonomy of fields. These latter six-digit codes were included with Arts & Humanities.

Table B2. Parameter Estimates from Hierarchical Logistic Regression Models for ELA Course Success

	B or higher		C or higher	
Variable	Parameter estimate	Standard error	Parameter estimate	Standard error
Intercept[1]	-2.593	0.113	-0.672	0.129
ACT ELA score[1]	0.141	0.005	0.105	0.006
Content indicator (1 for social sciences; 0 for English)	-1.521	0.143	-1.844	0.161
Content indicator x ACT ELA score	0.051	0.006	0.064	0.008

Note. ELA-related courses included English Composition I, American History, Other History, Psychology, Sociology, Political Science, and Economics.

[1] The intercept and the slope for the ACT ELA score were allowed to vary across the course/institution combinations. The estimates (and standard errors) of the variability in the intercepts and slopes across the course/institution combinations were 1.760 (0.168) and 0.003 (0.0003) from the B or higher model and 2.300 (0.216) and 0.004 (0.0005) from the C or higher model, respectively.

Table B3. Parameter Estimates from Hierarchical Logistic Regression Models for Students' Chances of Earning a 3.0 or Higher Cumulative GPA

Sample	Year	Mean/ Variance	Intercept (SE)	ELA Benchmark Indicator (SE)[1]
Four-year	1	Mean	-1.013 (0.053)	1.287 (0.048)
		Variance	0.101 (0.025)	0.064 (0.019)
	2	Mean	-0.908 (0.050)	1.434 (0.054)
		Variance	0.072 (0.021)	0.073 (0.023)
	3	Mean	-0.739 (0.051)	1.424 (0.057)
		Variance	0.072 (0.021)	0.080 (0.027)
	4	Mean	-0.541 (0.053)	1.351 (0.058)
		Variance	0.076 (0.023)	0.077 (0.028)
Two-year	1	Mean	-0.757 (0.070)	0.671 (0.100)
		Variance	0.087 (0.035)	0.147 (0.086)
	2	Mean	-0.651 (0.072)	0.793 (0.087)
		Variance	0.056 (0.030)	0.021 (0.039)
	3	Mean	-0.753 (0.072)	0.768 (0.097)
		Variance	0.028 (0.027)	0.015 (0.037)
	4	Mean	-0.713 (0.077)	0.841 (0.113)
		Variance	0.027 (0.030)	0.057 (0.069)

Note: SE = standard error; Mean = estimated mean value of parameter across institutions; Variance = estimated variance of parameter across institutions.

[1] For each case, the parameter estimate for the ELA Benchmark indicator associated with the mean was significantly different from zero with $p < 0.0001$.

Table B4. Parameter Estimates from Hierarchical Logistic Regression Models for Persistence

Sample/Outcome	Year	Mean/ Variance	Intercept (SE)	ELA Benchmark Indicator (SE)[1]
Four-year/ Retention	2	Mean	0.612	0.481
			(0.077)	(0.038)
		Variance	0.268	0.031
			(0.058)	(0.012)
	3	Mean	-0.077	0.536
			(0.082)	(0.042)
		Variance	0.300	0.050
			(0.065)	(0.017)
	4	Mean	-0.364	0.586
			(0.089)	(0.044)
		Variance	0.360	0.054
			(0.078)	(0.018)
Two-year/ Persistence	2	Mean	0.592	0.125[2]
			(0.047)	(0.081)
		Variance	0.018	0.069
			(0.013)	(0.060)
	3	Mean	-0.192	0.270[3]
			(0.043)	(0.065)
		Variance	0.011	0.024
			(0.011)	(0.029)
	4	Mean	-0.587	0.339
			(0.049)	(0.072)
		Variance	0.021	0.040
			(0.015)	(0.037)

Note. SE = standard error; Mean = estimated mean value of parameter across institutions; Variance = estimated variance of parameter across institutions.

[1] For most cases, the parameter estimate for the ELA Benchmark indicator associated with the mean was significantly different from zero with $p < 0.0001$. The exceptions are denoted otherwise.

[2] The parameter estimate for the ELA Benchmark indicator associated with the mean for this outcome was not significantly different from zero ($p > 0.05$).

[3] The parameter estimate for the ELA Benchmark indicator associated with the mean for this outcome was significantly different from zero with $p < 0.001$.

Table B5. Parameter Estimates from Hierarchical Discrete-Time Survival Models for Degree Completion

		Four-year institutions	Two-year institutions
Variable	**Mean/Variance**	**Estimate (SE)**	**Estimate (SE)**
Term 4	Mean	--[1]	-2.251 (0.139)
	Variance	--[1]	0.516 (0.147)
Term 5	Mean	--[1]	-3.636 (0.130)
	Variance	--[1]	0.188 (0.118)
Term 6	Mean	-5.114 (0.126)	-2.941 (0.070)
	Variance	0.450 (0.144)	0.011 (0.023)
Term 7	Mean	-4.358 (0.094)	-3.984 (0.124)
	Variance	0.272 (0.083)	0.061 (0.076)
Term 8	Mean	-1.704 (0.124)	-3.221 (0.086)
	Variance	0.712 (0.154)	0.023 (0.037)
Term 9	Mean	-2.731 (0.086)	-3.739 (0.165)
	Variance	0.267 (0.070)	0.035 (0.096)
Term 10	Mean	-2.387 (0.091)	-3.249 (0.122)
	Variance	0.321 (0.077)	0.030 (0.056)
Term 11	Mean	-3.757 (0.111)	-3.983 (0.171)
	Variance	0.209 (0.089)	--[2]
Term 12	Mean	-3.598 (0.120)	-3.600 (0.145)
	Variance	0.244 (0.108)	--[2]
ELA Benchmark indicator[3]	Mean	0.651 (0.037)	0.427 (0.051)
	Variance	0.034 (0.011)	--[2]

Note. SE = standard error. The term variables can be interpreted as: Term 4 = Spring/Summer term of year 2, Term 5 = Fall term of year 3, through Term 12 = Spring/summer term of year 6; Mean = estimated mean value of parameter across institutions; Variance = estimated variance of parameter across institutions.

[1] These terms were not included in the model for the four-year sample because too few bachelor's degrees were earned during these terms.
[2] These indicators did not vary across institutions in the model for the two-year sample.
[3] For each sample, the parameter estimate for the ELA Benchmark indicator associated with the mean was significantly different from zero with $p < 0.0001$.

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