COLLEGE READINESS

ACT National Curriculum Survey®
2005–2006

ACT®

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ACT is an independent, not-for-profit organization that provides assessment, research, information, and program management services in the broad areas of education and workforce development. Each year we serve millions of people in high schools, colleges, professional associations, businesses, and government agencies, nationally and internationally. Though designed to meet a wide array of needs, all ACT programs and services have one guiding purpose—helping people achieve education and workplace success.

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Overview

What Is the ACT National Curriculum Survey®?

The ACT National Curriculum Survey is a one-of-a-kind nationwide survey of educational practices and expectations conducted by ACT every three to five years. ACT surveys thousands of middle school/junior high school, secondary, and postsecondary[1] teachers in English/writing, reading (including English language arts and social studies teachers), mathematics, and science for the purpose of determining what skills and knowledge are currently being taught that are considered important for success at each grade level for college readiness.

ACT uses the survey results to guide the test development of ACT's EXPLORE® (8th and 9th grade), PLAN® (10th grade), and ACT® (11th and 12th grade) tests, which are key components of ACT's Educational Planning and Assessment System (EPAS™). ACT conducts the ACT National Curriculum Survey to ensure its curriculum-based assessments are measuring the knowledge and skills that are important for success in postsecondary education.

ACT conducts the only nationwide curriculum survey that empirically identifies current instructional practices and postsecondary expectations in order to develop tests that measure critical skills and knowledge.

Because the ACT National Curriculum Survey collects a wealth of information about what middle school, secondary, and postsecondary educators believe entering college students should know and be able to do to be ready for credit-bearing college-level coursework, we are sharing the results more broadly, recognizing that these data can help educational stakeholders make more informed educational decisions about college readiness standards and alignment of those standards with assessment and curriculum.

What is "college readiness"? In this report we use the phrase to refer to approximately a 75% chance of earning a grade of C or better, or approximately a 50% chance of earning a grade of B or better, in selected courses commonly taken by first-year college students in the areas of English (English Composition), mathematics (Algebra), social sciences (History, Psychology, Sociology, Political Science, or Economics), and natural sciences (Biology).

The first section of this report provides an overview of the 2005–2006 survey and highlights key findings. This section is followed by the findings for each of four subject areas: English/writing, mathematics, reading, and science. The last section offers conclusions based on the results.

[1] Throughout this report, the term *postsecondary instructors* refers only to instructors of credit-bearing college courses; it does not include instructors of remedial college courses. When the latter are referenced in the report, they are termed "remedial-course teachers."

Survey Participants Included Middle School, High School, and Postsecondary Instructors; Remedial-Course Teachers; and High School Guidance Counselors

For the 2005–2006 ACT National Curriculum Survey, we sent surveys (see Table 1.1) to a nationally representative sample of middle school/junior high school, high school, and college teachers who teach courses in English/writing, reading (including English language arts and social studies), mathematics, and science (including biology, chemistry, physics, and Earth/space science) in public and private institutions across the United States. We also included a sample of high school guidance counselors and of college remedial-course teachers. The response rates by content area ranged from 16% to 30%, and the overall response rate was 19%. Appendix A provides the details of the survey respondent information.

In the fall of 2000, 28% of incoming college freshmen took a remedial course in either reading, writing, or math (NCES, 2004). Instructors of these kinds of courses were included in the 2005–2006 survey sample.

Table 1.1

ACT National Curriculum Surveys Sent in 2005–2006

Grade level	Number of surveys
Middle school/junior high school	6,800
High school	
Teachers	10,800
Guidance counselors	1,200
Postsecondary	12,992
Remedial-course	3,873
Total	35,665

All teachers were asked to perform two primary tasks. First, teachers were asked to *rate content knowledge and skills* with respect to how important each is to student success in the content area (specifically, secondary teachers were asked to rate the importance in the class they teach; postsecondary instructors were asked to rate the importance of the content/skill as a prerequisite to success in their class). These results allow for comparison of secondary school teachers' views of the importance of course outcomes to postsecondary instructors' expectations of what is needed for success in their courses. Second, teachers were asked to *rank groups* of content and skills, known as *strands*, with respect to their relative importance for student readiness for college. In addition, all teachers (except for postsecondary) were asked to indicate whether they teach that particular knowledge/skill in their course. Finally, teachers were asked to provide additional information specific to the courses they teach (e.g., textbooks used, calculator policies in math, course requirements in science, texts featured in English and social studies courses, impact of state standards).

High school guidance counselors were surveyed to provide information such as what kinds of courses were typically offered in their schools, general course-taking patterns of students, and at what grade level a student in their district typically took certain courses.

We also surveyed a sample of teachers who teach remedial courses at the postsecondary level in reading, writing, and math. Unfortunately, far too many high school graduates currently need to enroll in non-credit-bearing remedial courses in order to become ready for postsecondary work. According to the National Center for Educational Statistics (NCES), in the fall of 2000, 28% of all incoming freshmen were enrolled in at least one remedial course (see Figure 1.1; National Center for Education Statistics, 2004, p. 84). By collecting data identifying both the critical skills and knowledge that students were missing and the set of knowledge and skills that resulted in successful remediation in a content area, we believe the results will help to identify the broader knowledge and skills these students are not attaining in high school.

It is important to note that there are no remedial science courses that students typically take in college; thus freshman science courses were not included in the remediation part of the survey.

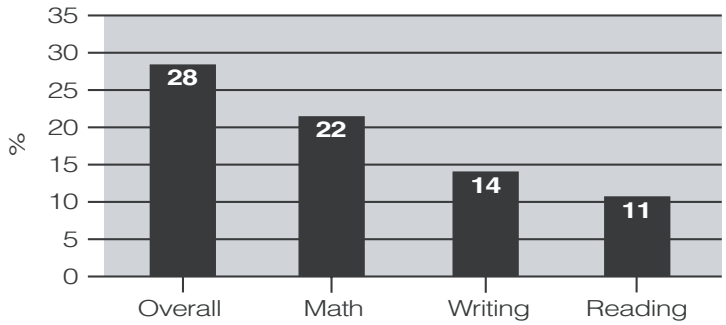
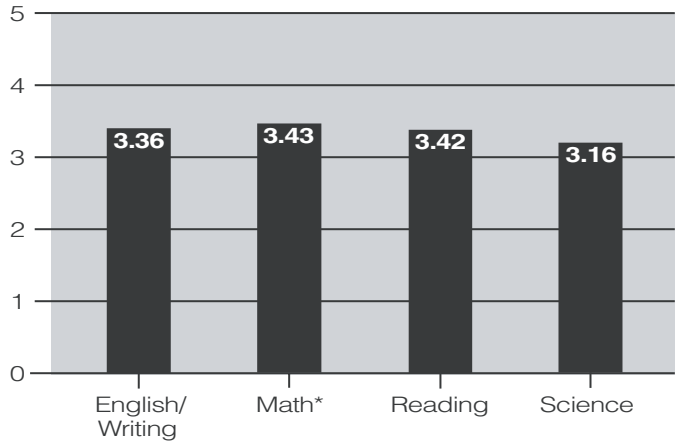


Figure 1.1: Percentage of College Freshmen Enrolled in Remedial Coursework in Fall 2000

Summary of Results

1. ACT's Educational Planning and Assessment System (EPAS) Tests Measure Content and Skills Educators Identify as Important for College Readiness

ACT conducts its National Curriculum Survey to make sure that ACT's EPAS test specifications are up to date and reflect the knowledge and skills currently needed for college readiness. The results of the ACT National Curriculum Survey affirm that the knowledge and skills currently being taught in United States classrooms that are important for readiness and success in college are being adequately represented in ACT's EXPLORE, PLAN, and ACT tests. The knowledge and skills being measured by the tests and the relative emphasis accorded to each are consistent with those rated as important and necessary by secondary and postsecondary teachers.



* Because mathematics, unlike the other three content areas, contains a much larger pool of topics and skills whose importance varies depending on the courses taught by the survey respondents, we evaluated these topics and skills in the context of the courses in which they are most relevant.

Figure 1.2: Postsecondary Mean Importance Ratings of EPAS Content and Skills (1=Not Important; 5=Very Important)

Figure 1.2 reports the means of postsecondary teacher importance ratings using a five-point scale (1 = Not Important, 5 = Very Important) for the groups of knowledge and skills currently measured by the EPAS tests. This table illustrates that the knowledge and skills being measured

are considered important by postsecondary instructors, with all four subject areas averaging above the 3.0 mark (the minimum level of importance is 2.0).

ACT uses importance rating results to guide decisions about the knowledge and skills to be measured on EPAS tests and in what proportions. When postsecondary and secondary instructors' ratings disagree, we give precedence to the postsecondary instructors' ratings to make sure our EPAS tests measure knowledge and skills critical to college readiness. If a particular skill or knowledge currently on the EPAS tests falls into the unimportant range, or if an untested skill or knowledge falls into the moderately important range or beyond, the ACT National Curriculum Survey results give us the validity evidence to make a corresponding change in our test specifications. We also use the importance rating results to help guide us in evaluating the overall emphases the knowledge and skills receive in each test.

Across all subject areas, high school teachers rate more content topics and skills as "important" or "very important" than do postsecondary instructors.

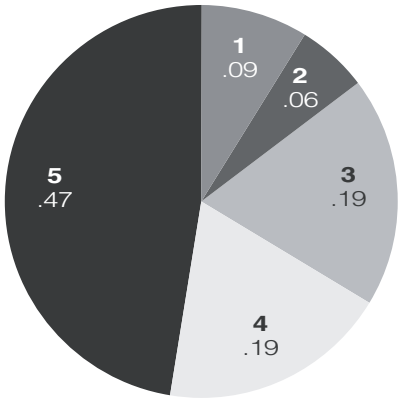


Figure 1.3: High School Teachers' Ratings (1=Not Important; 5=Very Important)

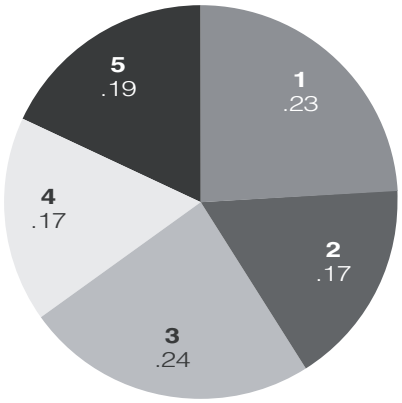


Figure 1.4: Postsecondary Instructors' Ratings (1=Not Important; 5=Very Important)

Appendix B gives statistical details about each knowledge and skill question asked. Appendix C provides details about EPAS test development, including EPAS test specifications. Sections 2 through 5 in this document include additional discussion about the validity evidence provided by ACT National Curriculum Survey 2005–2006 results with respect to each content area EPAS tests.

2. What Postsecondary Instructors Expect Entering College Students to Know Is Far More Targeted and Specific Than What High School Teachers View as Important

High school teachers in all content areas (English/writing, reading, mathematics, and science) tended to rate far more content and skills as "important" or "very important" than did their middle school/junior high school, postsecondary, or remedial counterparts (see Figures 1.3 and 1.4). Postsecondary instructors selected fewer topics and skills as important prerequisites for success.

This finding is consistent with recent policy statements raising concerns that some states require far too many standards to be taught and measured, rather than becoming more

selective in identifying the most important state standards for students to attain. The long lists of content topics and skills defy teachers' efforts to teach them in detail within the confines of a single school year (Thomas B. Fordham Foundation, 2006). It may be that the extensive demands of state standards are forcing high school teachers to treat all content topics as important, sacrificing depth for breadth. And since our postsecondary survey results indicate that a more rigorous treatment of fundamental content knowledge and skills needed for credit-bearing college courses would better prepare students for postsecondary school and work, this unintended consequence of state standards merits further analysis.

3. Remedial-Course Teachers' Ratings of Math and Reading Skills Tend to Align More Closely With Those of Postsecondary Instructors Than With Those of High School Teachers

When individual content and skill ratings of importance were examined, the responses given by both mathematics and reading remedial-course teachers aligned much more closely with postsecondary instructors' responses than with high school teachers' responses. This finding is consistent with the intent of remedial programs, which is to prepare students for success in postsecondary coursework. The closer alignment of remedial-course teachers' and postsecondary instructors' views of what their students need to know is important and points to a continuing gap between what high schools are teaching and what postsecondary educators expect of their entering students.

4. While Most High School Teachers Across Subject Areas Believe That Meeting Their State's Standards Prepares Students for College-Level Work, Most Postsecondary Instructors Disagree

State standards describe the knowledge and skills that each state identifies as important and necessary for students to learn. Schools, teachers, and students are being held accountable for meeting state standards by No Child Left Behind legislation (No Child Left Behind Act, 2001). Although the standards differ from state to state in content, specificity, and levels of proficiency expected, one thing they have in common is that they are the foundation for each state's curriculum and assessment efforts. Given the importance of state standards, ACT collected data on how aware postsecondary and high school teachers were of their state's standards as well as how well they thought their state's standards were preparing students for college-level work (for detailed data see Appendix D). The majority of these teachers (95% of high school teachers and 59% of postsecondary instructors) indicated that they understood their state's standards at least moderately well. Figure 1.5 summarizes how well

teachers believed their state's standards prepared students for college-level work.

High school teachers believe state standards are preparing students well for college-level work; however, 65% of postsecondary instructors responded that their state's standards prepared students poorly or very poorly for college-level work in their content area. This finding strongly suggests that a gap still exists between what colleges believe is important for college readiness and what state standards are requiring teachers to teach.

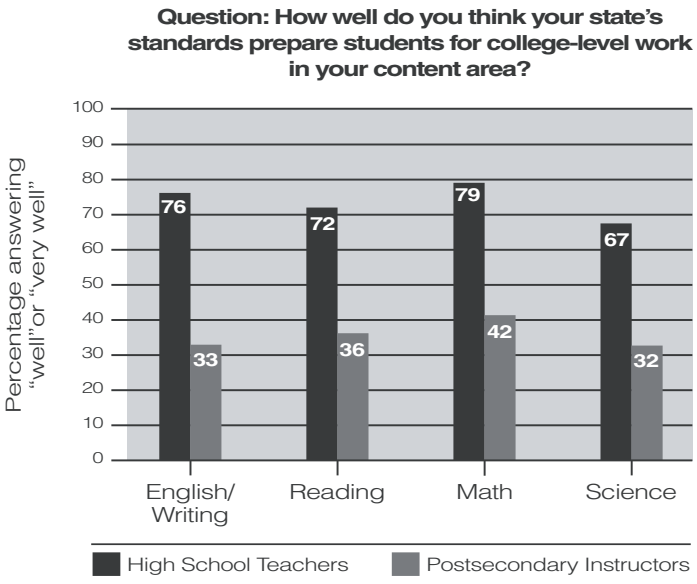


Figure 1.5: High School and Postsecondary Responses About State Standards

Repairing this gap does *not* necessarily involve adding more state standards. In fact, our survey findings (including the responses of remedial-course teachers) suggest that perhaps fewer and more-targeted state standards, focused on the essential knowledge and skills in each content area instead of many standards covering a broad array of topics and skills, might bring state standards more in line with what postsecondary instructors identify as prerequisite for postsecondary success in school and work. Whether such an approach would be appropriate in any particular state would need to be considered as part of ongoing P–20 dialogues among the state's elementary, middle/junior high, and high school teachers, postsecondary instructors, and other stakeholders.

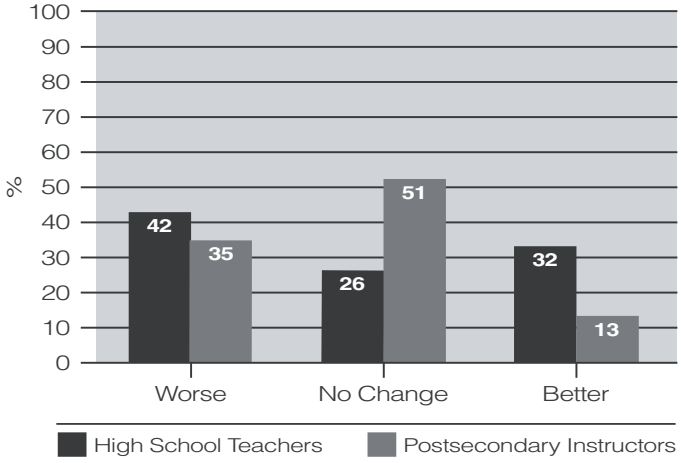


Figure 1.6: 2006 Students' College Readiness Compared With That of the Past 5–10 Years

5. High School Teachers Believe Today's High School Graduates Are Less Well Prepared for Postsecondary Education and Work Than Graduates in Previous Years, While Postsecondary Instructors Perceive No Difference

ACT asked educators their opinions as to "How prepared for college-level work are today's graduating seniors (or incoming freshmen) compared with graduating seniors (or the freshmen) in the past 5–10 years?"

As Figure 1.6 shows, a plurality of secondary instructors across disciplines (42%) believe that students are not as well prepared today for college-level work as were students in the past,

while a majority of postsecondary instructors (51%) believe that student preparation today is neither better nor worse than that of students in the past (see Appendix E for detailed response data). At the same time, 32% of high school teachers think students today are better prepared for college-level work—a percentage nearly two and a half times greater than that of postsecondary instructors who believe this.

Despite the apparently conflicting beliefs of high school teachers, a clear majority of both secondary (68%) and postsecondary (86%) teachers think that student preparation today for college-level work is the same or worse than student preparation 5 to 10 years ago.

These results can be interpreted in a number of ways. Because so much discussion has revolved around the current state of student readiness, educators may be more acutely aware than in the past that many graduating seniors (or incoming freshmen) are not well prepared for college. Another interpretation might be that expectations for students entering college have increased over the past 5–10 years, in which case educators are responding to a question asking about a moving target. Or, the data may reflect an increased sense that student preparation is declining. In any case, the results clearly reflect that the majority of respondents do not believe today's students are better prepared than their predecessors, despite explicit attempts toward this end.

6. Differences Between Secondary Instruction and Postsecondary Expectations

English/Writing:

Idea Development (High School) Versus Usage and Punctuation (Postsecondary)

With the advent of word processors and grammar checkers, is it really that important for students to know the basics when perhaps a machine can do it for them? The answer from many postsecondary English and writing instructors is "yes."

Survey results suggest that high school and postsecondary teachers differ in the relative importance they ascribe to the basic mechanics of writing (Sentence Structure and Formation, Usage, and Punctuation) as compared to more global skills that deal with rhetoric or the development of arguments (Topic and Idea Development). Postsecondary instructors ranked mechanics more frequently among the most important groups of skills for success in an entry-level, credit-bearing postsecondary English course, while secondary teachers' rankings of these strands were generally lower. In contrast, secondary teachers ranked Topic and Idea Development (e.g., considering the appropriateness of expression in relation to purpose, audience, unity, or focus; or determining the effect of adding, revising, or deleting supporting material) higher than did postsecondary instructors.

Mathematics:

Advanced Content (High School) Versus Rigorous Understanding of Fundamentals (Postsecondary)

Survey results indicate wide agreement between secondary and postsecondary mathematics teachers in ranking strands of skills and processes in order of importance for success in mathematics. Then why do 22% of college freshmen take remedial math courses (NCES, 2004, p. 84)? Inadequate high school coursework may account for at least part of the remediation problem. Too few students may be taking enough high school math (up through Algebra II at a minimum). However, survey results also revealed a discontinuity between secondary preparation and postsecondary expectations. High school mathematics teachers gave more advanced topics greater importance than did their postsecondary counterparts. In contrast, postsecondary and remedial-course mathematics instructors rated a rigorous understanding of fundamental underlying mathematics skills and processes as being more important than exposure to more advanced math topics. These results suggest that high school mathematics instruction concentrating on building up fundamental understanding and rigorous application of fundamental principles will likely better prepare students for college-level math than will instruction that covers many content topics less rigorously.

Reading:

Decreased Instruction in Reading Strategies After 10th Grade (High School) Versus Reading Strategies Emphasized in Remedial Reading Courses (Postsecondary)

Postsecondary and high school teachers' responses aligned identically when the teachers were asked to rank given strands of reading skills in order of importance. However, overall achievement in reading does not show evidence of increasing throughout high school (ACT, 2006), and we know that 11% of college freshmen enrolled in a remedial reading course in Fall 2000 (National Center for Education Statistics, 2004). The survey results indicate that this may be tied to a lack of reading courses in high school and a decline in the teaching of targeted reading strategies after 9th grade. Meanwhile, remedial-course teachers rate such strategies as being of high importance and devote a high percentage of time to teaching them in order to get their students ready for entry-level college coursework. These findings suggest that more instruction in reading—including reading texts with greater complexity across the curriculum—is needed throughout the high school years.

Science:

Science Content (High School) Versus Inquiry/Process (Postsecondary)

High school science teachers consistently rated science content as more important to student success than science process/inquiry skills. These responses are in direct contrast to those of middle school/junior high school and postsecondary science teachers, who consistently rated science process skills higher in importance than science content. These results are reflected in state standards for science, which often describe detailed strategic content standards but only provide one overall group of "process standards" that often apply across courses, or sometimes across all of the high school grades. Survey results suggest that the emphasis on science content in high school science instruction does not align with postsecondary expectations for college readiness in science.

EPAS tests, as measures of college readiness, reflect postsecondary expectations of what knowledge and skills are most important for success in first-year college coursework. Postsecondary instructors' importance ratings of skills and knowledge are given precedence in ACT's evaluation of the survey results.

2
English/Writing

The English/Writing ACT National Curriculum Survey

The English/Writing ACT National Curriculum Survey was sent to 7,146 educators in English/writing, as shown in Table 2.1 (see Appendix A, Table A.2 for further details).

Table 2.1
Participants in the English/Writing ACT National Curriculum Survey

Grade level	Courses	Surveys sent
Middle school/ junior high school	*English/Language Arts*	1,600
High school	*Writing/Composition*	2,000
Postsecondary	Entry-level courses	
	Composition	1,097
	Freshman English	403
	Survey of American Literature	800
Remedial-course	*Developmental Writing*	1,246

All teachers were asked to perform two primary tasks. First, teachers were asked to rate discrete *content knowledge and skills* with respect to how important each is to student success in English/writing (specifically, secondary and remedial-course teachers were asked to rate the importance in the class they teach; postsecondary instructors were asked to rate the importance of the content/skill as a prerequisite to success in their class). These results allow for comparison of secondary school teachers' course outcomes to postsecondary instructors' expectations.

Second, teachers were asked to rank *groups* of content and skills, known as *strands*, with respect to their relative importance for student success in English and writing.

In addition, all teachers except for postsecondary instructors were asked to indicate whether or not the skill/content is taught in their course. If not taught, the teacher was asked to indicate the reason (because the skill is taught in a prior course, or for any other reason). Further information about what knowledge and skills are being taught in middle school/junior high school and high school can be found in Appendix F. Teachers were also asked to provide information about what texts are featured in their English and writing courses and about their perceptions of their state's standards in English and writing.

Table 2.2
Median Ratings of Individual Skills by English/Writing Strand on a Five-Point Scale (1 = Not Important; 5 = Very Important)

Skills	MS	HS	PS
The 14 skills that make up Topic and Idea Development	4.05	4.12	3.34
The 8 skills that make up Organization, Unity, and Coherence	4.74	4.64	3.96
The 8 skills that make up Word Choice in Terms of Style, Tone, Clarity, and Economy	4.17	4.27	3.57
The 7 skills that make up Sentence Structure and Formation	4.00	4.31	3.80
The 7 skills that make up Conventions of Usage	4.21	4.07	4.16
The 11 skills that make up Conventions of Punctuation	3.98	4.17	3.81

Results of Importance Ratings

Table 2.2 shows the results of cumulative importance ratings of the individual content and skills that make up each strand. Each knowledge and skill item was rated using a five-point scale where 1= not important and 5 = very important (mean rating results are given in Appendix B, Table B.1). The medians were calculated from all of the individual content and skill ratings within each strand. These median importance ratings are reported in Table 2.2 by middle school/junior high school (MS), high school (HS), and postsecondary (PS) instructors' cumulative rating results.

These results indicate that teachers at every grade level consider the knowledge and skills covered on the EPAS English and ACT Writing Tests to be important.

Table 2.3

English/Writing Strand Rankings (1= Most Important; 6 = Least Important)

Strand	MS	HS	PS
Topic and Idea Development	2	1	3
Organization, Unity, and Coherence	1	2	1
Word Choice in Terms of Style, Tone, Clarity, and Economy	4	4	6
Sentence Structure and Formation	3	3	2
Conventions of Usage	5	5	4
Conventions of Punctuation	6	6	5

Results of Rank-Ordering Strands

In order to determine relative importance, participants in the English/writing version of the ACT National Curriculum Survey were asked to rank order six strands from most important (1st) through least important (6th). (For a detailed list of rankings, see Appendix G.) Results of averaged rankings are provided in Table 2.3 by middle school/junior high school (MS), high school (HS), and postsecondary (PS) responses.

Although the relative ranking results, in summary, indicate some agreement between postsecondary and high school English and writing instructors, additional analyses reveal interesting differences. Strands that deal with basic mechanics of writing (Sentence Structure and Formation, Conventions of Usage, and Conventions of Punctuation) were ranked as the most important (1) of the six strands by 35% of postsecondary instructors, whereas only 10% of high school teachers gave these strands the top mark (see Figure 2.1). This analysis reveals that knowledge and skills related to mechanics tend to be more highly valued by college instructors than by high school teachers.

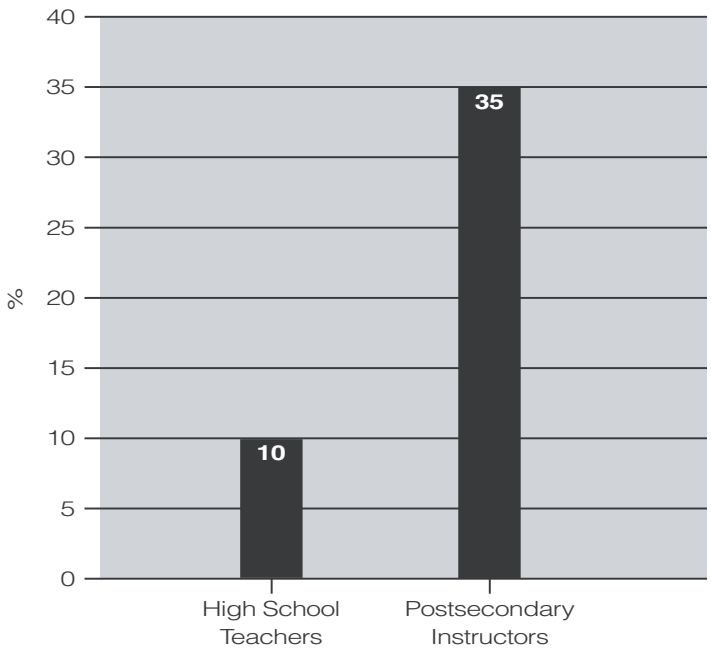


Figure 2.1: Percentage of Postsecondary Instructors Versus High School Teachers Who Rank a Mechanics Strand as the Most Important Strand (1)

Disagreement Between High School Teachers and Postsecondary Instructors

Postsecondary instructors rank the basic mechanics of writing higher than do high school teachers.

Survey results reveal differences between the secondary and postsecondary judgments of what is most important for success in English and writing. Postsecondary responses clustered around Sentence Structure and Formation and Conventions of Usage as "1" ratings in a way that high school teachers' responses did not. This suggests that many postsecondary instructors are more concerned with the fundamental elements of writing than are high school teachers. Further examination of individual survey questions supports this inference. Of the top ten highest-rated writing characteristics in the ACT National Curriculum Survey, postsecondary instructors had six related to grammar and usage, while high school teachers had none. Of the top 30 postsecondary writing characteristics, almost half (12) were ranked a minimum of 20 spots lower in importance in the high school data. Every one of the characteristics with this great a difference was related to language usage and mechanics. High school teachers ranked as "1" the student ability to write an effective introduction and conclusion to a piece of writing; postsecondary instructors ranked this characteristic 30th. Postsecondary instructors ranked as "2" the student ability to punctuate the end of a sentence correctly; high school teachers ranked this characteristic 31st. (Postsecondary instructors ranked student ability to write unified and coherent text as "1," which was similar to high school teachers' ranking it "2.")

Much of the commentary provided by postsecondary instructors in the comments section of the ACT National Curriculum Survey focused on the importance of mechanics at the postsecondary level. Many postsecondary instructors expressed frustration at having students enter their classes who could not write a complete sentence or could not understand discussion about basic elements of writing. Many postsecondary instructors reported having to reteach these basic elements before they could move on to the critical thinking/reading components required for their courses. Postsecondary instructors repeatedly indicated that their job was to teach students how to weigh and develop arguments but that students' grammatical insufficiencies interfered with their work, although to a slightly lesser extent. Interestingly, high school teachers said the same things about the students in their classes. They expressed frustration at the inability of many students to write complete sentences or to recognize correct subject-verb agreement. Middle school/junior high school teachers voiced similar concerns. Some expressed a desire to see more grammar taught in grades 5 and 6. Middle school/junior high school teachers reported that they

received students two to three years behind in their grammar skills (and reading skills) and were unable to catch them up in just one year.

Short Shrift for Some English/Writing Skills

High school response data indicate that teachers are not teaching certain skills. For example, nearly 50% of high school teachers at each grade level do not teach the skill "writing to tell a story through fiction or nonfiction." Almost 66% of high school teachers at each grade level do not teach "writing to describe a process or how to do something." While these responses do not necessarily mean that half or two-thirds of students are not being taught these skills at all (since they may well be taught them in prior or later grades), there is a real possibility that these skills are not being taught in some schools or that they are not being reinforced enough to be mastered. Indeed, some correlation between teachers not teaching skills and students not mastering skills is suggested by the data in the Conventions of Usage and Conventions of Punctuation sections in the survey. Every skill but one ("Ensuring grammatical agreement") identified in those sections is noted by 26%–69% of non-postsecondary instructors as not being taught in their grade; and postsecondary instructors noted that entering students are not proficient in conventions of language usage and punctuation.

While it appears that there may be some uncertainty about understanding the sequence for teaching some writing skills within high school and between middle school/junior high school, high school, and postsecondary, with other skills there does seem to be strong articulation. A skill such as "writing to tell a story through fiction or nonfiction," for example, is indicated by a few middle school/junior high school teachers (7%) as Not Important, by somewhat more high school teachers (21%) as Not Important, and by even more postsecondary instructors (30%) as Not Important. "Writing to express one's feelings" shows similar movement, perhaps being useful as a means to assist developing writers (in middle school/junior high school) and perhaps being dismissed as Not Important by postsecondary instructors who expect more critical writing. Importance ratings seem to indicate that the following elements of writing are more important to high school teachers than to either middle school/junior high school teachers or postsecondary instructors: "collaborating with peers on reviews of drafts," "developing one's own voice as a writer," "writing to analyze literature or media," "citing sources accurately," and "gathering and synthesizing resources." These elements appear to be most appropriately taught at the high school level in students' development as writers.

Remedial-Course Writing Teachers' Importance Ratings Agree With High School Teachers' Ratings

A sample of teachers who teach remedial courses at the postsecondary level in writing participated in this year's ACT English/Writing National Curriculum Survey. We thought these teachers could best identify the critical skills and knowledge that students are typically missing and the set of knowledge and skills that, when emphasized, result in student readiness for success in postsecondary writing.

Analysis of the data reveals that remedial-course writing teachers' responses more closely resemble high school teachers' results than postsecondary instructors' results (see Table H.1 in Appendix H for detailed results of remedial-course teachers' responses). Because the purpose of remedial courses is to prepare students for postsecondary coursework, a close alignment with postsecondary instructors' expectations is anticipated. However, in the case of preparing students to be successful in postsecondary writing, remedial-course writing teachers seem to be fostering the same kind of environment when teaching writing as do high school teachers.

Discussion of Survey Results and EPAS English Tests

ACT National Curriculum Survey results support ACT's EPAS English Tests and ACT Writing Test as assessments of content and skills that teachers of English and writing say are important.

The EPAS English Tests measure student achievement and readiness in punctuation, grammar and usage, sentence structure, writing strategy, organization, and style (for EPAS English Test specifications, see Appendix C). Questions are distributed fairly evenly across all of these six areas of English. Both aggregate importance results (as seen in Table 2.2) and importance ratings for specific content and skills (see Table B.1 in Appendix B for a complete listing of English/writing content and skills and their ratings) provide empirical evidence that the knowledge and skills that EPAS English Tests measure are considered important for postsecondary success. Similarly, content and skills rated by the majority of instructors as not important are not present on EPAS English Tests or the ACT Writing Test.

Examination of the EPAS English Test specifications reveals a fairly even distribution of questions among the six English content areas, with a few more items devoted to sentence structure. This relatively equal distribution is strongly supported by empirical curriculum survey evidence, especially the evidence from postsecondary responses. The median ratings support that all of these areas are important for postsecondary success in English. Although postsecondary instructors are not in complete agreement with respect to the

relative importance of topic and idea development, they do consistently rate organization, and sentence structure, as well as usage and grammar, as particularly important for college readiness. ACT staff will continue to use these survey results as we continue to develop and refine our EPAS English Tests.

Because the ACT Writing Test is optional, it should be noted that the ACT English Test measures the knowledge and skills that postsecondary instructors identified as important for postsecondary success in writing. In all the EPAS English Tests, students must make writing decisions and must make sound judgments about development and organization, as well as correct decisions about usage, grammar, and sentence structure.

Discussion of Survey Results and the ACT Writing Test Specifications

Because postsecondary institutions have varying needs with respect to considering incoming students' writing samples for admissions or placement decisions, ACT offers the ACT Writing Test as an option. With this policy, postsecondary institutions are able to make their own decisions about whether to require, recommend, or not ask for the results from the ACT Writing Test for admissions and/or course placement purposes. Also, this policy allows students to decide whether to take the ACT Writing Test based on the requirements of the institutions they are considering (which ensures that students are not required to pay for and take a test that they do not need).

The ACT Writing Test is a 30-minute essay test. Students are given one writing prompt that defines an issue and describes two points of view on that issue. The student produces a direct writing sample that responds to the question about the student's position on the issue. The ACT Writing Test measures a student's ability to express judgments, maintain a focus, develop a position on a topic, organize ideas in a logical way, and use language clearly and effectively according to the rules of standard written English (for the scoring rubric, see Appendix I). These criteria are all highly endorsed by postsecondary instructors as important skills and knowledge that students need for postsecondary success in writing (see Table B.1 in Appendix B for a complete listing of English/writing content and skills and their ratings).

The survey results also provide additional validity evidence for the persuasive writing that students must compose for the ACT Writing Test. Writing to convey information, express ideas, and express an opinion or take a position on an issue received the highest mean importance ratings from postsecondary instructors (see Table B.1 in Appendix B). These ratings align very well with the kind of writing measured by the ACT Writing Test.

3
Mathematics

The Mathematics ACT National Curriculum Survey

The Mathematics ACT National Curriculum Survey was sent to 6,879 mathematics educators, as shown in Table 3.1 (see Appendix A, Table A.4 for further details).

All teachers were asked to perform two primary tasks. First, teachers were asked to rate discrete *content knowledge and skills* with respect to how important each is to student success in mathematics (specifically, secondary and remedial-course teachers were asked to rate the importance in the class they teach; postsecondary instructors were asked to rate the importance of the content/skill as a prerequisite to success in their class). These results allow for comparison of secondary school teachers' course outcomes to postsecondary instructors' expectations.

Table 3.1

Participants in the Mathematics ACT National Curriculum Survey

Grade level	Courses	Surveys sent
Middle school/ junior high school	*Mathematics, Pre-Algebra, Algebra, Geometry*	1,800
High school	*Mathematics, Algebra, Geometry, Trigonometry, Precalculus, Calculus, Probability and/or Statistics*	2,000
Postsecondary	*College/Finite/Discrete Math*	350
	Probability/Statistics	350
	Algebra	350
	Geometry/Precalculus	350
	Calculus	350
Remedial-course	*Developmental Math/ Remedial Math*	1,329

Second, teachers were asked to rank *groups* of content and skills, known as *strands*, with respect to their relative importance for student success in mathematics.

In addition, all teachers except for postsecondary instructors were asked to indicate in which mathematics course the knowledge or skill is taught. If not taught, the respondent was not to fill in any ratings about that particular knowledge or skill item. Further information about what knowledge and skills are being taught in middle school/junior high school and high school can be found in Appendix F. Teachers were also asked to provide information about what textbooks are used in their mathematics courses, about calculator policies, and about their perceptions of their state's standards in mathematics.

Results of Importance Ratings

Table 3.2 shows the results of cumulative importance ratings of the individual content and skills that make up each strand. Each knowledge and skill item was rated using a five-point scale where 1= not important and 5 = very important (mean rating results are given in Appendix B, Table B.2). The medians were calculated from all of the individual content and skill ratings within each strand. These median importance ratings are reported in Table 3.2 by middle school/junior high school (MS), high school (HS), and postsecondary (PS) instructors' cumulative rating results.

These results indicate that teachers consider the knowledge and skills covered on the EPAS Mathematics Tests to be important. The Functions strand contains content and skills that primarily are present on the ACT, so the low importance rating from middle school/junior high school teachers is reflected in those skills not being tested at all on EXPLORE and only minimally on PLAN. Similarly, postsecondary instructors rate the Probability strand items low in importance; the ACT Mathematics Test reflects these results in that this strand is covered, but not to the extent of the other strands.

Table 3.2

Median Ratings of Individual Skills by Mathematics Strand on a Five-Point Scale (1 = Not Important; 5 = Very Important)

Skills	MS	HS	PS
The 4 skills that make up Basic Operations and Applications	4.53	4.03	4.15
The 12 skills that make up Probability, Statistics, and Data Analysis	3.22	2.95	1.76
The 13 skills that make up Numbers: Concepts and Properties	2.44	3.06	2.20
The 23 skills that make up Expressions, Equations, and Inequalities	2.80	3.70	2.95
The 16 skills that make up Graphical Representations	2.86	3.79	2.71
The 10 skills that make up Properties of Plane Figures	3.78	3.91	2.61
The 7 skills that make up Measurement	3.98	3.69	2.48
The 10 skills that make up Functions	1.84	3.51	2.33

Results of Rank-Ordering Strands

In order to determine relative importance, participants in the Mathematics ACT National Curriculum Survey were asked to rank order eight strands from most important (1st) through least important (8th). (For a detailed list of rankings, see Appendix G.) Results of averaged rankings are provided in Table 3.3 by middle school/junior high school (MS), high school (HS), and postsecondary (PS) responses.

Table 3.3

Mathematics Strand Rankings (1 = Most Important; 8 = Least Important)

Strand	MS	HS	PS
Basic Operations and Applications	1	1	1
Probability, Statistics, and Data Analysis	2	8	8
Numbers: Concepts and Properties	4	4	3
Expressions, Equations, and Inequalities	3	2	2
Graphical Representations	6	3	4
Properties of Plane Figures	7	6 (tie)	6
Measurement	5	6 (tie)	7
Functions	8	5	5

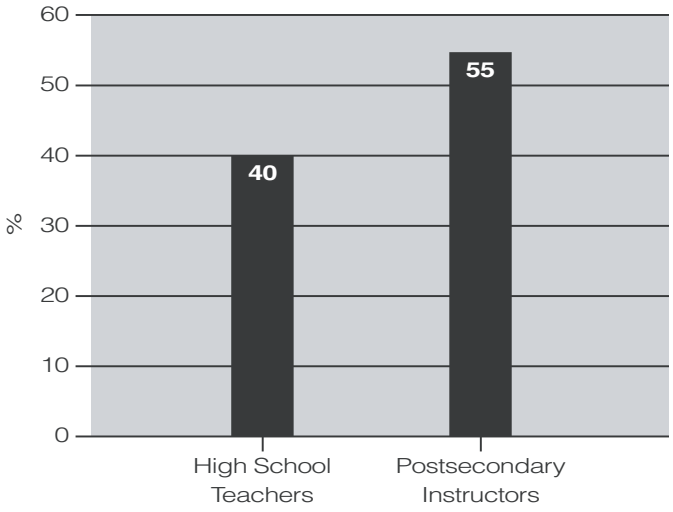


Figure 3.1: Percent of Postsecondary Instructors Versus High School Teachers Who Rank Basic Operations and Applications as the Most Important Strand (1)

The relative ranking data, in summary, reveal agreement between postsecondary and high school mathematics instructors, Figure 3.1, however, illustrates that though they each chose Basic Operations and Applications as their top-rated mathematics strand, far more postsecondary instructors made it their top choice. High school teachers spread their top ranking over more options.

Disagreement Between High School and Postsecondary Instructors About What Is Most Important in Mathematics

Despite much agreement between high school and postsecondary mathematics instructors' results, we observed areas of disagreement. Most notably, high school and postsecondary instructors tend to disagree when it comes to the importance of more advanced content topics. High school mathematics teachers gave more advanced mathematics topics greater importance than did their postsecondary counterparts. Postsecondary instructors responded that they consider rigorous understanding of fundamental mathematics more important than exposure to more esoteric mathematics content topics for success in their courses. Postsecondary math instructors indicated in written comments on the survey instrument that the student ability they want above all else is the ability to do fundamental mathematics. These instructors feel that if their incoming students have a solid basic math background, they can teach them college content.

The largest difference between the importance ratings that high school and postsecondary instructors assigned a given knowledge and skill item was for "understanding new material by reading a textbook." This skill's mean ranked 31st on the list of postsecondary responses and only 78th on that of high school teachers' responses, a difference of 47 places. Further evidence showing the difference in perception in this skill's importance is in the "taught/not taught" data. "Understanding new material by reading a textbook" was reported as Not Taught in 20% of high school math courses. Given the greater importance assigned by postsecondary instructors, high school mathematics teachers may want to reconsider how much time they spend teaching students how to be successful consumers of textbook information.

What Coursework Is Needed for Success in Postsecondary Mathematics?

The highest-rated math content and skills that postsecondary Algebra teachers report as prerequisites for success in their courses were, in order: performing addition, subtraction, multiplication, and division on signed rational numbers; simplifying algebraic expressions; graphing on a number line; and solving linear equations and inequalities in one variable (for the complete list, see Table B.2 in Appendix B). There were 11 different skills that averaged a 4.00 rating or higher on a five-point scale, and all but one of these skills were reported by high school teachers as being taught at a 98% or greater rate than were instruction in arithmetic, or in Algebra I, or in Algebra II. The one that was not was "recalling basic facts, definitions, formulas, and algebraic procedures as needed to solve a problem," taught at a 93% rate. The content that both postsecondary instructors rated the highest and that was being covered the least in instruction in arithmetic or in Algebra I courses was: solving quadratic equations and factoring (80%), working with rational exponents (41%), and using the quadratic formula (68%). These are all topics typically covered in Algebra II. These results suggest that high school mathematics students who take mathematics coursework through Algebra II are being taught material they need to achieve readiness for introductory math at the college level (for a detailed list of what different math courses teach, see Appendix J).

Remedial-Course Math Teachers' Responses Agree With Postsecondary Instructors': Fundamentals Are More Important Than Advanced Math Content Topics

A sample of teachers who teach remedial courses at the postsecondary level in mathematics participated in this year's ACT Mathematics National Curriculum Survey. We thought these teachers could best identify the critical skills and knowledge that students are typically missing and the set of knowledge and skills that, when emphasized, result in student readiness for success in postsecondary mathematics.

Results reveal that postsecondary mathematics remedial-course teachers' ratings were closer to postsecondary mathematics entry-level-course instructors' ratings than to high school mathematics teachers' ratings (see Appendix H, Table H.2 for detailed results of remedial-course teachers' responses). Specifically, both groups of postsecondary respondents consistently rated understanding of fundamental mathematics as more important than exposure to more esoteric mathematics content topics for success in their courses. In contrast, high school mathematics teachers rated many more content

topics with greater importance. These results indicate that postsecondary mathematics teachers of entry-level and remedial courses agree in favoring "depth" and rigorous understanding of fundamental skills, whereas high school mathematics instructors more highly value "breadth." Interestingly, state standards tend to mirror high school teachers' responses by including long lists of mathematics content topics. Postsecondary remedial-course teachers are not required to abide by state standards, and therefore are not required to maintain the same broad focus and can concentrate more specifically on the skills required for college success.

Discussion of Survey Results and EPAS Mathematics Test Specifications

The EPAS Mathematics Tests measure student achievement and readiness in Basic Operations and Applications; Probability, Statistics and Data Analysis; Numbers: Concepts and Properties; Expressions, Equations, and Inequalities; Graphical Representations; Properties of Plane Figures; Measurement; and (for the ACT only) Functions. (For EPAS Mathematics Test specifications, see Appendix C.)

ACT National Curriculum Survey results support ACT's Mathematics Tests as assessments of content and skills that mathematics instructors indicate are important.

ACT National Curriculum Survey results provide solid validity evidence that EPAS Mathematics Tests measure important skills and knowledge at the appropriate levels that are necessary for success. Both aggregate importance results (as seen in Table 3.2) and importance ratings for specific knowledge and skills (see Table B.2 in Appendix B for a complete listing of mathematics knowledge and skills and their ratings) provide empirical evidence that the knowledge and skills that EPAS Mathematics Tests measure are considered important for postsecondary success. Similarly, knowledge and skills rated by the majority of instructors as not important are not included on EPAS Mathematics Tests.

The Probability and Statistics strand received the lowest importance ratings from high school and postsecondary instructors. ACT will continue to cover Probability and Statistics on EPAS Mathematics exams because results affirm that postsecondary instructors consider this group of knowledge and skills to be important for success in postsecondary mathematics. However, the majority of the EPAS Mathematics Tests is devoted to measuring other mathematical knowledge and skills.

ACT staff will continue to consult the survey results when making test development decisions about the specific mathematics knowledge and skills included on the EPAS Mathematics Tests.

How Calculators Are Currently Being Used in Mathematics Instruction

Today's calculators have more capabilities than ever before, including computer algebra systems and sophisticated statistical programs. The ACT National Curriculum Survey asked how calculators are currently being used in mathematics instruction across the country (see Table 3.4).

The responses show that the use of calculators is quite widespread. At the higher levels of mathematics taught in high schools and colleges, calculators tend to be required.

In classrooms where calculators were allowed, the survey question shown in Table 3.5 was used to gather evidence about how calculators are used in mathematics tests.

It appears that almost everyone who allows calculators to be used in class also allows them on either all of a test or part of it. These findings are largely consistent with ACT's calculator policy (calculators are allowed, but are not required, on EPAS Mathematics Tests).

Table 3.4
Calculators in Instruction

Is the use of calculators in the course:	MS %	HS %	PS %
required?	19	47	44
recommended?	36	38	23
optional?	34	14	22
not permitted?	11	1	10

Table 3.5
Calculators on Tests

Which one of the following best describes the use of calculators on exams in your course?	MS %	HS %	PS %
Always allowed for all parts of exams	22	60	72
Exams given in parts. For one part calculators are allowed; for other parts, calculators are not allowed.	53	36	19
Never allowed on any part of exam	12	1	4
Other	10	2	4

4

Reading

The Reading ACT National Curriculum Survey

The Reading ACT National Curriculum Survey was sent to 7,398 educators who taught a variety of courses, as shown in Table 4.1 below (see Appendix A, Table A.6 for further details).

All teachers were asked to perform two primary tasks. First, teachers were asked to rate discrete *content knowledge and skills* with respect to how important each is to student success in reading (specifically, secondary and remedial teachers were asked to rate the importance in the class they teach; postsecondary instructors were asked to rate the importance of the content/skill as a prerequisite to success in their class). These results allow for comparison of secondary school teachers' course outcomes to postsecondary instructors' expectations.

Table 4.1

Participants in the Reading ACT National Curriculum Survey

Grade level	Courses	Surveys sent
Middle school/ junior high school	*Language Arts*	1,800
High school	*Language Arts*	1,200
	History/Civics	800
Postsecondary	Entry-level courses	
	Composition	1,097
	Freshman English	403
	Survey of American Literature	800
Remedial-course	*Developmental Reading*	1,298

Second, teachers were asked to rank *groups* of content and skills, known as *strands*, with respect to their relative importance for student success in reading.

In addition, all teachers except for postsecondary instructors were asked to indicate whether or not the skill/content is taught in their course. If not taught, the teacher was to indicate the reason (because the skill is taught in a prior course, or for any other reason). Further information about what knowledge and skills are being taught in middle school/junior high school and high school can be found in Appendix F. Teachers were also asked to provide additional information about what texts are featured in their courses and about their perceptions of their state's standards in reading.

Results of Importance Ratings

Table 4.2 shows the results of cumulative importance ratings of the individual content and skills that make up each strand. Each knowledge and skill item was rated using a five-point scale where 1= not important and 5 = very important (mean rating results are given in Appendix B, Table B.3). The medians were calculated from all of the individual content and skill ratings within each strand. These median importance ratings are reported in Table 4.2 by middle school/junior high school (MS), high school (HS), and postsecondary (PS) instructors' cumulative rating results.

The results show that participants at every grade level rate the knowledge and skills covered on the EPAS Reading Tests as important.

Table 4.2

Median Ratings of Individual Skills by Reading Strand on a Five-Point Scale (1 = Not Important; 5 = Very Important)

Skills	MS	HS	PS
The 10 skills that make up Main Ideas and Author's Approach	4.27	4.24	4.16
The 12 skills that make up Generalizations and Conclusions	4.23	4.25	3.84
The 4 skills that make up Supporting Details	4.55	4.41	3.81
The 10 skills that make up Relationships	4.55	4.23	3.63
The 8 skills that make up Meaning of Words	4.37	4.06	3.17

Results of Rank-Ordering Strands

In the ranking section of the survey, instructors were asked to rank five strands from important (1st) through least important (5th). (For a detailed list of rankings, see Appendix G.) High school (HS) and postsecondary (PS) instructors responding to the reading surveys had 100% agreement on these rankings (see Table 4.3).

Table 4.3

Reading Strand Rankings (1 = Most Important; 5 = Least Important)

Strand	MS	HS	PS
Main Ideas and Author's Approach	1	1	1
Generalizations and Conclusions	4	2	2
Supporting Details	3	3	3
Relationships	5	4	4
Meaning of Words	2	5	5

Although relative ranking results, in summary, show 100% agreement, further analysis revealed a higher level of agreement among postsecondary instructors than among high school teachers. Postsecondary instructors by a large margin chose Main Ideas and Author's Approach as their most important strand (see Figure 4.1), but the top choice of high school teachers was spread out over four of the five reading strands. Main Ideas and Author's Approach was still the overwhelming favorite, but high school teachers also chose Generalizations and Conclusions, Relationships, and Meaning of Words as most important in higher percentages than postsecondary teachers chose anything other than their top-ranked strand. This suggests that there is a higher level of disagreement among high school teachers about what groups of skills are most important for reading success.

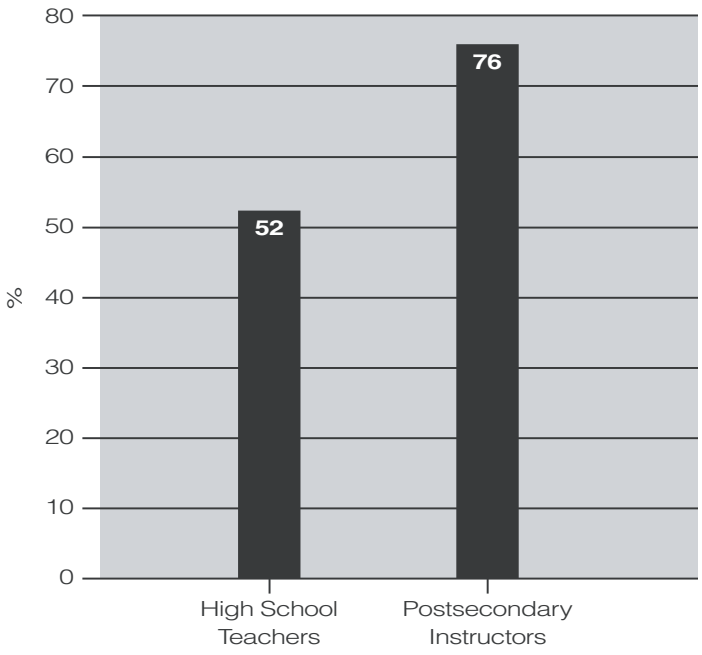


Figure 4.1: Percent of Postsecondary Instructors Versus High School Teachers Who Rank Main Ideas and Author's Approach as the Most Important Strand (1)

Given the Consensus on What's Important, Why Do We Not See Gains in College Readiness?

For reading, high school teachers and postsecondary instructors seem to be nearly completely in sync when assigning importance to groups of reading skills. Given this encouraging indication of aligned perceptions of importance in high school knowledge and skills and postsecondary expectations, what accounts for the lack of studies showing increases in reading achievement during high school (ACT, 2006) and the fact that many students graduate unready for college-level reading and must therefore enroll in non-credit-bearing college remedial courses in reading (NCES, 2004, p. 84)?

To answer this question, survey results were reanalyzed by content area experts. As in other content areas, the familiar pattern among importance ratings emerged: high school teachers rated many more skills and more content topics at a higher level of importance than did their postsecondary counterparts. That is, high school teachers' responses rate nearly all the different knowledge and skills as important at every grade level. Also, analyzing the "taught/not taught" data at each grade level, we did not find evidence that the construct of reading was being addressed in a systematic way, with certain fundamental skills identified, rigorously taught, and then built upon systematically from 9th through 12th grades. In fact, we saw less reading instruction altogether after the 10th-grade year. That is, many

reading topics and skills rated high in importance were taught primarily in the 9th and 10th grades in language arts classes. However, time devoted to targeted reading strategies appeared to be distinctly lower in 11th and especially 12th grade. These findings suggest students may be missing necessary instruction in reading, especially after their 10th-grade year.

Remedial-Course Reading Instructors' Responses Reveal a Void in Grade 9–12 Reading Instruction

A sample of teachers who teach remedial courses at the postsecondary level in reading participated in this year's ACT Reading National Curriculum Survey (see Table H.3 in Appendix H for detailed results of remedial teachers' responses). We thought these teachers could best identify the critical skills and knowledge that students are typically missing and the set of knowledge and skills that, when emphasized, result in student readiness for success in postsecondary-level reading.

Remedial-course reading teachers' results reveal that remedial-course teachers devote more teaching time and assign higher importance ratings to reading strategies that are designed to improve reading comprehension than did their postsecondary or high school counterparts. This result prompted us to examine the data to see if and when high school students were receiving instruction in these reading strategies. We found that reading strategies were taught 70–80% of the time in 9th and 10th grades. However, the time taught fell to 32–35% of the time by 11th and 12th grade (see Appendix K for detailed response data). These findings, as noted above, suggest students may be lacking necessary instruction in reading strategies after their 10th-grade year.

Reading Across the Curriculum: Who's Responsible?

Reading is a key element of learning any content area. Our survey results reveal that content area reading might not be explicitly attended to in English language arts classrooms. In 9th, 10th, 11th, and 12th grades, the percentage of language arts teachers who say they do not teach reading and demonstrating understanding of social science–based texts are 60%, 62%, 22%, and 52%, respectively. Similarly, 93%, 88%, 94%, and 96% of English language arts teachers reported not teaching reading and demonstrating understanding of natural science–based texts. Meanwhile, analysis of the responses indicates that English language arts teachers overall did not tend to rate reading in other content areas as highly as they did language arts–based reading activities. Teachers in other content areas may be assuming that language arts teachers are able to devote adequate

time to teaching reading across all content areas, and that teachers in content areas other than language arts therefore do not need to spend time on this topic. Given these findings, teachers in content areas other than language arts may want to evaluate whether they devote adequate instruction to helping students successfully read in their content area.

Discussion of Survey Results and EPAS Reading Test Specifications

The EPAS Reading Tests measure student achievement and readiness in referring and reasoning strategies in reading passages drawn from four content areas: Prose Fiction, Humanities, Social Sciences, and (for the ACT only) Natural Sciences (for the EPAS Reading Test specifications, see Appendix C). These content areas are equally represented in the EPAS Reading Tests since they include the content area reading that students typically encounter in their coursework. EPAS Reading Tests include passages of varying levels of complexity so inferences can be made about students' abilities to comprehend different complexities of text.

ACT National Curriculum Survey results support ACT's Reading Tests as assessments of varied reading skills that teachers indicate are important.

ACT National Curriculum Survey results provide solid validity evidence that EPAS Reading Tests measure important skills and knowledge at the appropriate levels that are necessary for success. Both aggregate importance results (as seen in Table 4.2) and importance ratings for specific content and skills (see Table B.3 in Appendix B for a complete listing of reading content and skills and their ratings) provide empirical evidence that the referring and reasoning skills that EPAS Reading Tests measure are considered important for postsecondary success. Similarly, content and skills rated by the majority of instructors as not important are not included on EPAS Reading Tests.

ACT staff will continue to use these survey results when making test development decisions about the specific knowledge and skills included on the EPAS Reading Tests.

5
Science

The Science ACT National Curriculum Survey

The Science ACT National Curriculum Survey was sent to 13,042 science educators, as shown in Table 5.1 (see Appendix A, Table A.8 for further details).

All teachers were asked to perform two primary tasks. First, teachers were asked to rate discrete *content knowledge and skills* with respect to how important each is to student success in science (specifically, secondary teachers were asked to rate the importance in the class they teach; postsecondary instructors were asked to rate the importance of the content/skill as a prerequisite to success in their class). These results allow for comparison of secondary school teachers' course outcomes to postsecondary instructors' expectations.

Second, teachers were asked to rank *groups* of content and skills, known as *strands*, with respect to their relative importance for student success in science.

Table 5.1

Participants in the Science ACT National Curriculum Survey

Grade level and science content area	Courses	Surveys sent
Middle school/ junior high school	*Science, Physical Science*	1,600
High school Biology	*Biology*	1,200
High school Chemistry	*Chemistry*	1,200
High school Earth Science	*Earth Science*	1,200
High school Physics	*Physics*	1,200
Postsecondary Biology	*Introduction to Biology/ Life Science*	1,650
Postsecondary Chemistry	*Introduction to Chemistry/ General Chemistry/etc.*	1,646
Postsecondary Earth/ Space Science	*Geology/Earth Sciences/ etc.*	1,603
Postsecondary Physics	*Introduction to Astronomy*	300
	Introduction to Physics/ General Physics/etc.	1,443

In addition, all teachers except for postsecondary instructors were asked to indicate whether or not the skill/content is taught in their course. If not taught, the teacher was to indicate the reason (because the skill is taught in a prior course, or for any other reason). Further information about what knowledge and skills are being taught in middle school/junior high school and high school can be found in Appendix F. Teachers were also asked to provide information about what textbooks are used in their science courses and about their perceptions of their state's standards in science.

Results of Importance Ratings

Table 5.2 shows the results of cumulative importance ratings of the individual content and skills that make up each strand. Each knowledge and skill item was rated using a five-point scale where 1= not important and 5= very important (mean rating results are given in Appendix B, Tables B.4–B.8). The medians were calculated from all of the individual content and skill ratings within each strand. These median importance ratings are reported in Table 5.2 by middle school/ junior high school (MS), high school (HS), and postsecondary (PS) instructors' cumulative rating results. We calculate these medians to determine whether participants consider the overall knowledge and skills covered on the EPAS Science Tests to be important.

Table 5.2

Median Ratings of Individual Skills by Science Strand on a Five-Point Scale (1 = Not Important; 5 = Very Important)

Skills	MS	HS	PS
The 4 skills that make up Interpretation of Data	4.13	4.11	3.52
The 6 skills that make up Scientific Investigation	4.00	3.68	2.83
The 9 skills that make up Evaluation of Models, Inferences, and Experimental Results	3.83	3.70	3.24

The results show teachers at every grade level rated the knowledge and skills covered on the EPAS Science Tests as important.

Results of Rank-Ordering Strands

In order to determine relative importance, high school and postsecondary science participants ranked three strands in order of importance from most important (1st) to least important (3rd). (For a detailed list of strand data, see Appendix L. Middle school/junior high school science teachers were not asked to rank strands.) Results of averaged rankings are provided in Table 5.3 by high school (HS) and postsecondary (PS) responses.

We see fairly similar results from high school and postsecondary instructors using this data collection method. However, with only three strands, interpretation of these results is limited.

Table 5.3

Science Strand Rankings (1 = Most Important; 3 = Least Important)

Strand	HS	PS
Interpretation of Data	1	1
Scientific Investigation	2	3
Evaluation of Models, Inferences, and Experimental Results	3	2

Figure 5.1 details high school and postsecondary science instructors' top choice when asked to rank the three science strands in order of overall relative importance. Although all three strands received a large percentage of top rankings, Interpretation of Data was chosen the most popular strand by both high school teachers and postsecondary instructors.

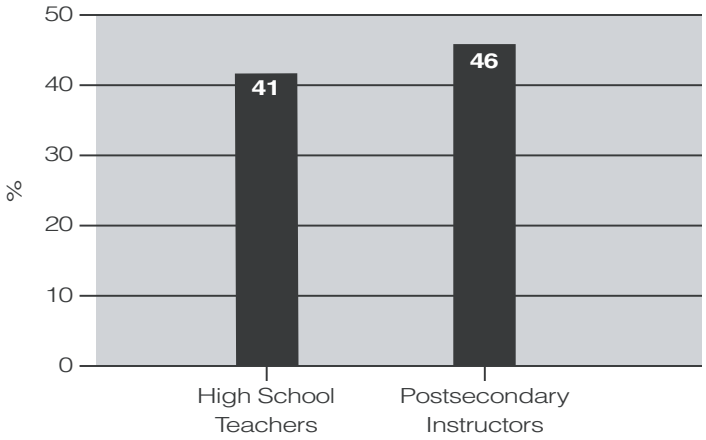


Figure 5.1: Percentage of Postsecondary Instructors Versus High School Teachers Who Rank Interpretation of Data as the Most Important Strand (1)

Postsecondary and Middle School/Junior High Teachers Consistently Rate Science Content Much Lower Than Do High School Teachers

Both middle school/junior high school and postsecondary science instructors rate process/inquiry skills as more important than science content topics; high school teachers rate them in exactly the opposite order.

Science process/inquiry skills and knowledge took 1st and 2nd place in both the middle school/junior high school and postsecondary science instructors' importance ratings. In contrast, science process/inquiry skills and knowledge did not appear until the 7th position in the high school instructors' list of importance ratings (see Appendix M). Instead, high school teachers consistently rated content topics (e.g., the content grouping "mechanics" received the highest mean rating of 4.51, and the content grouping "genetics and heredity" received the second-highest mean rating of 4.37) above science process/inquiry skills (e.g., the process grouping "interpretation of data" received the highest mean importance rating among high school teachers, coming in 7th with a mean rating of 3.98). These results held for teachers across science content areas. Overall, these results indicate a substantial difference between high school science teachers' perceptions of what is most important and postsecondary science instructors' expectations of prerequisite skills and knowledge needed for success in science at the postsecondary level.

High School Science Teachers' Values Reflected in State Standards

State standards in science typically have far more science content standards than science inquiry standards.

Postsecondary instructors consistently stated in written comments that they believe being able to think and solve problems scientifically is more important for success in postsecondary science courses than is specific science content knowledge. We received many postsecondary instructors' comments whose general thrust was: "If I am given students who can think scientifically, then I can teach them the content."

High school science teachers' tendencies to rate science content as more important than science process skills are reflected in state standards in science. State standards in science tend to include many more content topics than science process inquiry skills and knowledge. Often, state standards in science describe only one set of science process skills that are to be applied to all high school grades; however, for content, specific standards are provided for each area and even for particular science courses (e.g., Biology, Advanced Biology, Chemistry, Physics). State standards for science content tend to systematically increase in complexity from grade to grade or course to course. This attention to detail in science content standards gives the overall impression that states value science content more than science process/inquiry skills.

No Remedial Courses Identified for Science

EPAS Science Tests emphasize application of science process and inquiry skills and fundamental science knowledge in a variety of real-world science contexts.

We were not able to identify remedial science courses that students typically took to prepare them for postsecondary work, so no remedial-course teachers' responses are available for comparison.

Discussion of Survey Results and EPAS Science Test Specifications

The EPAS Science Tests measure student achievement and readiness in skill areas of interpretation of data; scientific investigation; evaluation of models, inferences, and experimental results; and in the content areas of life science (EXPLORE only), physical science (EXPLORE only), Earth/space science, and (PLAN and the ACT only) biology, chemistry, and physics (for our EPAS Science Tests' specifications, see Appendix C).

ACT National Curriculum Survey results support ACT's Science Tests as assessments of science process and inquiry skills that science teachers indicate are important.

ACT National Curriculum Survey results provide solid validity evidence that EPAS Science Tests measure important skills and knowledge at the appropriate levels that are necessary for success. Both aggregate importance results and importance ratings for specific content and skills (see Tables B.4 through B.8 in Appendix B for a complete listing of science content and skills and their ratings) provide empirical evidence that the knowledge and skills that EPAS Science Tests measure are considered important for postsecondary success. Similarly, content and skills rated by the majority of instructors as Not Important are not included on EPAS Science Tests.

Most importantly, although some fundamental science content is measured on the EPAS Science Tests, science inquiry and process skills receive the greatest emphasis. Knowledge and process skills such as how to accurately interpret data, how to make appropriate experimental design decisions, how to reach the appropriate conclusions when presented with results of experiments, and how to appropriately evaluate given models and scientific explanations, all cast in real-life contexts of the different science content areas, are extensively covered by EPAS Science Tests. The survey results provide substantial validity evidence that what is measured on EPAS Science Tests clearly aligns with postsecondary instructors' expectations for success in postsecondary science courses.

6
Conclusions

A primary finding of the ACT National Curriculum Survey 2005–2006 is that ACT's EPAS tests reflect current instructional priorities and college readiness expectations and provide longitudinal measures of skills and knowledge needed for student readiness for college. We will continue to use these survey results to guide test development decisions.

Another major finding is that many postsecondary instructors believe that their state's standards are not preparing students for college-level work across content areas. If state standards are not focused on college readiness, then the state assessments designed to measure attainment of those standards probably are not focused on college readiness either. We believe states should seek empirical evidence that their standards and assessments are actually fostering, preparing, and measuring student readiness for postsecondary work in each content area and are doing so according to a reasonable strategy from grade to grade.

High school teachers are being held accountable to teach students the content and skills listed in state standards. Given those expectations, it is not surprising that our survey found that high school teachers tend to rate more content and skills with higher importance and at greater frequency than do their postsecondary counterparts. This finding is particularly disturbing in light of the finding that the majority of high school teachers felt that their state's standards are preparing students well for postsecondary work—when, in stark contrast, the majority of postsecondary instructors across content areas responded that their state's standards did a poor or very poor job of preparing students for postsecondary work. These results suggest a large difference in perception between high school teachers' and postsecondary instructors' expectations of what is required for a student to be ready for college-level work in a content area. Given the number of college freshmen taking remedial courses, these differences in expectations demand greater scrutiny.

We see evidence of differences in high school emphases and postsecondary expectations in each content area surveyed. Many postsecondary English and writing instructors value punctuation and grammar more than do high school teachers. In reading, instruction in the 11th and 12th grades may not prepare students for college-

level reading assignments (especially considering the number of college freshmen who enroll in a remedial reading course). A greater emphasis in teaching reading strategies is present in remedial reading courses at the postsecondary level—the same strategies that seem no longer taught at the high school level after 10th grade. In mathematics, postsecondary mathematics instructors rate a rigorous understanding of fundamental concepts as more important than exposing students to more content topics, whereas high school mathematics teachers give higher importance ratings to advanced content topics. In science, postsecondary instructors rate science process and inquiry knowledge and skills as most important, whereas high school teachers rate science content as more important.

ACT conducts the ACT National Curriculum Survey to monitor current educational practices and to ascertain postsecondary expectations so that we can build instruments to measure what educators have identified as important. ACT will actively use the survey results throughout EPAS test development. We hope that these research results will also help inform educational stakeholders in their own educational programs.

References

ACT, (2006). *Reading between the lines: What the ACT reveals about college readiness in reading.* Iowa City, IA: Author.

National Center for Education Statistics. (2004). Remedial course-taking. In *The condition of education 2004*. Retrieved August 21, 2004, from http://nces.ed.gov//programs/coe/2004/section5/indicator31.asp.

No Child Left Behind Act, 20 U. S. C. ¶ 6301 *et seq.* (2001).

Thomas B. Fordham Foundation. (2006). *The state of state standards 2006*. Washington, DC: Author.

Appendices

English/Writing Sample Breakdown for the 2005–2006 ACT National Curriculum Survey

Tables A.1 and A.2 give the breakdown of English/writing participants in the 2005–2006 ACT National Curriculum Survey. Table A.1 gives the number of survey instruments sent out to writing instructors, and Table A.2 gives the response rate.

Table A.1
English/Writing Surveys Sent

Sample	Courses	Sample size
Middle school/ junior high school	*English/Language Arts*	1,600
High school	*Writing/Composition*	2,000
Postsecondary	Entry-level courses	
	Composition	1,097
	Freshman English	403
	Survey of American Literature	800
Remedial-course	*Developmental Writing*	1,246

Table A.2
English/Writing Survey Response Rate

Survey type	Number mailed	Number returned	Response rate
Middle school/ junior high school	1,600	220	13%
High school	2,000	363	18%
Postsecondary	2,300	401	17%
Remedial-course	1,246	151	12%
Total	7,146	1,135	16%

Mathematics Sample Breakdown for the 2005–2006 ACT National Curriculum Survey

Tables A.3 and A.4 give the breakdown of math participants in the 2005–2006 ACT National Curriculum Survey. Table A.3 gives the number of survey instruments sent out to math instructors, and Table A.4 gives the response rate.

Table A.3
Mathematics Surveys Sent

Sample	Courses	Sample size
Middle school/ junior high school	*Mathematics, Pre-Algebra, Algebra, Geometry*	1,800
High school	*Mathematics, Algebra, Geometry, Trigonometry, Precalculus, Calculus, Probability and/or Statistics*	2,000
Postsecondary	*College/Finite/Discrete Math*	350
	Probability/Statistics	350
	Algebra	350
	Geometry/Precalculus	350
	Calculus	350
Remedial-course	*Developmental Math/ Remedial Math*	1,329

Table A.4
Mathematics Survey Response Rate

Survey type	Number mailed	Number returned	Response rate
Middle school/ junior high school	1,800	206	11%
High school	2,000	282	14%
Postsecondary	1,750	455	26%
Remedial-course	1,329	249	19%
Total	6,879	1,192	17%

Reading Sample Breakdown for the 2005–2006 ACT National Curriculum Survey

Tables A.5 and A.6 give the breakdown of reading participants in the 2005–2006 ACT National Curriculum Survey. Table A.5 gives the number of survey instruments sent out to reading instructors, and Table A.6 gives the response rate.

Table A.5
Reading Surveys Sent

Sample	Courses	Sample size
Middle school/ junior high school	*Language Arts*	1,800
High school	*Language Arts*	1,200
	History/Civics	800
Postsecondary	Entry-level courses	
	Composition	1,097
	Freshman English	403
	Survey of American Literature	800
Remedial-course	*Developmental Reading*	1,298

Table A.6
Reading Survey Response Rate

Survey type	Number mailed	Number returned	Response rate
Middle school/ junior high school	1,800	297	17%
High school	2,000	305	15%
Postsecondary	2,300	401	17%
Remedial-course	1,298	188	14%
Total	7,398	1,191	16%

Science Sample Breakdown for the 2005–2006 ACT National Curriculum Survey

Tables A.7 and A.8 give the breakdown of science participants in the 2005–2006 ACT National Curriculum Survey. Table A.7 gives the number of survey instruments sent out to science instructors, and Table A.8 gives the response rate.

Table A.7
Science Surveys Sent

Sample	Courses	Sample size
Middle school/ junior high school	*Science, Physical Science*	1,600
High school Biology	*Biology*	1,200
High school Chemistry	*Chemistry*	1,200
High school Earth Science	*Earth Science*	1,200
High school Physics	*Physics*	1,200
Postsecondary Biology	*Introduction to Biology/ Life Science*	1,650
Postsecondary Chemistry	*Introduction to Chemistry/ General Chemistry/etc.*	1,646
Postsecondary Earth/Space Science	*Geology/Earth Sciences/ etc.*	1,603
Postsecondary Physics	*Introduction to Astronomy*	300
	Introduction to Physics/ General Physics/etc.	1,443

Table A.8
Science Survey Response Rate

Survey type	Number mailed	Number returned	Response rate
Middle school/ junior high school	1,600	287	18%
High school	4,800	1,104	23%
Postsecondary	6,642	1,659	25%
Total	13,042	3,050	23%

Guidance Counselor Sample Breakdown for the 2005–2006 ACT National Curriculum Survey

Table A.9 gives the number of survey instruments sent out to guidance counselors and gives their response rate. All surveys were sent to high school guidance counselors.

Table A.9

Guidance Counselor Surveys Sent and Response Rate

Survey type	Number mailed	Number returned	Response rate
Guidance Counselor	1,200	361	30%

Table B.1
Statistical Details for English/Writing Topics and Skills

	MS mean rating	MS SD	HS mean rating	HS SD	PS mean rating	PS SD
Composition Process and Purpose						
Prewriting, brainstorming, or other techniques of invention	4.53	0.90	4.25	1.04	3.48	1.23
Mapping, clustering, outlining, or other organizational tools	4.38	0.92	4.03	1.11	3.18	1.18
Selecting a topic	4.14	1.10	4.28	1.04	3.62	1.20
Formulating a thesis	4.11	1.27	4.74	0.76	4.01	1.09
Analyzing an issue or problem	3.88	1.27	4.26	1.07	3.66	1.14
Gathering and synthesizing resources	3.77	1.27	4.20	1.11	3.14	1.17
Evaluating source materials critically	3.50	1.40	4.07	1.19	3.18	1.19
Citing sources accurately	3.77	1.32	4.42	1.04	3.00	1.28
Avoiding plagiarism	4.29	1.05	4.62	0.89	4.18	1.13
Collaborating with peers on reviews of drafts	4.17	1.08	3.89	1.15	2.79	1.20
Editing and proofreading	4.69	0.65	4.55	0.79	3.78	1.11
Revising for content rather than for grammar and mechanics	4.46	0.88	4.39	0.92	3.75	1.12
Developing one's own voice as a writer	4.08	1.18	3.98	1.13	3.04	1.16
Other writing process skill (Please specify.)	4.10	1.35	4.26	1.30	3.59	1.49
Writing to ...						
explore ideas	4.05	1.20	4.13	1.11	3.71	1.08
express one's feelings	4.31	1.09	3.74	1.31	2.82	1.28
tell a story through fiction or nonfiction	4.12	1.23	3.15	1.48	2.42	1.21
analyze literature or media	4.11	1.27	4.44	1.06	3.05	1.22
convey information	4.54	0.80	4.53	0.85	3.88	1.05
argue or persuade readers	4.25	1.09	4.39	1.02	3.59	1.13
express an opinion or take a position on an issue	4.41	0.99	4.45	0.93	3.70	1.13
describe a process or how to do something	3.71	1.31	3.05	1.58	2.90	1.19
present research	3.89	1.36	4.08	1.29	2.96	1.19
writing purpose (Please specify.)	3.68	1.63	4.00	1.45	3.15	1.58
MEAN	**4.12**		**4.16**		**3.36**	
Topic and Idea Development						
Establishing and adjusting the focus of a paper for audience and purpose	4.24	1.16	4.24	1.04	3.44	1.12
Determining the appropriateness of expression for audience and purpose	4.06	1.22	4.14	1.05	3.34	1.10
Providing appropriate context or background information for readers	4.04	1.25	4.10	1.19	3.34	1.08
Moving between general statements and specific reasons, examples, and details	4.51	0.90	4.64	0.75	3.81	1.08
Differentiating between assertions and evidence	3.08	1.59	4.02	1.31	3.52	1.19
Supporting claims with multiple sources of evidence	3.58	1.54	4.33	1.08	3.21	1.21
Using personal experience to support claims	4.07	1.18	3.83	1.21	2.82	1.15
Adding, revising, and deleting supporting details to improve the effectiveness of a piece of writing	4.52	0.85	4.51	0.84	3.56	1.06
Determining the relevancy of material to topic and purpose	4.16	1.15	4.28	1.06	3.65	1.13
Taking and maintaining a position on an issue	4.08	1.28	4.27	1.12	3.47	1.18
Fairly and accurately representing differing points of view on an issue	3.41	1.50	3.71	1.45	3.32	1.14
Anticipating and responding to counterarguments to a position taken on an issue	2.86	1.61	3.61	1.47	3.13	1.16
Addressing implications of a position taken on an issue or a proposed solution to a problem	2.72	1.60	3.36	1.52	2.93	1.13
Other topic and idea development skill (Please specify.)	2.80	1.83	3.75	1.66	2.80	1.64
MEAN	**3.72**		**4.06**		**3.31**	
Organization, Unity, and Coherence						
Using effective introductions and conclusions in a piece of writing	4.83	0.53	4.83	0.49	3.85	1.02
Establishing a logical progression of ideas	4.75	0.62	4.77	0.57	4.05	0.99
Logically grouping ideas into paragraphs within a piece of writing	4.80	0.58	4.72	0.66	4.18	0.95
Ordering paragraphs in a logical way within a piece of writing	4.78	0.64	4.68	0.72	4.09	0.98
Ordering sentences in a logical way within a paragraph	4.73	0.60	4.59	0.79	4.13	0.97
Using effective transitions between paragraphs	4.65	0.79	4.57	0.77	3.87	1.01
Choosing appropriate transition words and phrases within a sentences or to connect sentences within a paragraph	4.63	0.77	4.52	0.80	3.73	1.07
Other organization, unity, and coherence skill (Please specify.)	3.98	1.65	4.15	1.41	3.21	1.64
MEAN	**4.64**		**4.60**		**3.89**	
Word Choice in Terms of Style, Tone, Clarity, and Economy						
Choosing words and images that are specific, precise, and clear in terms of their context	4.54	0.81	4.49	0.87	3.70	1.04
Using varied words and images within a piece of writing	4.44	0.87	4.41	0.88	3.33	1.05
Maintaining consistency of style and tone within a piece of writing	4.15	1.14	4.27	0.99	3.46	1.06
Avoiding vague pronouns (i.e., pronouns without a clear antecedent)	4.15	1.09	4.42	0.89	3.88	1.05
Avoiding wordiness	4.18	1.11	4.27	0.99	3.67	1.04
Avoiding redundancy	4.20	1.10	4.27	1.01	3.68	1.04
Using rhetorically effective subordination, coordination, and parallelism	3.54	1.49	4.13	1.18	3.42	1.11
Other word choice skill (Please specify.)	3.59	1.81	4.09	1.36	3.27	1.58
MEAN	**4.10**		**4.29**		**3.55**	

Note:
MS = Middle school/junior high school teachers
HS = High school teachers
PS = Postsecondary teachers (no remedial-course teachers)
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table B.1

Statistical Details for English/Writing Topics and Skills *(continued)*

	MS mean rating	MS SD	HS mean rating	HS SD	PS mean rating	PS SD
Sentence Structure and Formation						
Avoiding …						
faulty subordination, coordination, and parallelism	3.24	1.49	4.04	1.14	3.73	1.06
awkward fused sentences (i.e., comma splices, run-on sentences)	4.41	1.02	4.46	0.83	4.24	0.96
sentence fragments that are not rhetorically defensible	4.34	1.12	4.41	0.96	4.29	0.97
dangling and misplaced modifiers	3.60	1.40	4.17	1.02	3.80	1.12
inappropriate shifts of tense, voice, mood, number or person	4.00	1.19	4.42	0.85	4.09	1.03
Using a variety of sentence types (i.e., simple, compound, complex)	4.39	0.97	4.31	0.97	3.69	1.07
Other sentence structure and formation skill (Please specify.)	3.36	1.78	4.08	1.31	3.60	1.37
MEAN	**3.91**		**4.27**		**3.92**	
Conventions of Usage						
Ensuring grammatical agreement (i.e., pronoun-antecedent, subject-verb)	4.44	0.90	4.47	0.83	4.27	0.94
Forming simple and compound tenses of regular and irregular verbs	4.21	1.12	4.07	1.19	4.16	1.01
Using the proper form of possessive pronouns	4.27	1.06	4.17	1.03	4.22	0.95
Using the appropriate case of a pronoun	4.25	1.07	4.26	0.97	4.17	0.96
Forming and using modifiers	4.08	1.20	4.03	1.13	3.93	1.04
Using the idioms of standard written English	3.81	1.28	3.94	1.22	4.00	1.02
Other convention of usage (Please specify.)	3.81	1.70	3.89	1.46	3.62	1.50
MEAN	**4.12**		**4.12**		**4.05**	
Conventions of Punctuation						
Punctuating ...						
end of sentence	4.62	0.86	4.38	1.00	4.56	0.85
between clauses of compound sentences when the conjunction is omitted	4.22	1.14	4.26	0.99	4.12	0.99
before a conjunctive adverb joining clauses of a compound sentence	3.92	1.29	4.17	1.03	3.94	1.07
parenthetical elements with commas, parentheses, and dashes	3.83	1.33	4.12	1.08	3.75	1.14
essential/nonessential elements, subordinate clauses, and appositives	3.87	1.31	4.16	0.99	3.78	1.11
possessive nouns and pronouns	4.35	1.01	4.27	1.00	4.26	0.96
items in a series	4.30	1.08	4.21	1.05	4.05	1.07
Avoiding unnecessary punctuation	4.15	1.16	4.14	1.03	3.81	1.09
Using a semicolon to indicate a relationship between the closely related independent clauses	3.98	1.18	4.25	0.93	3.71	1.13
Using a colon to introduce an example or an elaboration	3.83	1.23	4.13	1.04	3.56	1.15
Other convention of punctuation (Please specify.)	3.57	1.85	4.14	1.25	3.58	1.52
MEAN	**4.06**		**4.20**		**3.92**	
Evaluation of Writing						
Writing appropriately for purpose and audience	4.34	0.91	4.32	0.90	4.16	0.90
Writing unified and coherent text	4.61	0.80	4.79	0.52	4.62	0.66
Developing ideas using appropriate organizational strategy	4.56	0.81	4.64	0.64	4.43	0.81
Developing ideas using relevant examples and details	4.61	0.77	4.79	0.48	4.56	0.71
Using a clear beginning, middle, and ending	4.76	0.73	4.73	0.55	4.25	0.89
Using voice	3.84	1.17	3.93	1.00	3.35	1.03
Using precise word choice	4.06	1.02	4.15	0.94	3.74	0.94
Using appropriate tone	3.74	1.11	4.01	0.96	3.57	0.95
Using sentence variety	4.24	0.95	4.13	0.95	3.62	0.97
Using correct grammar, usage, and mechanics	4.47	0.80	4.46	0.79	4.25	0.96
MEAN	**4.32**		**4.40**		**4.06**	

Note:
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SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table B.2
Statistical Details for Mathematics Topics and Skills

	MS mean rating	MS SD	HS mean rating	HS SD	PS mean rating	PS SD
Process Skills						
Choosing an appropriate method for calculating (e.g., mental, paper and pencil, calculator, or estimation)	4.08	1.13	3.84	1.18	3.60	1.24
Using estimation to approximate solutions	3.88	1.11	3.58	1.19	3.05	1.12
Demonstrating concepts using manipulatives and/or pictorial representations	3.69	1.09	3.54	1.22	2.97	1.27
Solving problems posed in real-world settings and interpreting the solution	4.50	0.83	4.30	0.85	3.78	1.02
Recognizing when essential information is missing	3.89	1.08	3.90	1.13	3.66	1.09
Planning and carrying out a strategy for solving multistep problems	4.49	0.79	4.51	0.73	4.12	0.91
Recognizing generalizations of mathematical ideas	4.17	0.95	4.05	0.97	3.68	1.06
Recognizing and using patterns to solve problems	4.31	0.89	4.21	0.97	3.81	1.04
Applying mathematical ideas to new contexts	4.26	0.93	4.30	0.90	3.74	1.00
Formulating new patterns or structures	3.78	1.13	3.92	1.00	3.02	1.05
Solving several problems representing different aspects/components of a larger problem or scenario	3.83	1.11	4.12	1.02	3.26	1.13
Recalling basic facts, definitions, formulas, and algebraic procedures as needed to solve a problem	4.43	0.90	4.50	0.83	4.32	0.95
Recalling theorems and more complex formulas when needed to solve a problem	3.32	1.43	4.13	1.10	3.30	1.21
Applying theorems to solve a problem	3.35	1.47	4.16	1.19	3.36	1.27
Constructing and/or critiquing proofs, either informal or formal	2.29	1.40	3.31	1.43	1.99	1.07
Performing basic operations with a calculator	3.59	1.45	3.75	1.36	3.53	1.43
Using the statistical capabilities of a calculator	2.51	1.37	3.03	1.40	1.67	1.03
Using the graphical capabilities of a calculator	2.90	1.55	3.77	1.38	2.50	1.40
Using the symbolic algebra capabilities of a calculator	2.54	1.46	2.67	1.48	1.51	0.96
Solving routine problems quickly	4.16	1.08	3.95	1.08	3.68	1.09
Solving novel problems quickly	3.38	1.28	3.28	1.24	2.42	1.06
Understanding new material by reading a textbook	3.39	1.39	3.41	1.33	3.51	1.09
MEAN	**3.67**		**3.83**		**3.20**	
Basic Operations and Applications						
Performing addition, subtraction, multiplication, and division on signed rational numbers	4.65	0.71	4.37	1.07	4.75	0.69
Working with ratios and proportions	4.67	0.64	4.29	0.98	4.31	0.96
Working with percent (e.g., simple interest, tax, and markdowns)	4.40	0.86	3.77	1.33	3.98	1.17
Converting units of measure	3.77	1.18	3.50	1.39	3.27	1.28
MEAN	**4.37**		**3.98**		**4.08**	
Probability, Statistics, and Data Analysis						
Reading and interpreting graphs, charts, and other data representations	4.37	0.94	3.88	1.18	3.52	1.29
Representing data (e.g., circle graphs, scatterplots, and frequency distributions)	4.16	0.96	3.48	1.32	2.34	1.33
Determining a line of best-fit by eye for a set of data	3.26	1.30	3.20	1.34	1.85	1.06
Working with correlation	2.99	1.34	2.93	1.35	1.56	0.94
Finding the mean, median, and mode	4.14	1.02	3.29	1.42	1.91	1.21
Finding the variance and standard deviation of data	2.13	1.32	2.45	1.44	1.55	1.01
Working with the normal distribution	2.32	1.37	2.40	1.41	1.53	0.98
Computing the probability of a simple event	3.91	1.11	3.12	1.34	1.73	1.12
Using counting techniques	3.61	1.25	2.97	1.38	1.79	1.03
Working with Venn diagrams	3.07	1.29	2.76	1.24	1.86	1.14
Working with mutually exclusive, dependent, and independent events	3.18	1.21	2.80	1.36	1.59	1.01
Working with combinations, permutations, and the binomial theorem	2.81	1.40	2.81	1.39	1.67	1.01
MEAN	**3.33**		**3.01**		**1.91**	
Numbers, Concepts, and Properties						
Working with number properties (e.g., divisibility, even/odd, and positive/negative)	4.43	0.94	3.94	1.28	3.95	1.18
Performing operations with integer exponents	4.17	1.04	4.19	1.07	4.36	1.06
Working with rational exponents	3.75	1.37	3.89	1.29	3.90	1.37
Performing matrix addition and multiplication	2.31	1.36	3.03	1.42	1.63	1.02
Finding determinants	1.95	1.31	2.87	1.47	1.45	0.90
Working with series and sequences (e.g., arithmetic and geometric)	3.26	1.29	3.06	1.34	1.86	1.18
Working with sequences that are defined recursively	2.19	1.35	2.76	1.44	1.63	1.01
Computing the sum of an infinite geometric series	1.85	1.24	2.73	1.42	1.65	1.12
Working with sigma notation	1.45	0.94	2.85	1.46	2.11	1.31
Working with sets and set notation	2.44	1.32	2.97	1.38	2.68	1.34
Knowing the difference between rational and irrational numbers	3.42	1.21	3.69	1.28	3.37	1.41
Knowing the difference between real and complex numbers	2.58	1.45	3.47	1.49	2.98	1.51
Working with complex numbers	2.23	1.37	3.42	1.50	2.20	1.31
MEAN	**2.77**		**3.30**		**2.60**	

Note:
MS = Middle school/junior high school teachers
HS = High school teachers
PS = Postsecondary teachers (no remedial-course teachers)
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table B.2

Statistical Details for Mathematics Topics and Skills *(continued)*

	MS mean rating	MS SD	HS mean rating	HS SD	PS mean rating	PS SD
Expressions, Equations, and Inequalities						
Evaluating algebraic expressions by substitution	4.32	1.07	4.32	0.98	4.40	1.02
Simplifying algebraic expressions	4.44	0.91	4.51	0.92	4.42	1.03
Solving linear equations and inequalities in one variable	4.37	1.05	4.50	0.96	4.29	1.15
Solving absolute value equations and inequalities	3.73	1.41	3.81	1.28	3.48	1.39
Performing operations on radical expressions/equations	3.37	1.57	4.05	1.14	3.66	1.41
Performing addition, subtraction, and multiplication of polynomials	3.37	1.59	4.21	1.09	4.00	1.39
Working with linear equations in two variables	3.72	1.44	4.41	0.96	3.49	1.41
Performing polynomial long division	2.35	1.47	3.02	1.38	2.70	1.49
Solving quadratic equations by factoring	3.17	1.68	4.11	1.19	3.79	1.49
Using the quadratic formula	3.10	1.70	4.02	1.30	3.72	1.51
Using the discriminant	2.54	1.63	3.26	1.47	2.63	1.50
Solving quadratic inequalities	2.46	1.58	3.24	1.51	2.63	1.48
Determining roots of polynomial and rational equations algebraically	2.80	1.66	3.77	1.41	2.97	1.56
Performing operations with rational expressions	3.29	1.55	3.70	1.40	3.47	1.51
Implementing remainder and factor theorems	1.94	1.39	3.23	1.50	2.30	1.38
Working with logarithmic and exponential functions	2.12	1.45	3.52	1.54	2.87	1.58
Solving systems of two linear equations in two variables algebraically	3.15	1.70	4.08	1.22	2.95	1.51
Working with equations of parabolas, circles, ellipses, and hyperbolas	2.31	1.45	3.37	1.41	2.49	1.35
Working with parametric equations	1.64	1.22	2.55	1.46	1.82	1.14
Working with transformations algebraically	2.42	1.46	3.40	1.47	2.16	1.33
Determining maxima/minima for quadratic functions	2.25	1.47	3.34	1.52	2.44	1.44
Understanding continuity	1.77	1.34	2.88	1.56	2.05	1.29
Finding the limit of an expression	1.64	1.22	2.84	1.65	1.73	1.17
MEAN	**2.88**		**3.66**		**3.06**	
Graphical Representations						
Graphing on a number line	4.23	1.08	3.96	1.34	4.32	1.15
Graphing linear equations in two variables	3.96	1.33	4.33	1.08	4.05	1.33
Finding the slope of a line	3.97	1.34	4.51	0.88	4.16	1.27
Working with equations of parallel and perpendicular lines	3.44	1.45	4.17	1.10	3.58	1.47
Working with graphs of quadratic equations and functions	3.10	1.64	4.01	1.30	3.45	1.53
Solving systems of equations and inequalities graphically	3.25	1.57	3.91	1.32	2.81	1.49
Graphing parabolas, circles, ellipses, and hyperbolas	2.42	1.54	3.35	1.43	2.50	1.35
Determining a locus of points	1.90	1.34	2.78	1.48	1.86	1.10
Working with transformations graphically	2.87	1.49	3.56	1.40	2.23	1.35
Working with linear relationships	3.64	1.46	4.13	1.12	3.26	1.41
Approximating roots of polynomial and rational equations from graphs	2.53	1.55	3.44	1.43	2.46	1.41
Recognizing relationships between a family of equations and their graphs	2.85	1.58	3.67	1.41	2.61	1.42
Working with graphs of rational functions	2.76	1.54	3.53	1.45	2.46	1.41
Finding midpoints in the plane	2.49	1.53	3.70	1.31	2.48	1.40
Finding distances in the plane	2.73	1.56	3.87	1.23	2.88	1.46
Working with discontinuous graphs	1.85	1.23	2.90	1.48	2.26	1.29
MEAN	**3.00**		**3.74**		**2.96**	
Properties of Plane Figures						
Using the Pythagorean theorem	4.00	1.22	4.27	1.12	3.81	1.51
Applying properties of right, acute, and obtuse angles	4.03	1.15	3.96	1.39	2.77	1.52
Applying properties of lines, segments, and rays	3.78	1.29	3.86	1.45	2.66	1.49
Working with parallel lines, transversals, and angle measures	3.78	1.28	3.96	1.44	2.45	1.42
Working with properties of special quadrilaterals	3.75	1.26	3.82	1.48	1.98	1.25
Working with side length relationships in 45-45-90 degree triangles and 30-60-90 degree triangles	3.25	1.45	4.00	1.42	2.68	1.59
Working with congruent and similar triangles	3.97	1.18	4.02	1.38	2.56	1.50
Working with circles (e.g., radius, diameter, arc, and chord)	3.93	1.15	3.82	1.44	2.82	1.49
Working with inscribed and circumscribed polygons and circles	2.60	1.41	3.38	1.55	1.74	1.09
Working with logic statements (e.g., converse, contrapositive, and if-then)	2.26	1.42	3.33	1.52	2.26	1.36
MEAN	**3.54**		**3.84**		**2.57**	
Measurement						
Finding the area of hybrid figures	3.14	1.50	3.29	1.52	1.97	1.21
Finding the volume of hybrid figures	2.88	1.47	3.21	1.53	1.84	1.15
Understanding the scale on, for example, rulers and protractors	3.98	1.23	3.65	1.51	2.55	1.51
Finding the area and perimeter of polygons and circles	4.35	0.92	3.99	1.37	2.92	1.48
Finding volume (e.g., cylinders, prisms, and pyramids)	4.02	1.16	3.90	1.41	2.61	1.39
Finding surface area	4.00	1.15	3.81	1.44	2.48	1.38
Understanding relations between a scale factor and length, area, volume	3.74	1.24	3.69	1.44	2.40	1.37
MEAN	**3.73**		**3.65**		**2.40**	

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SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table B.2

Statistical Details for Mathematics Topics and Skills *(continued)*

	MS mean rating	SD	HS mean rating	SD	PS mean rating	SD
Functions						
Finding the volume of a function at a given point	3.30	1.48	4.00	1.37	2.27	1.62
Understanding the concept of function	3.34	1.45	3.99	1.37	3.71	1.48
Working with functions (e.g., domain and range, composition, and inverses)	3.06	1.49	3.90	1.42	3.45	1.55
Using right triangle trigonometry	2.39	1.59	3.97	1.41	2.67	1.65
Using trigonometric identities	1.84	1.35	3.41	1.61	2.38	1.56
Solving trigonometric equations	1.83	1.36	3.50	1.63	2.27	1.51
Using the law of sines and law of cosines	1.81	1.33	3.51	1.62	1.95	1.32
Working with graphs of trigonometric functions, including amplitude, period, and phase shift	1.57	1.16	3.27	1.70	2.24	1.50
Using radian measure	1.57	1.20	3.26	1.69	2.55	1.71
Working with vectors in a plane	1.69	1.26	2.86	1.60	1.67	1.07
MEAN	**2.24**		**3.57**		**2.52**	

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Table B.3
Statistical Details for Reading Topics and Skills

	MS mean rating	MS SD	HS mean rating	HS SD	PS mean rating	PS SD
Reading Content						
Reading and demonstrating understanding of …						
prose fiction	4.22	1.13	3.81	1.53	3.03	1.45
humanities-based texts (e.g., the arts, philosophy, architecture, religion/ethics, literary criticism, personal essays, memoirs)	3.23	1.38	3.50	1.34	3.40	1.25
social sciences–based texts (e.g., history, political science, economics, psychology, business, geography, sociology)	2.90	1.46	3.55	1.54	3.45	1.33
natural sciences–based texts (e.g., biology, chemistry, physics, physical sciences)	2.00	1.30	1.69	1.08	2.02	1.12
Reading and demonstrating understanding of …						
poetry	3.95	1.09	3.50	1.51	2.39	1.31
drama	3.62	1.24	3.54	1.53	2.33	1.28
"functional" text (e.g., brochures, business letters, maps)	3.49	1.32	2.99	1.41	2.75	1.32
graphs, charts, and diagrams	3.58	1.37	3.17	1.50	2.82	1.38
technical documents (e.g., instructional manuals, contracts)	2.72	1.42	2.07	1.28	2.01	1.06
news and feature articles	3.82	1.14	3.58	1.29	3.57	1.25
editorials/opinion pieces	3.77	1.13	3.68	1.14	3.56	1.23
research studies	3.43	1.44	3.60	1.36	3.10	1.25
primary sources (e.g., letters, speeches)	3.64	1.19	3.83	1.22	3.43	1.26
advertisements	3.32	1.28	2.63	1.33	2.31	1.18
Other reading content (Please specify.)	4.04	1.47	3.56	1.68	2.53	1.70
MEAN	**3.45**		**3.25**		**2.85**	
Main Ideas and Author's Approach						
Determining main idea(s) and purpose(s) of a paragraph or a text by identifying ideas, key words and topic sentences	4.83	0.54	4.57	0.87	4.58	0.77
Inferring the main idea(s) and purpose(s) of a paragraph or a text	4.85	0.45	4.64	0.76	4.55	0.75
Summarizing basic ideas and events in a text	4.82	0.52	4.61	0.84	4.50	0.80
Understanding the point of view from which a text is told	4.66	0.68	4.53	0.90	4.24	0.92
Identifying an author's unstated assumptions	4.40	0.93	4.35	1.05	3.93	1.07
Determining from a text the …						
organizational pattern	4.08	1.10	3.90	1.19	3.72	1.12
major claims made	3.74	1.29	4.05	1.16	4.31	0.90
evidence and sources of information used	3.99	1.15	4.13	1.14	4.07	1.04
Recognize how writing style helps shape the meaning of a given text	4.00	1.11	4.00	1.18	3.43	1.19
Other skill relating to main ideas and author's approach (Please specify.)	4.14	1.31	3.79	1.62	3.09	1.69
MEAN	**4.35**		**4.26**		**4.04**	
Supporting Details						
Recognizing and recalling details explicitly stated in a text	4.59	0.83	4.44	0.93	3.97	1.03
Locating and interpreting details subtly stated in a text	4.51	0.90	4.38	0.93	3.65	1.02
Determining how details are used to support points made in a text	4.64	0.79	4.51	0.83	4.13	0.91
Other skill relating to supporting details (Please specify.)	3.93	1.47	3.58	1.68	2.74	1.70
MEAN	**4.42**		**4.23**		**3.62**	
Relationships						
From a text, recognizing and recalling explicitly stated …						
sequences	4.58	0.79	4.28	1.00	3.66	1.07
cause-effect relationships	4.66	0.68	4.47	0.87	4.10	0.97
comparisons and contrasts	4.69	0.63	4.51	0.85	4.04	0.97
Making reasonable inferences from a text about …						
sequences	4.52	0.82	4.17	1.05	3.59	0.98
cause-effect relationships	4.57	0.74	4.35	0.95	3.93	0.98
comparisons and contrasts	4.61	0.70	4.41	0.90	3.88	0.94
Analyzing interactions between characters in a literary text	4.50	0.90	4.13	1.28	2.82	1.45
Categorizing or classifying information in a text	4.26	1.03	3.94	1.18	3.45	1.12
Drawing appropriate analogies	4.11	1.13	3.97	1.21	3.38	1.10
Other skill relating to relationships (Please specify.)	3.71	1.53	3.52	1.70	2.35	1.60
MEAN	**4.42**		**4.18**		**3.52**	
Meaning of Words						
Determining the appropriate meaning of words and phrases from context	4.79	0.57	4.48	0.99	4.27	0.89
Distinguishing between literal and figurative meanings of words and phrases	4.57	0.80	4.22	1.21	3.94	1.12
Recognizing and understanding the use of literary devices …						
metaphor/simile	4.55	0.85	4.00	1.31	3.20	1.30
symbolism	4.20	1.17	4.21	1.20	3.14	1.31
satire	3.51	1.46	3.96	1.33	3.11	1.27
irony	3.97	1.29	4.12	1.27	3.20	1.26
foreshadowing	4.35	1.01	3.99	1.36	2.87	1.35
Other skill relating to meanings of words (Please specify.)	4.38	1.20	3.68	1.59	2.57	1.71
MEAN	**4.29**		**4.08**		**3.29**	

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Table B.3

Statistical Details for Reading Topics and Skills *(continued)*

	MS mean rating	SD	HS mean rating	SD	PS mean rating	SD
Generalizations and Conclusions						
Drawing conclusions from information given in a text	4.81	0.54	4.61	0.78	4.36	0.88
Predicting outcomes based on a text	4.64	0.69	4.31	1.01	3.51	1.17
Distinguishing between fact, opinion, and reasoned judgment	4.65	0.73	4.44	0.93	4.35	0.94
Using information implied in a text to make generalizations	4.48	0.87	4.32	0.97	4.04	0.90
Recognizing stereotypes in a text	3.79	1.28	4.09	1.08	3.83	1.11
Recognizing logical fallacies in a text	3.33	1.47	3.79	1.37	3.75	1.13
Making connections between …						
two or more texts	4.22	1.14	4.15	1.13	3.85	1.07
two or more subjects or disciplines (e.g., literature and history)	4.14	1.13	4.18	1.06	3.50	1.16
a text and one's prior knowledge	4.52	0.89	4.43	0.90	3.89	1.05
Applying information gained from a text to new situations or problems	4.24	1.04	4.34	0.99	3.93	1.05
Developing an alternative hypothesis or solution to one proposed in a text	3.78	1.23	3.83	1.32	3.27	1.20
Other skill relating to generalizations and conclusions (Please specify.)	3.58	1.52	3.24	1.78	2.65	1.64
MEAN	**4.18**		**4.14**		**3.74**	
Evaluating and Judging Texts						
Evaluating information in a text for …						
specificity	3.38	1.37	3.79	1.25	3.42	1.01
relevance	3.85	1.27	4.23	0.98	3.78	0.98
significance or importance	3.92	1.20	4.39	0.94	4.14	0.91
fair and accurate treatment of differing points of view	3.59	1.27	4.12	1.08	3.81	1.05
persuasive techniques (e.g., appeals, biased assumptions, loaded language)	3.78	1.29	3.96	1.20	3.50	1.13
credibility and appropriateness of sources of information	3.53	1.30	4.23	1.07	3.80	1.14
sufficiency of evidence in support of an argument or claim	3.66	1.40	4.20	1.09	3.95	1.11
internal consistency	2.93	1.47	3.60	1.29	3.69	1.06
general soundness of reasoning	3.46	1.47	4.03	1.13	3.95	1.00
Judging a text against generally recognized standards of quality or excellence	3.05	1.46	3.57	1.39	3.06	1.18
Assessing the risks and benefits of an action described by a text	3.19	1.42	3.50	1.35	2.92	1.16
Recognizing how history and culture influence a text	3.73	1.32	4.12	1.22	3.50	1.20
Other text evaluation and judging skill (Please specify.)	2.42	1.50	2.76	1.72	2.31	1.58
MEAN	**3.42**		**3.88**		**3.53**	
Reading Strategies						
Reading independently for a variety of purposes (e.g., for enjoyment or information)	4.83	0.57	4.38	1.03	4.06	1.06
Applying strategies before, during, and after reading to increase fluency and comprehension (e.g., previewing, reading headings and boldface text, skimming, scanning)	4.77	0.63	4.33	1.03	3.74	1.14
Using a variety of "fix up" strategies (e.g., rereading, changing reading rate) to better comprehend a text	4.54	0.93	4.00	1.24	3.41	1.15
Other reading strategy (Please specify.)	4.47	1.22	3.82	1.61	3.04	1.80
MEAN	**4.65**		**4.13**		**3.56**	

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Table B.4
Statistical Details for Life Science and Biology Topics and Skills
Middle School Life Science

Content Topic	MS mean rating	SD
Criteria for living things	4.40	1.08
Homeostasis	3.69	1.44
Levels of organization (e.g., cells, tissues, organs)	4.33	1.15
Organic molecules versus inorganic molecules	2.94	1.53
Structure and function of biologically important molecules (e.g., proteins, lipids, carbohydrates, and nucleic acids)	3.02	1.59
Metabolic reactions (e.g., fermentation, cellular respiration)	3.31	1.44
Matter and energy in biological systems (e.g., laws of thermodynamics)	2.79	1.54
Enzymes (e.g., specificity, denaturation)	2.26	1.33
pH scale and the importance of pH in biological systems	2.83	1.50
Structure and function of prokaryotic cells	3.79	1.40
Structure and function of eukaryotic cells and organelles (e.g., membrane structure, cytoplasm, nucleus, Golgi apparatus)	4.15	1.26
Protein synthesis	2.84	1.62
Current cell theory (e.g., all living things are composed of cells)	4.33	1.14
Research leading to current cell theory (e.g., experiments of Hooke, Schleiden, and Schwann)	3.55	1.51
Mitosis	3.97	1.35
Cell specialization	3.62	1.35
Similarities and differences between cell types (e.g., muscle, nerve, plant, bacterial)	3.84	1.28
Structure and function of DNA and chromosomes	3.92	1.39
Karyotyping	2.61	1.53
Molecular genetics (e.g., DNA replication, transcription, translation)	2.86	1.62
Mendelian genetics (e.g., Mendel's laws, genetic crosses, Punnett squares)	3.93	1.50
Meiosis	3.65	1.49
Modes of inheritance (e.g., recessive, dominant, sex-linked)	3.82	1.47
Mutation	3.45	1.41
Biotechnology (e.g., Human Genome Project, PCR, stem cell research)	2.67	1.50
Work of Darwin, Lamarck, Lyell, and Malthus	2.83	1.51
Natural selection	3.51	1.45
Selection and adaptation	3.66	1.42
Speciation	2.98	1.53
Fossil record and evolutionary relationships	3.14	1.56
Early Earth and the origin of life	2.89	1.53
Classification systems for organisms (e.g., three kingdom, six kingdom)	4.00	1.43
Binomial nomenclature	3.61	1.49
Dichotomous taxonomic keys	3.48	1.49
Major animal phyla (e.g., organisms and adaptations)	4.28	1.24
Vertebrates versus invertebrates	3.67	1.56
Animal behavior	3.56	1.52
Structure and function of organ systems	3.86	1.47
Sensory organs	3.46	1.56
Human health (e.g., nutrition, aging, vaccination)	3.46	1.65
Major plant phyla (e.g., structure, function, and adaptations)	3.35	1.52
Plant reproduction (e.g., life cycle)	3.55	1.50
Photosynthesis	4.20	1.24
Major phyla and life cycles of fungi (e.g., structure, function, and adaptations)	3.41	1.38
Role of fungi as decomposers	3.67	1.44
Fungi in useful products (e.g., antibiotics, bread)	3.50	1.44
Major phyla of bacteria (e.g., structure, function, and adaptations)	3.16	1.64
Viral structure and replication	3.11	1.55
Major phyla of protists (e.g., structure, function, and adaptations)	3.10	1.61
Bacteria and biotechnology	2.86	1.57
Ecosystems and population dynamics (e.g., food chains, energy pyramids, succession)	3.91	1.35
Growth models of populations	3.09	1.61
Population ecology (e.g., habitats, niches)	3.73	1.48
Species interactions (e.g., competition, predation, mutualism)	3.80	1.46
Human impact on the environment (e.g., pollution, greenhouse effect)	3.93	1.36
Abiotic factors	3.48	1.57
Elements cycling through ecosystems	3.45	1.60
MEAN	**3.48**	

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Table B.4
Statistical Details for Life Science and Biology Topics and Skills *(continued)*
Biology

Content Topic	HS mean rating	SD	PS mean rating	SD
Criteria for living things	4.57	0.75	3.66	1.20
Homeostasis	4.64	0.69	3.15	1.12
Levels of organization (e.g., cells, tissues, organs)	4.49	0.85	3.69	1.12
Organic molecules versus inorganic molecules	4.01	1.07	3.13	1.16
Structure and function of biologically important molecules e.g., proteins, lipids, carbohydrates, and nucleic acids)	4.47	0.80	3.11	1.19
Structure and function of important functional groups (e.g., phosphate group, hydroxyl group, amino group)	3.33	1.30	2.33	1.16
Metabolic reactions (e.g., fermentation, cellular respiration)	4.41	0.89	2.74	1.18
Matter and energy in biological systems (e.g., laws of thermodynamics)	3.43	1.30	2.94	1.16
Enzymes (e.g., specificity, denaturation)	4.05	1.09	2.82	1.21
Properties of water that are important for life processes	4.21	0.99	3.34	1.24
pH scale and the importance of pH in biological systems	3.88	1.03	3.16	1.18
Structure and function of prokaryotic cells	4.36	0.95	3.06	1.22
Structure and function of eukaryotic cells and organelles (e.g., membrane structure, cytoplasm, nucleus, Golgi apparatus)	4.79	0.55	3.47	1.22
Protein synthesis	4.56	0.81	2.74	1.19
Current cell theory (e.g., all living things are composed of cells)	4.52	0.79	3.66	1.24
Research leading to current cell theory (e.g., experiments of Hooke, Schleiden, and Schwann)	3.65	1.23	2.23	1.09
Cell cycle and its regulation (e.g., gap 1, synthesis, gap 2, mitosis)	4.50	0.91	2.76	1.16
Cell size factors (e.g., cell surface area to volume ratio)	4.14	1.04	2.67	1.20
Cell specialization (e.g., cells take on different structures and functions by expressing a subset of genes)	4.15	1.07	2.78	1.16
Membrane function	4.55	0.74	3.04	1.23
Similarities and differences between cell types (e.g., muscle, nerve, plant, bacterial)	3.98	1.04	2.82	1.14
Research leading to the identification of DNA as the genetic material (e.g., experiments of Griffith and Hershey and Chase)	3.68	1.30	2.34	1.18
Structure and function of DNA and chromosomes	4.81	0.53	3.50	1.21
Structure and function of RNA (e.g., rRNA, tRNA)	4.67	0.73	3.11	1.28
Karyotyping	3.88	1.19	2.06	1.00
Molecular genetics (e.g., DNA replication, transcription, translation)	4.65	0.80	2.99	1.27
Mendelian genetics (e.g., Mendel's laws, genetic crosses, Punnett squares)	4.73	0.68	3.39	1.24
Meiosis and gametogenesis	4.62	0.74	3.23	1.28
Modes of inheritance (e.g., recessive, dominant, sex-linked)	4.67	0.73	3.17	1.22
Gene expression and regulation	4.11	1.12	2.53	1.13
Mutation	4.40	0.86	2.85	1.21
Biotechnology (e.g., Human Genome Project, PCR, stem cell research)	3.85	1.20	2.34	1.11
Work of Darwin, Lamarck, Lyell, and Malthus	3.96	1.15	3.19	1.36
Natural selection	4.45	0.94	3.74	1.29
Fitness	4.11	1.20	3.23	1.32
Selection and adaptation	4.29	1.01	3.40	1.26
Speciation (e.g., allopatric)	3.81	1.23	2.60	1.25
Hardy-Weinberg equation	3.04	1.45	2.15	1.16
Fossil record and evolutionary relationships	3.86	1.20	3.09	1.39
Early Earth and the origin of life	3.53	1.30	2.78	1.38
Classification systems for organisms (e.g., three kingdom, six kingdom)	4.23	1.08	3.27	1.36
Binomial nomenclature	4.16	1.09	3.21	1.39
Dichotomous taxonomic keys	3.95	1.21	2.41	1.19
Molecular/genetic techniques to determine relationships between organisms (e.g., based on mitochondrial DNA sequence)	3.31	1.35	2.20	1.11
Major animal phyla (e.g., organisms and adaptations)	3.80	1.29	2.99	1.32
Vertebrates versus invertebrates	3.83	1.30	3.28	1.37
Animal behavior	3.04	1.37	2.20	1.01
Growth and development	3.54	1.32	2.50	1.11
Structure and function of organ systems	3.84	1.32	2.98	1.23
Sensory organs	3.35	1.32	2.64	1.21
Human health (e.g., nutrition, aging, vaccination)	3.27	1.41	2.72	1.28
Major plant phyla (e.g., structure, function, and adaptations)	3.48	1.41	2.66	1.33
Plant reproduction (e.g., life cycle)	3.48	1.39	2.58	1.21
Plant physiology (e.g., transport, hormones, response to stimuli such as light and gravity)	3.24	1.42	2.27	1.11
Photosynthesis	4.58	0.84	3.27	1.34
Major phyla and life cycles of fungi (e.g., structure, function, and adaptations)	2.95	1.40	2.20	1.22
Role of fungi as decomposers	3.89	1.15	2.91	1.37
Fungi in useful products (e.g., antibiotics, bread)	3.53	1.31	2.55	1.23
Major phyla of bacteria (e.g., structure, function, and adaptations)	3.36	1.40	2.14	1.17
Viral structure and replication	3.77	1.27	2.43	1.20
Major phyla of protists (e.g., structure, function, and adaptations)	3.25	1.41	2.15	1.14
Bacteria and biotechnology	3.50	1.33	2.33	1.14
Ecosystems and population dynamics (e.g., food chains, energy pyramids, succession)	4.37	1.06	3.22	1.35
Growth models of populations	3.69	1.34	2.44	1.23
Population ecology (e.g., habitats, niches)	4.08	1.20	2.89	1.28
Species interactions (e.g., competition, predation, mutualism)	4.20	1.12	2.98	1.29
Human impact on the environment (e.g., pollution, greenhouse effect)	4.13	1.16	3.30	1.35
Abiotic factors	3.92	1.22	2.65	1.19
Elements cycling through ecosystems	3.99	1.19	2.75	1.22
MEAN	**3.99**		**2.86**	

Note:
MS = Middle school/junior high school teachers
HS = High school teachers
PS = Postsecondary teachers (no remedial-course teachers)
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table B.5

Statistical Details for Middle School/Junior High School Physical Science Topics and Skills

Content Topic	MS mean rating	SD
Units of measurement	4.64	0.70
Metric system	4.60	0.71
Physical and chemical changes	4.49	1.01
Elements, compounds, and molecules	4.46	1.02
Mass, volume, and density	4.50	0.97
Chemical symbols and formulas	4.24	1.20
Atoms: protons, electrons, and neutrons	4.33	1.26
Forces within the atom	3.47	1.60
Energy levels within the atom	3.64	1.55
Periodic table; atomic number, mass number	4.30	1.25
Types of chemical bonds	3.47	1.69
Chemical reactions: reactants and products	3.88	1.48
Balancing chemical equations	3.28	1.61
Endothermic and exothermic reactions	3.52	1.55
Rates of chemical response	2.86	1.65
Solutions: solubility and concentration	3.22	1.61
Polarity	2.48	1.58
Freezing point depression; boiling point elevation	3.00	1.63
Acids and bases; salts	3.57	1.58
pH scale	3.55	1.58
Radioactive elements and radioactivity	2.57	1.56
Speed, velocity, and acceleration	4.07	1.48
Momentum	3.83	1.55
Force	4.17	1.36
Newton's three laws of motion	4.21	1.38
Friction	4.16	1.32
Gravity	4.41	1.14
Mass and weight	4.35	1.12
Projectile and orbital motion	3.09	1.68
Fluid pressure	2.96	1.75
Buoyancy; Archimedes' principle	3.16	1.68
Bernoulli's principle	3.14	1.72
Work, power, and efficiency	3.69	1.60
Simple mechanics (levers, pulleys, etc.)	3.75	1.59
Kinetic and potential energy	4.26	1.26
Mechanical, thermal, gravitational, chemical, electromagnetic, and nuclear energy	3.62	1.48
Energy conversions and conservation of energy	3.84	1.41
Temperature and molecular motion	3.71	1.41
Temperature scales	3.75	1.43
Heat transfer: conduction, convection, and radiation	3.73	1.39
Specific heat; amount of heat gained or lost	2.72	1.50
Melting, freezing, and boiling points	3.95	1.27
Heats of fusion and vaporization	2.62	1.60
Thermal expansion	2.84	1.64
Heating and cooling systems; heat engines	2.15	1.54
Types of waves: transverse and longitudinal	3.27	1.71
Amplitude, wavelength, and frequency	3.43	1.60
Speed of waves	3.21	1.68
Constructive and destructive interference	2.72	1.65
Transmitting sound	2.94	1.69
Intensity and loudness	2.84	1.71
Frequency (pitch); sound quality (timbre)	2.90	1.67
Doppler effect	2.84	1.69
Resonance	2.53	1.59
Light energy: photons	2.92	1.72
Electromagnetic waves	3.36	1.65
Electromagnetic spectrum	3.40	1.65
Doppler effect	2.98	1.71
Reflection and refraction	3.30	1.64
Separating white light: prisms	3.22	1.67
Diffraction	2.92	1.68
Transmittance and absorbance	2.72	1.69
Transparent, translucent, and opaque surfaces	3.02	1.69
Primary and complementary colors and pigments	2.72	1.63
Incandescent and fluorescent light	2.56	1.65
Plane, concave, and convex mirrors	2.87	1.69
Concave and convex lenses	2.98	1.64
Cameras, telescopes, and microscopes	2.83	1.58
Lasers; fiber optics	2.47	1.60
Fossil fuels	3.51	1.43
Solar energy; wind and water power	3.53	1.40
Nuclear energy	3.31	1.57
Alternative energy sources	3.54	1.46
Pollution and conservation	3.58	1.49
Petroleum fuels and fractional distillation	2.35	1.62
Polymers	2.30	1.48
Electronic devices (transistors, integrated circuits, etc.)	1.95	1.32
Communication devices (telephones, computers, etc.)	2.24	1.43
MEAN	**3.35**	

Note:
MS = Middle school/junior high school teachers
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table B.6

Statistical Details for Secondary/Postsecondary Chemistry Topics and Skills

Content Topic	HS mean rating	SD	PS mean rating	SD
Units of measurement; metric system	4.65	0.69	4.47	0.90
Classification and properties of matter	4.37	0.86	3.70	1.16
Density	4.11	0.94	3.58	1.10
Atoms, molecules, ions; mole concept	4.93	0.31	3.97	1.11
Chemical formulas and equations	4.92	0.36	3.78	1.17
Stoichiometry and percent yield	4.70	0.67	3.41	1.30
Heat, enthalpy, state functions	3.65	1.24	2.32	1.08
Ideal gas law, kinetic molecular theory	4.32	0.91	2.79	1.19
Electron configurations, valence electrons	4.67	0.62	3.16	1.26
Chemical bond formation	4.54	0.78	3.03	1.23
Bonding theories	4.08	1.03	2.47	1.17
Polarity, electronegativity	4.11	0.94	2.62	1.18
Kelvin temperature scale	4.27	0.94	3.47	1.32
Phase changes	4.10	1.00	2.94	1.16
Phase diagrams	3.62	1.17	1.89	1.03
Units of concentration	4.11	1.08	3.48	1.26
Colligative properties	3.32	1.34	2.01	0.96
Reaction rates	3.29	1.33	2.03	1.03
Reaction mechanisms	2.77	1.46	1.57	0.88
Catalysts, enzymes	3.06	1.22	1.75	0.96
Chemical equilibria	3.56	1.40	2.49	1.23
Bronsted acid/base theory	3.72	1.29	2.84	1.32
Lewis acid/base theory	3.41	1.37	2.16	1.12
pH scale	4.21	1.06	3.30	1.29
Acid/base reactions	4.14	1.09	3.18	1.28
Common ion effect and buffer solutions	2.84	1.46	1.86	0.98
Acid/base titration	3.82	1.27	2.57	1.26
Acid/base indicators	3.72	1.22	2.35	1.16
Solubility product	3.13	1.45	1.84	0.97
Qualitative analysis	3.35	1.49	2.00	1.07
Spontaneity and entropy	2.78	1.43	1.88	1.08
2nd law of thermodynamics	2.69	1.47	1.90	1.10
Gibbs free energy	2.44	1.50	1.84	1.11
Oxidation/reduction reactions	3.53	1.38	2.68	1.28
Electrochemical cells	2.72	1.47	1.91	1.02
Batteries and storage cells	2.52	1.38	1.74	0.95
Electrolysis	2.66	1.36	1.72	0.95
Corrosion	2.67	1.41	1.56	0.81
Chemistry of Groups 1A, 2A	3.83	1.16	2.31	1.26
Metals, metalloids, nonmetals	4.13	1.04	2.72	1.35
Chemistry of Groups 5A, 6A, 7A	3.75	1.23	2.13	1.16
The Noble gases	3.90	1.14	2.33	1.27
Basic organic nomenclature	3.03	1.47	1.58	0.91
Organic molecules/structures	2.87	1.50	1.55	0.89
Functional groups	2.65	1.47	1.52	0.90
Petroleum and its products	2.15	1.27	1.40	0.75
Molecular stereochemistry	2.03	1.29	1.46	0.84
Amino acids, proteins	2.02	1.29	1.43	0.79
Carbohydrates, nucleic acids	2.02	1.27	1.40	0.79
Synthetic polymers	2.08	1.33	1.33	0.69
Chemistry of transition metals	2.98	1.46	1.61	0.87
Spectroscopy/absorption	2.63	1.36	1.76	1.00
Nature of radioactivity	3.26	1.35	1.91	1.03
Rates of nuclear decay	3.10	1.39	1.55	0.83
Nuclear fission/fusion	3.16	1.36	1.62	0.91
Radiochemical dating	2.81	1.33	1.56	0.82
MEAN	**3.43**		**2.31**	

Note:
HS = High school teachers
PS = Postsecondary teachers (no remedial-course teachers)
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table B.7

Statistical Details for Earth Science Topics and Skills

Middle School and Junior High School Earth Science

Content topic	MS mean rating	SD
Map reading and interpretation	3.45	1.48
Latitude and longitude	3.51	1.52
Remote sensing	2.21	1.47
The geologic time scale	3.47	1.50
Fossils and fossilization	3.44	1.41
Interpretation of fossils	3.15	1.42
Properties of matter	4.11	1.25
Minerals and their properties	3.71	1.59
Rocks and their properties	3.75	1.57
The rock cycle	3.77	1.58
Biogeochemical cycles (carbon, nitrogen, etc.)	3.21	1.48
Weathering processes	3.82	1.39
Soil formation and soil properties	3.41	1.48
Erosion and agents of erosion	3.86	1.35
Deposition	3.69	1.46
Groundwater	3.76	1.40
Surface water	3.79	1.43
Mass movement	3.45	1.58
Landform creation	3.90	1.41
Global plate tectonics	4.09	1.37
Volcanism	3.90	1.41
Earthquakes	3.94	1.39
Mountain-building	3.85	1.46
Earth's interior	3.97	1.39
Types of natural resources	3.83	1.25
Fossil fuels	3.86	1.23
Alternative energy sources	3.79	1.33
Air, water, soil pollution	4.04	1.18
Conservation of resources	3.91	1.26
Population growth	3.15	1.39
The water cycle	4.27	1.14
Role of solar energy	3.96	1.25
The composition of air	3.98	1.27
Earth's atmosphere	4.07	1.27
Air pressure, temperature, density	3.97	1.32
Global and local winds	3.67	1.43
Relative humidity and dew point	3.53	1.57
Clouds and precipitation	3.92	1.38
Air masses and fronts	3.78	1.47
Storms	3.78	1.43
Weather prediction	3.64	1.47
Definition of climate	3.81	1.37
Global climate change	3.61	1.43
Ocean currents	3.16	1.61
Properties of ocean water	3.12	1.62
Topography of the ocean floor	3.10	1.57
Tides	3.56	1.52
Waves	3.34	1.57
Sea level changes	2.90	1.57
Constellations	3.04	1.53
Timekeeping	2.49	1.45
Historical astronomy	2.82	1.51
Gravity and motion	3.90	1.44
The Sun-Earth-Moon system	4.12	1.38
Origin of our solar system	3.65	1.59
Motions of the planets	3.62	1.57
Kepler's laws	3.10	1.68
Earth's moon	3.86	1.43
The terrestrial planets	3.37	1.60
The gas planets	3.43	1.59
Comets, asteroids, meteors, and other minor bodies	3.46	1.57
The Sun and its energy	3.91	1.45
The Milky Way and other galaxies	3.45	1.60
Birth and evolution of stars	3.38	1.66
Life outside our solar system	2.75	1.65
Formation and structure of the universe	3.24	1.64
MEAN	**3.58**	

Note:
MS = Middle school/junior high school teachers
HS = High school teachers
PS = Postsecondary teachers (no remedial-course teachers)
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table B.7

Statistical Details for Earth Science Topics and Skills *(continued)*

Earth Science

Content topic	HS mean rating	SD	PS mean rating	SD
Map reading and interpretation	4.08	1.01	3.16	1.25
Latitude and longitude	4.07	1.04	3.43	1.32
Remote sensing	2.76	1.41	1.76	0.92
The geologic time scale	3.89	1.22	2.59	1.29
Fossils and fossilization	3.63	1.25	2.27	1.17
Interpretation of fossils	3.52	1.38	2.03	1.08
Properties of matter	4.02	1.15	3.69	1.17
Minerals and their properties	4.11	1.20	2.49	1.22
Rocks and their properties	4.22	1.15	2.55	1.22
The rock cycle	4.30	1.12	2.68	1.36
Biogeochemical cycles (carbon, nitrogen, etc.)	3.40	1.37	2.05	1.06
Weathering processes	4.19	1.05	2.39	1.15
Soil formation and soil properties	3.57	1.36	2.10	1.04
Erosion and agents of erosion	4.17	1.08	2.50	1.18
Deposition	3.96	1.15	2.36	1.16
Groundwater	3.97	1.22	2.36	1.13
Surface water	4.03	1.17	2.49	1.16
Mass movement	3.91	1.21	2.18	1.06
Landform creation	4.02	1.12	2.20	1.11
Global plate tectonics	4.65	0.76	2.97	1.42
Volcanism	4.43	0.91	2.64	1.25
Earthquakes	4.51	0.85	2.63	1.25
Mountain-building	4.22	0.93	2.35	1.22
Earth's interior	4.37	0.89	2.50	1.29
Types of natural resources	3.66	1.36	2.75	1.24
Fossil fuels	3.59	1.42	2.62	1.20
Alternative energy sources	3.51	1.45	2.28	1.18
Air, water, soil pollution	3.61	1.39	2.54	1.23
Conservation of resources	3.49	1.46	2.46	1.20
Population growth	2.73	1.55	2.49	1.25
The water cycle	4.40	1.01	2.95	1.35
Role of solar energy	4.19	1.10	2.63	1.31
The composition of air	4.05	1.17	2.51	1.25
Earth's atmosphere	4.35	1.02	2.54	1.24
Air pressure, temperature, density	4.28	1.10	2.44	1.31
Global and local winds	4.15	1.14	2.14	1.13
Relative humidity and dew point	4.15	1.14	2.03	1.14
Clouds and precipitation	4.23	1.08	2.17	1.13
Air masses and fronts	4.23	1.14	2.04	1.15
Storms	4.23	1.09	2.09	1.14
Weather prediction	4.05	1.26	1.88	1.04
Definition of climate	3.96	1.24	2.45	1.29
Global climate change	4.07	1.21	2.56	1.28
Ocean currents	3.60	1.47	2.22	1.19
Properties of ocean water	3.30	1.51	2.20	1.15
Topography of the ocean floor	3.57	1.41	2.29	1.20
Tides	3.63	1.30	2.25	1.16
Waves	3.43	1.46	2.27	1.17
Sea level changes	3.31	1.43	2.28	1.16
Constellations	3.42	1.42	1.91	1.17
Timekeeping	3.41	1.40	2.29	1.29
Historical astronomy	3.44	1.39	2.01	1.18
Gravity and motion	4.13	1.17	2.70	1.40
The Sun-Earth-Moon system	4.51	0.96	2.78	1.44
Origin of our solar system	4.28	1.08	2.05	1.26
Motions of the planets	4.22	1.12	2.44	1.36
Kepler's laws	3.88	1.30	2.26	1.38
Earth's moon	4.34	1.12	2.35	1.31
The terrestrial planets	4.13	1.14	2.09	1.24
The gas planets	4.07	1.16	2.02	1.21
Comets, asteroids, meteors, and other minor bodies	3.98	1.18	1.93	1.18
The Sun and its energy	4.43	1.01	2.44	1.36
The Milky Way and other galaxies	3.76	1.26	2.02	1.18
Birth and evolution of stars	4.07	1.25	1.93	1.24
Life outside our solar system	2.97	1.46	1.61	1.00
Formation and structure of the universe	3.82	1.33	1.91	1.22
MEAN	**3.92**		**2.37**	

Note:
MS = Middle school/junior high school teachers
HS = High school teachers
PS = Postsecondary teachers (no remedial-course teachers)
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table B.8
Statistical Details for Secondary/Postsecondary Physics Topics and Skills

Content topic	HS mean rating	SD	PS mean rating	SD
Units of measurement	4.79	0.52	4.17	1.07
Metric system	4.73	0.60	4.01	1.11
Vectors	4.64	0.70	2.96	1.41
Distance, displacement, speed, velocity, acceleration in one and two dimensions	4.89	0.36	3.37	1.29
Position-time graphs and velocity-time graphs	4.58	0.75	3.13	1.33
Newton's laws of motion	4.91	0.33	3.01	1.37
Static equilibrium	4.31	0.97	2.37	1.19
Momentum and conservation of momentum	4.64	0.67	2.58	1.33
Kinetic energy and potential energy	4.78	0.50	2.78	1.35
Conservation of mechanical energy	4.70	0.61	2.72	1.35
Elastic and inelastic collisions	4.22	0.97	2.09	1.13
Law of gravitation	4.35	0.95	2.68	1.33
Free fall motion and motion on an inclined plane	4.67	0.61	2.64	1.29
Projectile motion	4.59	0.67	2.46	1.22
Uniform circular motion: centripetal acceleration	4.27	0.98	2.45	1.24
Simple harmonic motion—springs and pendulums	4.02	1.11	2.07	1.14
Work and the work-energy theorem	4.53	0.80	2.32	1.35
Torque and rotational motion	3.66	1.32	2.01	1.15
Temperature scales	3.59	1.43	3.38	1.35
Specific heat and calorimetry	3.55	1.44	2.20	1.22
Heat transfer: conduction, convection, radiation, insulation	3.49	1.38	2.38	1.25
Latent heat and phases of matter: solid, liquid, gas	3.46	1.42	2.24	1.27
Ideal gas law	3.16	1.46	2.43	1.31
Kinetic theory of gases	3.27	1.45	2.05	1.18
Laws of thermodynamics	3.57	1.43	2.00	1.18
Heat engines	3.08	1.41	1.61	0.90
Production of waves: acceleration of charges and vibration	4.00	1.19	2.18	1.20
Properties of waves: wavelength, frequency, speed, amplitude	4.47	0.92	3.08	1.44
Electromagnetic spectrum	4.13	1.09	2.96	1.36
Interaction of light with matter: reflection, refraction, absorption, emission	4.21	1.06	2.66	1.35
Doppler effect	3.90	1.10	2.32	1.26
Diffraction and interference	3.81	1.12	2.15	1.24
Images formed by mirrors and/or lenses	3.91	1.18	2.41	1.29
Optical instruments: microscopes and/or telescopes	3.05	1.29	2.17	1.21
Lasers and holography	2.69	1.31	1.54	0.85
Electrostatics: Coulomb's law	4.12	1.21	2.53	1.44
Electric field	3.93	1.21	2.27	1.37
Electric potential and potential difference	4.13	1.15	2.23	1.34
Current, resistance, voltage; Ohm's law	4.38	1.04	2.53	1.46
Conductivity: conductors and insulators	3.99	1.12	2.29	1.34
Capacitance and capacitors	3.31	1.39	1.92	1.22
DC circuits	4.09	1.15	2.26	1.33
AC circuits	3.25	1.44	1.78	1.10
Electrical energy and power	4.00	1.15	2.21	1.30
Magnetism and magnetic effects of current	3.69	1.32	2.30	1.28
Electromagnetic induction	3.42	1.35	1.93	1.22
Atomic structure: protons, neutrons, electrons	3.56	1.50	3.56	1.38
Density	3.55	1.36	3.52	1.35
Deformation of solids	2.59	1.39	1.72	0.95
Fluid behavior: hydrostatics and/or hydrodynamics	2.88	1.44	1.82	0.99
Nuclear decay: radioactivity	2.98	1.50	2.10	1.17
Nuclear reactions: fission and/or fusion	3.00	1.49	2.07	1.22
Wave-particle duality	3.26	1.40	1.94	1.26
Uncertainty principle	2.70	1.35	1.76	1.13
Quantum physics: atomic spectra	2.77	1.47	2.05	1.23
Pauli exclusion principle and the periodic table	2.48	1.36	1.92	1.23
Relativity (general and/or special)	2.94	1.43	1.71	1.04
MEAN	**3.82**		**2.42**	

Note:
HS = High school teachers
PS = Postsecondary teachers (no remedial-course teachers)
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

English Test Specifications

Table C.1 summarizes the specifications for the EXPLORE, PLAN, and ACT English Tests by showing the number (and proportion) of test questions in each test.

Several features of this coordinated set of English testing programs can be seen in this summary of test specifications. First, as the tests assess higher levels along the content continua, the emphasis of the assessment shifts from usage/mechanics skills like punctuation to more complex, global skills related to strategy, organization, and style. Also, as the target grade level of the testing program increases, so do the number of questions, the number of passages, and the length of the passages. These shifts reflect the expected change in level of sophistication of the examinee population.

The multiple-choice test questions derive from a domain of specific language components that educators agree are important to clear communication. The language components are not tested in isolation, but rather within the context of a passage; their listing here is not meant to be a prescription for language arts education, but merely a means of describing the kinds of writing abilities indirectly measured by the tests.

Table C. 1
English Test Specifications

	Testing program		
Content area	**EXPLORE**	**PLAN**	**ACT**
Punctuation	6 (.15)	7 (.14)	10 (.13)
Grammar and Usage	8 (.20)	9 (.18)	12 (.16)
Sentence Structure	11 (.28)	14 (.28)	18 (.24)
Strategy	5 (.12)	6 (.12)	12 (.16)
Organization	5 (.12)	7 (.14)	11 (.15)
Style	5 (.12)	7 (.14)	12 (.16)
Total	**40**	**50**	**75**
Passages	4	4	5
Passage Length	300 words	300 words	325 words

English Language Continuum Content Descriptions

Punctuation. The items in this category test the examinee's understanding of the conventions of internal and end-of-sentence punctuation, with emphasis on the capabilities of punctuation to remove ambiguity and clarify meaning.

Punctuating breaks in thought
- End of a sentence (period, exclamation point, question mark)
- Between clauses of compound sentences when conjunction is omitted or when clauses contain commas
- Before a conjunctive adverb joining clauses of a compound sentence
- Parenthetical elements (comma, dash, parentheses)

Punctuating relationships and sequences
- Avoiding ambiguity
- Indicating possessives
- Indicating items or simple phrases in a series
- Indicating restrictive/essential or nonrestrictive/nonessential elements (e.g., participial phrases, subordinate clauses, appositives)

Avoiding unnecessary punctuation
- Between subject and predicate
- Between verb and object
- Between adjective and noun (modifier and modified element)
- Between noun and preposition
- Between preposition and object
- Between two coordinate elements or correlatives
- Within series already linked by conjunctions
- Between intensive and antecedent

Grammar and Usage. The items in this category test the examinee's understanding of agreement between subject and verb, between pronoun and antecedent, and between modifiers and the words modified; formation of verb tenses; pronoun case; formation of comparative and superlative adjectives and adverbs; and idiomatic usage.

Assuring grammatical agreement
- Predicate with subjects of varying complexity (including compound subjects, collective nouns, sentences beginning with *there* or *where*)
- Pronoun with antecedent (only when the relationship is clear)
- Adjectives and adverbs with their corresponding nouns and verbs

Forming verbs
- Tenses of regular and irregular verbs
- Compound tenses

Using pronouns
- Using the proper form of the possessives and distinguishing them from adverbs (*there*) and contractions (*it's* and *who's*)
- Using the appropriate case of a pronoun

Forming modifiers
- Forming comparatives and superlatives of adjectives and adverbs
- Using the appropriate comparative or superlative form depending on the context

Observing usage conventions
- Using the idioms of standard written English

Sentence Structure. The items in this category test the examinee's understanding of relationships between and among clauses, management and placement of modifiers, and shifts in construction.

Relating clauses
- Avoiding faulty subordination, coordination, and parallelism
- Avoiding run-on and fused sentences
- Avoiding comma splices
- Avoiding sentence fragments (except those required in dialogue or otherwise defensible as rhetorically appropriate in their context)

Using modifiers
- Constructing sentences so that antecedents are clear and unambiguous (avoiding squinters and danglers)
- Placing modifiers so that they modify the appropriate element

Avoiding unnecessary or inappropriate shifts in construction
- Person or number of pronoun
- Voice of verb
- Tense of verb
- Mood of verb

Strategy. The items in this category test the examinee's understanding of the appropriateness of expression in relation to audience and purpose; judgment in adding, revising, or deleting supporting material (e.g., the strengthening of compositions with appropriate supporting material); and judgment of the relevancy of statements in context. These items focus on the processes of writing: the choices made and strategies employed by a writer in the act of composing or revising.

Making decisions about the appropriateness of expression for audience and purpose

Making decisions about adding, revising, or deleting supporting material

Judging relevancy
- Omitting irrelevant material (or retaining relevant material)

Organization. The items in this category test the examinee's understanding of the organization of ideas and judgment in choosing effective opening, transitional, and closing sentences.

Establishing logical order
- Choosing the appropriate conjunctive adverb or transitional expression
- Placing sentences in a logical location
- Ordering sentences in a logical sequence (orderly movement within paragraphs)
- Ordering a series of phrases in a logical way
- Beginning a paragraph in the appropriate place
- Ordering paragraphs in a logical sequence

Making decisions about cohesion devices: openings, transitions, and closings
- Selecting an effective statement relative to the essay as a whole
- Selecting an effective statement relative to a specific paragraph or paragraphs

Style. The items in this category test the examinee's understanding of rhetorically effective management of sentence elements, clarity of pronoun references, economy in writing, and precision and appropriateness of words and images.

Managing sentence elements effectively
- Rhetorically effective and logical subordination, coordination, and parallelism
- Avoiding ambiguity of pronoun reference (only when the relationship is problematic)

Editing and revising effectively
- Avoiding clearly excessive or inappropriate wordiness
- Avoiding redundancy

Choosing words to fit meaning and function
- Maintaining the level of style and tone
- Choosing words and images that are specific, precise, and clear in terms of their context and connotation; recognizing and avoiding mixed metaphors and awkward or nonsensical expressions

No single test form is expected to assess the student's understanding of all of these areas. Rather, the content of the test is sampled from the domain described above and is measured in the context of the passages. Also, the tests do not assess memorized rules of grammar. The emphasis is on the application of sound writing practices to the revising and editing of prose that is typical of that encountered in school and in life in general.

Writing Test Specifications

The ACT Writing Test was introduced nationally as an optional component to the ACT in February 2005. It is an achievement test designed to measure students' writing proficiency and to complement the information currently provided by the ACT English Test. Students have 30 minutes to write on a single writing prompt. The prompt provides a rhetorical situation—an issue or a problem with two alternative positions or solutions. The examinees are asked to develop and support, through their writing, one of those positions or solutions or to propose a third alternative. The features embedded in the 6-point holistic scoring rubric are based on a set of descriptors of what students should be able to do in order to succeed in first-year college writing courses. (See Figure C.1.) Each essay is scored by two readers. The sum of the readers' scores is reported as the essay's score, on the score range 2–12.

Figure C.1
ACT Writing Test Descriptors (What Students Should Be Able to Do)

1. Show the ability to make and articulate judgments by
   - taking a position on an issue or problem.
   - demonstrating the ability to grasp the complexity of issues or problems by considering implications or complications.
2. Sustain a position by focusing on the topic throughout the writing.
3. Develop a position by
   - presenting support or evidence using specific details.
   - using logical reasoning that shows the writer's ability to distinguish between assertions and evidence and to make inferences based on support or evidence.
4. Organize and present ideas in a logical way by
   - logically grouping and sequencing ideas.
   - using transitional devices to identify logical connections and tie ideas together.
5. Communicate clearly by using language effectively and by observing the conventions of standard written English.

Mathematics Test Specifications

The content areas for the EXPLORE, PLAN, and ACT Mathematics Tests are summarized in Table C.2. Included in this table is the number (and proportion) of questions in each content area. As can be seen from the table, there is a clear progression in the content coverage of the tests from the 8th- to the 10th- to the 12th-grade-level programs.

Several points need to be made about the labeling of the content areas, especially at the 8th-grade level. At Grade 8, consistent with the National Council of Teachers of Mathematics (NCTM) Standards, "Basic Statistical/ Probability Concepts" does not refer to the content of a formal statistics course, but to the ability to process data. Similarly, 8th-grade "Pre-Geometry" deals with use of figures and diagrams to solve mathematical problems. At levels higher than Grade 8, content definitions are consistent with standard course titles in high school.

The cognitive levels assessed by the Mathematics Tests are summarized in Table C.3. The numbers (and proportions) of questions at each cognitive level are reported in this table. Although at first sight the increase in the proportion of "Knowledge and Skills" questions, and the decline in the proportion of "Understanding Concepts/Integrating Conceptual Understanding" questions, with increasing grade level may seem surprising, it must be remembered that at the higher grade levels the content areas are more challenging.

Table C.2
Mathematics Test Specifications

	Testing program		
Content area	**EXPLORE**	**PLAN**	**ACT**
Basic Statistical/Probability Concepts	4 (.13)	*	*
Pre-Algebra	10 (.33)	14 (.35)	14 (.23)
Elementary Algebra	9 (.30)	8 (.20)	10 (.17)
Pre-Geometry	7 (.23)		
Plane Geometry		11 (.27)	14 (.23)
Coordinate Geometry		7 (.18)	9 (.15)
Intermediate Algebra			9 (.15)
Trigonometry			4 (.07)
Total	**30**	**40**	**60**

*On PLAN and the ACT, questions involving statistics/probability are included in the Pre-Algebra category.

Table C.3
Cognitive Specifications for the Mathematics Tests

	Testing program		
Cognitive level	**EXPLORE**	**PLAN**	**ACT**
Knowledge and Skills	8 (.267)	14 (.350)	30 (.500)
Direct Application	8 (.267)	12 (.300)	17 (.283)
Understanding Concepts/Integrating Conceptual Understanding	14 (.467)	14 (.350)	13 (.217)
Total	**30**	**40**	**60**

Mathematics Test forms are produced by sampling from the domains, rather than by testing every specific skill on every form. Students are advised to prepare for these tests by obtaining a thorough grounding in the full content domain rather than by trying to guess the specific content that will appear on a test form. Each form is a unique sample from the broad content domain; no particular topic in the content areas is guaranteed to appear on a given test form.

Mathematics Continuum Content and Cognitive Level Descriptions

Cognitive Levels

Knowledge and skills. Questions at this level require the student to use one or more facts, definitions, formulas, or procedures to solve problems that are presented in purely mathematical terms.

Direct application. Questions at this level require the student to use one or more facts, definitions, formulas, or procedures to solve straightforward problems set in real-world situations.

Understanding concepts. Questions at this level test the student's depth of understanding of major concepts by requiring reasoning from a concept to reach an inference or a conclusion.

Integrating conceptual understanding. Questions at this level test the student's ability to achieve an integrated understanding of two or more major concepts so as to solve nonroutine problems.

Content Areas

Basic Statistical/Probability Concepts. Questions in this content area (which is treated explicitly in EXPLORE, and implicitly as part of the Pre-Algebra content area in PLAN and the ACT) involve elementary counting and rudimentary probability; data collection, representation, and interpretation; reading and relating graphs, charts, and other representations of data; and other appropriate topics. All of these topics are addressed at a level preceding formal statistics. Questions in this content area cover the following topics:

- Counting and counting techniques
- The concept of probability
- Mean, median, and mode
- Data collection and representation
- Reading and interpreting graphs, charts, and other representations of data

Pre-Algebra. Questions in this content area are based (as appropriate for the grade levels across EXPLORE, PLAN, and the ACT) on basic operations using whole numbers, decimals, fractions, and integers; place value; square roots and approximations; the concept of exponents; scientific notation; factors; ratio, proportion, and percent; linear equations in one variable; absolute value and ordering numbers by value; elementary counting techniques and simple probability; data collection, representation, and interpretation; and understanding simple descriptive statistics. Questions in pre-algebra cover the following topics:

- Addition, subtraction, multiplication, and division of whole numbers, decimals, fractions, and integers
- Positive integer exponents
- Prime factorization
- Comparison of fractions
- Ratio and proportion
- Conversion of fractions to decimals, and conversion of decimals to fractions
- Absolute value
- Solution of linear equations in one variable (This is an Elementary Algebra topic for EXPLORE.)
- Percent
- Scientific notation
- Square roots and irrational numbers
- Operations with real numbers (field axioms)
- Order properties for real numbers
- Common factors and common multiples

Elementary Algebra. Questions in this content area are based (as appropriate for the grade levels across EXPLORE, PLAN, and the ACT) on properties of exponents and square roots, evaluation of algebraic expressions through substitution, using variables to express functional relationships, understanding algebraic operations, and the solution of quadratic equations by factoring. Questions in elementary algebra cover the following topics:

- Evaluation of algebraic expressions by substitution
- Simplification of algebraic expressions
- Addition, subtraction, and multiplication of polynomials
- Factorization of polynomials
- Solution of quadratic equations by factoring
- Formula manipulation and field properties of algebraic expressions

Pre-Geometry. Questions in this category (which applies to EXPLORE only) involve the use of scales and measurement systems, plane and solid geometric figures and associated relationships and concepts, the concept of angles and their measures, parallelism, relationships of triangles, properties of a circle, the Pythagorean theorem, and other appropriate topics. All of these topics are addressed at a level preceding formal geometry. Questions in pre-geometry cover the following topics:

- Using measurement systems
- Using rulers and other scales
- Concepts and relationships for plane and solid geometric figures
- Calculation of perimeter, area, and volume with formulas for selected geometric figures
- The concept of angle and angle measure
- Parallelism
- Properties of triangles
- Properties of circles
- Pythagorean theorem

Plane Geometry. Questions in this content area are based (as appropriate for the grade levels across PLAN and the ACT) on the properties and relations of plane figures, including angles and relations among perpendicular and parallel lines; properties of circles, triangles, rectangles, parallelograms, and trapezoids; transformations; the concept of proof and proof techniques; volume; and applications of geometry to three dimensions. Items in plane geometry cover the following topics:

- Identification of plane geometric figures
- Basic properties of a circle: radius, diameter, and circumference
- Measurement and construction of right, acute, and obtuse angles
- Parallel lines and transversals
- Congruent and similar triangles
- Areas of circles, triangles, rectangles, parallelograms, trapezoids, and, with formulas, other figures
- Pythagorean theorem
- Lines, segments, and rays
- Perpendicular lines
- Properties of triangles
- Ratio of sides in 45°-45°-90° triangles and 30°-60°-90° triangles
- Circumference and arc length

Coordinate Geometry. Questions in this content area are based (as appropriate for the grade levels across PLAN and the ACT) on graphing and the relations between equations and graphs, including points, lines, polynomials, circles, and other curves; graphing inequalities; slope; parallel and perpendicular lines; distance; midpoints; and conics. Questions in coordinate geometry cover the following topics:

- Graphing on the number line
- Identification and location of points in the coordinate plane
- Determination of graphs of functions and relations in the plane by plotting points
- Graphs of linear equations in two variables
- Slope of a line
- Distance formula for points in the plane

Intermediate Algebra. Questions in this content area (which applies to the ACT only) are based on an understanding of the quadratic formula, rational and radical expressions, absolute value equations and inequalities, sequences and patterns, systems of equations, quadratic inequalities, functions, modeling, matrices, roots of polynomials, and complex numbers. Questions in intermediate algebra cover the following topics:

- Solution of linear inequalities in one variable
- Operations with integer exponents
- Operations with rational expressions
- Slope-intercept form of a linear equation
- Operations with radical expressions
- Quadratic formula
- Graphs of parabolas, circles, ellipses, and hyperbolas
- Zeros of polynomials
- Rational exponents
- Equations of circles
- Solution of systems of two linear equations in two variables
- Simple absolute value equations and inequalities
- Graphical solutions to systems of equations and/or inequalities
- Equations of parallel and perpendicular lines

Trigonometry. Questions in this content area (which applies to the ACT only) are based on understanding trigonometric relations in right triangles; values and properties of trigonometric functions; graphing trigonometric functions; modeling using trigonometric functions; use of trigonometric identities; and solving trigonometric equations. Questions in trigonometry cover the following topics:

- Right triangle trigonometry
- Trigonometric functions
- Graphs of trigonometric functions, including amplitude, period, and phase shift
- Trigonometric identities
- Addition formulas for sine and cosine
- Simple trigonometric equations

Reading Test Specifications

The text content areas, number of passages, passage lengths, and number (and proportion) of items for the EXPLORE, PLAN, and ACT Reading Tests are summarized in Table C.4.

Table C.4
Reading Test Specifications

	Testing program		
Content area	**EXPLORE**	**PLAN**	**ACT**
Prose Fiction	10 (.33)	8 (.32)	10 (.25)
Humanities	10 (.33)	9 (.36)	10 (.25)
Social Sciences	10 (.33)	8 (.32)	10 (.25)
Natural Sciences			10 (.25)
Total	**30**	**25**	**40**
Passages	3	3	4
Passage Length	500 words	500 words	750 words

Reading Continuum Content and Cognitive Level Descriptions

Cognitive Levels

Questions in the Reading Tests are classified in the general categories of Referring and Reasoning.

Referring. The questions in this category ask about material explicitly stated in a passage. These questions are designed to measure literal reading comprehension. A question is classified in the Referring category if the information required to answer it is directly given in the passage text. In such questions, there are usually relationships between the language of the passage and that of the question, and the answer to the question is typically evident in a single sentence, or two adjacent sentences, in the passage. Some Referring questions paraphrase the language of the passage.

Main ideas
- Recognizing the main idea of a passage
- Recognizing the main idea of a paragraph or paragraphs

Significant details
- Recognizing the information in a written passage that answers the questions who, what, where, when, why, and how

Relationships
- Recognizing sequences
- Recognizing cause-effect relationships
- Recognizing comparative relationships (comparisons and contrasts)

Reasoning. The questions in this category ask about meaning implicit in a passage and require cogent reasoning about a passage. These questions are designed to measure "meaning making" by logical inference, analysis, and synthesis. A question is classified in the Reasoning category if it requires inferring or applying a logical process to elicit an answer from the passage, or if it demands that the examinee combine many statements in the passage or interpret entire sections of the text.

Inferences from the text
- Inferring the main idea or purpose of a passage
- Inferring the main idea or purpose of a paragraph or paragraphs
- Showing how details are related to the main idea (e.g., how they support the main idea)
- Inferring sequences
- Inferring cause-effect relationships

Critical understanding of the text
- Drawing conclusions from information given
- Making comparisons and contrasts using stated information
- Making appropriate generalizations
- Recognizing logical fallacies, rhetorical flaws, or limitations in texts
- Recognizing stereotypes
- Understanding point of view
- Distinguishing between fact and opinion

Vocabulary
- Determining specific meanings of words or short phrases within the context of a passage

Content Areas

The content of the Reading Tests ranges widely among topics under the content areas named in Table C.4. As is true of the other content domains, the stimulus material for the Reading Tests becomes more challenging with the increase in the grade level being assessed; as Table C.4 shows, at the 8th-/9th- and 10th-grade levels, three content areas are used to assess reading skill (prose fiction, humanities, and social sciences). At the 11th-/12th-grade level, natural sciences text material is added.

Prose fiction. The questions in this area are based on intact short stories or passages from short stories or novels.

Humanities. The questions in this area are based on passages from memoirs, personal essays, and essays on architecture, art, dance, ethics, film, language, literary criticism, music, philosophy, radio, television, or theater. Passages describe or analyze works of art, ideas, or values.

Social sciences. The questions in this area are based on passages in anthropology, archaeology, biography, business, economics, education, geography, history, political science, psychology, or sociology. Passages typically present information gathered by research into written records or survey sampling rather than data gained by scientific experimentation.

Natural sciences. The questions in this area are based on passages in anatomy, astronomy, biology, botany, chemistry, ecology, geology, medicine, meteorology, microbiology, natural history, physiology, physics, technology, or zoology. Passages present a science topic with a lucid explanation of its significance.

Question Ordering

Reading Test questions are arranged according to a protocol that places more general questions ahead of more specific questions and that places questions about portions of the passage in the order in which those portions appear in the passage. ACT adopted this protocol, with the approval of reading consultants from outside ACT and after careful consideration of the measurement issues involved, to provide examinees with as natural and logical a sequence of items as possible.

Science Test Specifications

The EPAS Science Tests measure the student's interpretation, analysis, evaluation, reasoning, and problem-solving skills required in the natural sciences. A test for a given program is made up of five to seven test units, each of which consists of some scientific information (the stimulus) and a set of multiple-choice test items. Knowledge acquired in grade-level-appropriate science courses is needed to answer some of the questions. The tests emphasize scientific reasoning skills over recall of science content, skill in mathematics, or reading ability. The use of calculators is not permitted on the Science Tests. Table C.5 summarizes the test specifications for the EXPLORE, PLAN, and ACT Science Tests. Under the "Format" heading are the numbers (and proportions) of test questions associated with each of the three types of presentations used in the three tests. Under the "Cognitive Level" heading are the distributions of questions assessing the three cognitive levels. Finally, under the "Subject Matter" heading are the distributions of test questions by content domain being assessed. The terms used in the tables are defined in the next section.

Table C.5
Science Test Specifications

	Testing program		
Format	**EXPLORE**	**PLAN**	**ACT**
Data Representation	12 (.43)	10 (.33)	15 (.38)
Research Summaries	10 (.36)	14 (.47)	18 (.45)
Conflicting Viewpoints	6 (.21)	6 (.20)	7 (.17)
Total	**28**	**30**	**40**
Cognitive level			
Understanding	12 (.43)	9 (.30)	7 (.18)
Analysis	10 (.36)	13 (.43)	20 (.50)
Generalization	6 (.21)	8 (.27)	13 (.32)
Total	**28**	**30**	**40**
Subject matter			
Life Science	3		
Physical Science	2		
Earth/Space Science	1	1–2*	1–2*
Biology		1–2*	1–2*
Chemistry		1–2*	1–2*
Physics		1–2*	1–2*
Total	**6**	**5**	**7**

*At least one topic is required in this content area, and some test forms may have two topics. No more than two topics in a particular content area are allowed.

The following section provides detailed descriptions of the materials used in the EPAS Science Tests. These descriptions are presented in the order in which the information was summarized in Table C.5: first the formats for the stimulus material, then the definitions of the cognitive levels being assessed, and finally lists of the content included in the fields of science covered at each test level.

Science Continuum Stimulus Material, Cognitive Level, and Content Area Descriptions

Stimulus Material

Each stimulus used in the Science Tests as the basis for the test questions follows one of three formats. These formats are very specific in their intent and style, each being used to tap a specific subset of scientific reasoning skills.

Data representation format. The data representation format is intended to test the examinee's ability to understand, evaluate, and interpret information presented in a graphic or tabular format. The information may consist of any type of data that can be presented with minimal explanation. Examples include the results of simple experiments, observations, summarized data, figures, or flowcharts.

Research summaries format. The research summaries format is intended to evaluate an examinee's abilities to comprehend, evaluate, analyze, and interpret the design of experiments. In particular, the skills to be assessed using this format include the following:

- The understanding of the premise of the experiment (observation, confirmation, or hypothesis testing)
- The relationship of the design to the premise
- The understanding of control groups
- Variations in experimental designs
- Weaknesses of the experiment due to assumptions or limitations embedded in the design

Almost anything that relates to how scientists view experiments is a valid topic in this type of format. However, since the data representation format covers the aspects of interpretation of data, the tabular or graphic presentation of the experiments alone is not a major point of consideration. The simulated research studies are of sufficient complexity to allow significant comparisons of results. Often, a number of linked, related experiments are presented that build on each other and provide an extended simulation of several research studies.

Conflicting viewpoints format. The conflicting viewpoints format is intended to test the examinee's ability to evaluate two or more alternative theories, hypotheses, or viewpoints on a specific, observable phenomenon. This phenomenon may be a simple observation or a more complex process. The alternative viewpoints disagree in some clear fashion that is plausible, but they need not necessarily be based on a contemporary scientific controversy. The main restriction is that they be logical and complete. The alternative viewpoints are based on realistic assumptions and have logical conclusions.

Cognitive Levels

The questions in the Science Tests are classified according to three primary cognitive levels: understanding, analysis, and generalization. Within each of the three major cognitive classifications there are a number of subclassifications. These are presented to clarify the types of test questions that are within the major categories, but they are not meant to provide an exhaustive list. Some of the subclassifications do not apply to some of the stimulus formats. For example, a classification referring to experimental design is not appropriate for a data representation format. The stimulus formats that support questions with each subclassification are coded at the end of each description using DR for data representation, RS for research summaries, and CV for conflicting viewpoints.

Understanding. Understanding questions test students' ability to comprehend the information presented and, to a limited extent, their understanding of how it fits into the general scheme of the particular stimulus format. Examples of this ability include comprehending how the information in a bar graph is organized, understanding the control group's function in an experiment, and identifying unstated assumptions and the concept that serves as the basis for a particular theory. A question in the understanding classification does not merely ask the student to understand what is written, but to understand how that information is related to other parts of the material provided in the stimulus. An understanding question specifically deals with only a small part of the material in the stimulus, such as a single data point, graph axis, hypothesis, or experimental step.

Understanding—The ability to:

- Explain, describe, identify, or compare the basic features of, and concepts related to, the provided information. (DR, RS, CV)
- Explain, describe, identify, or compare the components of the experimental design or process. (RS)
- Explain, describe, identify or compare the basic features or data points in graphs, charts, or tables. (DR)
- Explain, describe, or identify basic scientific concepts or assumptions underlying the provided information. (DR, RS, CV)
- Select the appropriate translation of the provided information into a graph, figure, or diagram. (DR, RS, CV)

Analysis. Analysis questions should go beyond the level of understanding questions in testing the student's ability to relate a number of components of the presented material to each other on a higher, more abstract level. Examples of this question type include relating hypotheses to experimental design or data, and evaluating how a viewpoint is related to another viewpoint or to an observable phenomenon. Essentially, the student is required to exhibit the ability to see how each piece of information in the presentation fits in with the rest of the stimulus and what importance each piece has in reference to the topic. Often, an analysis question will prompt a student to carefully pick apart the details presented and piece them back together to get an overall view of the presented topic. An analysis question typically deals with a major portion of the presented information, such as a graphed relationship, one or more experiments, or one or more viewpoints. An analysis question does not extend beyond the scope of the presented material.

Analysis—The ability to:

- Critically examine the relationships between the information provided and the conclusions drawn or the hypotheses developed. (DR, RS, CV)
- Determine whether information or results support or are consistent with a point of view, hypothesis, or conclusion. (DR, RS, CV)
- Determine whether a hypothesis or conclusion supports or is consistent with a point of view, the results of a single experiment, or the information presented in a single graph or table. (DR, RS, CV)
- Evaluate experimental procedures, viewpoints, or theories for their strengths, weaknesses, similarities, or differences. (RS, CV)
- Specify alternative ways of testing the point of view or hypothesis, or specify alternative ways of producing the same results. (RS, CV)

Generalization. Generalization questions test the student's ability to see how the stimulus material relates to the rest of the world. A generalization question may ask for a general model of a scientific concept that is embedded in the presented data (for example, deduce a gas law from a set of data), how the results of an experiment could be used to assist someone in resolving a problem in the real world, or how a theory could be modified to account for some new, unforeseen data or phenomena. While generalization questions may not always be the most difficult for a student, they are intended to demand that the student assimilate all of the material presented and extend discovered concepts to new situations.

Generalization—The ability to:

- Generalize from given information to gain new information, generate a model, or make predictions. (DR, RS, CV)
- Extend concepts, procedures, or hypotheses to new situations to gain new information. (RS, CV)
- Generalize beyond the given information to a broader context, or generate a model consistent with the provided information. (DR, RS, CV)
- Predict outcomes on the basis of the provided information. (DR, RS, CV)

Content Areas

The content areas used to assess Science skills parallel the content courses commonly taught at Grades 7–12, and at the entry level at colleges and universities. Each test activity uses stimulus materials from one of these areas. Materials are produced specifically for the Science Tests. They are required to match the level of complexity of those used in the classroom. Often, students are confronted with a new situation to engage their reasoning skills.

The topics included in each content area are summarized below.

Life Science. The stimulus materials and questions in this content area cover such topics as biology, botany, ecology, health, human behavior, and zoology.

Physical Science. The stimulus materials and questions in this content area cover such topics as simple chemical formulas and equations and other basic chemistry, weights and measures, and basic principles of physics.

Earth/Space Science. The stimulus materials and questions in this content area cover such topics as geology, meteorology, astronomy, environmental science, and oceanography.

Biology. The stimulus materials and questions in this content area cover such topics as cell biology, botany, zoology, microbiology, ecology, genetics, and evolution.

Chemistry. The stimulus materials and questions in this content area cover such topics as atomic theory, inorganic chemical reactions, chemical bonding, reaction rates, solutions, equilibriums, gas laws, electrochemistry, and properties and states of matter.

Physics. The stimulus materials and questions in this content area cover such topics as mechanics, energy, thermodynamics, electromagnetism, fluids, solids, and light waves.

State Standards as Preparation for the Next Level of Learning

Middle School/Junior High School

How well do you think your state's standards prepare students for high school-level work in your content area?

	Very poorly %	Poorly %	Well %	Very well %
Writing	3	8	60	29
Reading	2	5	65	29
Math	1	8	67	24
Science	1	12	68	19

High School

How well do you think your state's standards prepare students for college-level work in your content area?

	Very poorly %	Poorly %	Well %	Very well %
Writing	3	20	60	16
Reading	3	25	57	15
Math	4	17	64	15
Biology	4	20	63	13
Chemistry	7	34	51	9
Earth Science	4	20	65	12
Physics	7	33	54	7
All Science Combined	5	27	57	10

Postsecondary

How well do you think your state's standards prepare students for college-level work in your content area?

	Very poorly %	Poorly %	Well %	Very well %
Writing	13	55	29	4
Reading	11	52	33	3
Math	11	47	38	4
Biology	17	47	31	5
Chemistry	13	57	27	3
Earth Science	20	52	26	2
Physics	17	49	32	1
All Science Combined	17	52	29	3

Student Preparation for College Today Versus in the Past 5–10 Years

High School

How prepared for college-level work are today's graduating seniors compared with graduating seniors in the past 5–10 years?

	No change %	Better prepared %	Not as well prepared %
Writing	23	35	42
Reading	23	30	48
Math	21	35	45
Biology	24	37	39
Chemistry	28	30	42
Earth Science	28	30	42
Physics	35	25	39
All Science Combined	29	30	40

Postsecondary

How prepared for college-level work are today's incoming freshmen compared with the freshmen in the past 5–10 years?

	No change %	Better prepared %	Not as well prepared %
Writing	51	22	26
Reading	34	22	45
Math	60	9	31
Biology	56	13	31
Chemistry	57	9	34
Earth Science	52	10	38
Physics	46	12	42
All Science Combined	53	11	36

Table F.1

Content Topics "Taught" Percentage
English/Writing

	MS % taught	HS % taught
Composition Process and Purpose		
Prewriting, brainstorming, or other techniques of invention	93	73
Mapping, clustering, outlining, or other organizational tools	92	68
Selecting a topic	88	81
Formulating a thesis	78	91
Analyzing an issue or problem	75	85
Gathering and synthesizing resources	72	78
Evaluating source materials critically	58	74
Citing sources accurately	70	80
Avoiding plagiarism	86	86
Collaborating with peers on reviews of drafts	85	75
Editing and proofreading	95	87
Revising for content rather than for grammar and mechanics	90	86
Developing one's own voice as a writer	78	72
Other writing process skill (Please specify.)	69	77
Writing to ...		
explore ideas	77	73
express one's feelings	88	59
tell a story through fiction or nonfiction	81	46
analyze literature or media	77	85
convey information	92	86
argue or persuade readers	83	82
express an opinion or take a position on an issue	86	87
describe a process or how to do something	61	36
present research	66	72
writing purpose (Please specify.)	55	74
Topic and Idea Development		
Establishing and adjusting the focus of a paper for audience and purpose	80	78
Determining the appropriateness of expression for audience and purpose	75	74
Providing appropriate context or background information for readers	75	72
Moving between general statements and specific reasons, examples, and details	90	86
Differentiating between assertions and evidence	36	61
Supporting claims with multiple sources of evidence	52	80
Using personal experience to support claims	77	62
Adding, revising, and deleting supporting details to improve the effectiveness of a piece of writing	90	87
Determining the relevancy of material to topic and purpose	75	75
Taking and maintaining a position on an issue	69	74
Fairly and accurately representing differing points of view on an issue	50	53
Anticipating and responding to counterarguments to a position taken on an issue	34	50
Addressing implications of a position taken on an issue or a proposed solution to a problem	28	40
Other topic and idea development skill (Please specify.)	18	60
Organization, Unity, and Coherence		
Using effective introductions and conclusions in a piece of writing	94	88
Establishing a logical progression of ideas	92	83
Logically grouping ideas into paragraphs within a piece of writing	92	78
Ordering paragraphs in a logical way within a piece of writing	90	77
Ordering sentences in a logical way within a paragraph	90	65
Using effective transitions between paragraphs	89	79
Choosing appropriate transition words and phrases within a sentences or to connect sentences within a paragraph	90	74
Other organization, unity, and coherence skill (Please specify.)	59	76
Word Choice in Terms of Style, Tone, Clarity, and Economy		
Choosing words and images that are specific, precise, and clear in terms of their context	87	77
Using varied words and images within a piece of writing	87	76
Maintaining consistency of style and tone within a piece of writing	73	73
Avoiding vague pronouns (i.e., pronouns without a clear antecedent)	74	74
Avoiding wordiness	78	75
Avoiding redundancy	80	76
Using rhetorically effective subordination, coordination, and parallelism	45	67
Other word choice skill (Please specify.)	45	67

Note:
MS = Middle school/junior high school teachers
HS = High school teachers

Table F.1

Content Topics "Taught" Percentage
English/Writing *(continued)*

	MS % taught	HS % taught
Sentence Structure and Formation		
Avoiding …		
faulty subordination, coordination, and parallelism	84	60
awkward fused sentences (i.e., comma splices, run-on sentences)	76	75
sentence fragments that are not rhetorically defensible	49	66
dangling and misplaced modifiers	81	57
inappropriate shifts of tense, voice, mood, number or person	85	74
Using a variety of sentence types (i.e., simple, compound, complex)	34	69
Other sentence structure and formation skill (Please specify.)	86	53
Conventions of Usage		
Ensuring grammatical agreement (i.e., pronoun-antecedent, subject-verb)	34	69
Forming simple and compound tenses of regular and irregular verbs	86	38
Using the proper form of possessive pronouns	72	50
Using the appropriate case of a pronoun	77	49
Forming and using modifiers	72	40
Using the idioms of standard written English	71	43
Other convention of usage (Please specify.)	68	45
Conventions of Punctuation		
Punctuating ...		
end of sentence	72	41
between clauses of compound sentences when the conjunction is omitted	77	58
before a conjunctive adverb joining clauses of a compound sentence	58	54
parenthetical elements with commas, parentheses, and dashes	62	54
essential/nonessential elements, subordinate clauses, and appositives	69	56
possessive nouns and pronouns	81	45
items in a series	76	47
Avoiding unnecessary punctuation	69	54
Using a semicolon to indicate a relationship between the closely related independent clauses	76	67
Using a colon to introduce an example or an elaboration	66	57
Other convention of punctuation (Please specify.)	54	65

Note:
MS = Middle school/junior high school teachers
HS = High school teachers

Table F.2

Content Topics "Taught" Percentage
Middle School/Junior High School Mathematics

	MS % taught before 8th	HS % taught before 9th
Performing addition, subtraction, multiplication, and division on signed rational numbers	91	99
Working with ratios and proportions	94	98
Working with percent (e.g., simple interest, tax, and markdowns)	92	98
Converting units of measure	91	96
Reading and interpreting graphs, charts, and other data representations	94	98
Representing data (e.g., circle graphs, scatterplots, and frequency distributions)	89	98
Determining a line of best-fit by eye for a set of data	42	80
Working with correlation	38	70
Finding the mean, median, and mode	94	98
Finding the variance and standard deviation of data	14	33
Working with the normal distribution	22	40
Computing the probability of a simple event	88	96
Using counting techniques	85	92
Working with Venn diagrams	80	88
Working with mutually exclusive, dependent, and independent events	55	81
Working with combinations, permutations, and the binomial theorem	29	68
Working with number properties (e.g., divisibility, even/odd, and positive/negative)	94	99
Performing operations with integer exponents	67	93
Working with rational exponents	45	71
Performing matrix addition and multiplication	17	48
Finding determinants	8	30
Working with series and sequences (e.g., arithmetic and geometric)	63	84
Working with sequences that are defined recursively	16	39
Computing the sum of an infinite geometric series	10	25
Working with sigma notation	5	13
Working with sets and set notation	29	51
Knowing the difference between rational and irrational numbers	49	89
Knowing the difference between real and complex numbers	25	48
Working with complex numbers	15	33
Evaluating algebraic expressions by substitution	67	91
Simplifying algebraic expressions	73	93
Solving linear equations and inequalities in one variable	65	92
Solving absolute value equations and inequalities	41	76
Performing operations on radical expressions/equations	22	60
Performing addition, subtraction, and multiplication of polynomials	18	70
Working with linear equations in two variables	26	74
Performing polynomial long division	7	38
Solving quadratic equations by factoring	7	52
Using the quadratic formula	8	49
Using the discriminant	6	34
Solving quadratic inequalities	6	33
Determining roots of polynomial and rational equations algebraically	5	40
Performing operations with rational expressions	21	56
Implementing remainder and factor theorems	10	23
Working with logarithmic and exponential functions	6	24
Solving systems of two linear equations in two variables algebraically	7	51
Working with equations of parabolas, circles, ellipses, and hyperbolas	7	31
Working with parametric equations	5	12
Working with transformations algebraically	14	38
Determining maxima/minima for quadratic functions	6	28
Understanding continuity	6	17
Finding the limit of an expression	5	14
Graphing on a number line	86	96
Graphing linear equations in two variables	51	83
Finding the slope of a line	46	84
Working with equations of parallel and perpendicular lines	26	72
Working with graphs of quadratic equations and functions	11	53
Solving systems of equations and inequalities graphically	15	61
Graphing parabolas, circles, ellipses, and hyperbolas	9	34
Determining a locus of points	8	19
Working with transformations graphically	29	54
Working with linear relationships	40	73

Note:
MS = Middle school/junior high school teachers
HS = High school teachers

Table F.2

Content Topics "Taught" Percentage
Middle School/Junior High School Mathematics *(continued)*

	MS % taught before 8th	HS % taught before 9th
Approximating roots of polynomial and rational equations from graphs	7	35
Recognizing relationships between a family of equations and their graphs	13	49
Working with graphs of rational functions	15	44
Finding midpoints in the plane	12	40
Finding distances in the plane	12	47
Working with discontinuous graphs	12	23
Using the Pythagorean theorem	56	90
Applying properties of right, acute, and obtuse angles	81	92
Applying properties of lines, segments, and rays	77	90
Working with parallel lines, transversals, and angle measures	68	92
Working with properties of special quadrilaterals	68	85
Working with side length relationships in 45-45-90 degree triangles and 30-60-90 degree triangles	40	64
Working with congruent and similar triangles	76	93
Working with circles (e.g., radius, diameter, arc, and chord)	79	91
Working with inscribed and circumscribed polygons and circles	27	51
Working with logic statements (e.g., converse, contrapositive, and if-then)	15	33
Finding the area of hybrid figures	54	67
Finding the volume of hybrid figures	39	60
Understanding the scale on, for example, rulers and protractors	90	94
Finding the area and perimeter of polygons and circles	93	97
Finding volume (e.g., cylinders, prisms, and pyramids)	79	94
Finding surface area	78	96
Understanding relations between a scale factor and length, area, volume	63	86
Finding the volume of a function at a given point	35	71
Understanding the concept of function	39	75
Working with functions (e.g., domain and range, composition, and inverses)	25	61
Using right triangle trigonometry	11	31
Using trigonometric identities	7	18
Solving trigonometric equations	7	17
Using the law of sines and law of cosines	6	17
Working with graphs of trigonometric functions, including amplitude, period, and phase shift	5	8
Using radian measure	5	7
Working with vectors in a plane	6	11

Note:
MS = Middle school/junior high school teachers
HS = High school teachers

Table F.3

Content Topics "Taught" Percentage
High School Mathematics

	% taught prior to Algebra I	% taught in Algebra I	% taught in Algebra II	% taught in Geometry	% taught in Trigonometry	% taught in Precalculus	HS % Not taught
Performing addition, subtraction, multiplication, and division on signed rational numbers	76	22	1	0	0	0	0
Working with ratios and proportions	70	27	1	2	0	0	0
Working with percent (e.g., simple interest, tax, and markdowns)	78	20	1	0	0	0	0
Converting units of measure	76	21	1	1	0	0	1
Reading and interpreting graphs, charts, and other data representations	68	30	1	0	0	0	0
Representing data (e.g., circle graphs, scatterplots, and frequency distributions)	49	39	8	0	0	1	2
Determining a line of best-fit by eye for a set of data	9	68	16	0	0	3	5
Working with correlation	7	45	24	2	2	6	14
Finding the mean, median, and mode	67	28	2	1	0	1	1
Finding the variance and standard deviation of data	2	12	32	2	4	15	34
Working with the normal distribution	2	12	28	1	5	14	39
Computing the probability of a simple event	41	43	9	1	0	4	3
Using counting techniques	42	27	16	1	1	6	7
Working with Venn diagrams	45	25	7	12	0	2	8
Working with mutually exclusive, dependent, and independent events	11	29	30	4	3	13	10
Working with combinations, permutations, and the binomial theorem	6	12	47	2	2	21	11
Working with number properties (e.g., divisibility, even/odd, and positive/negative)	76	21	2	0	0	0	1
Performing operations with integer exponents	29	66	5	0	0	0	0
Working with rational exponents	7	35	57	1	0	1	0
Performing matrix addition and multiplication	2	31	55	1	2	3	6
Finding determinants	0	13	72	1	1	5	7
Working with series and sequences (e.g., arithmetic and geometric)	7	18	45	7	3	19	2
Working with sequences that are defined recursively	1	8	47	4	3	27	10
Computing the sum of an infinite geometric series	0	4	45	7	2	34	7
Working with sigma notation	0	3	39	2	4	42	9
Working with sets and set notation	16	39	22	3	1	10	9
Knowing the difference between rational and irrational numbers	24	58	15	0	0	1	1
Knowing the difference between real and complex numbers	2	12	81	0	0	3	1
Working with complex numbers	1	4	86	0	1	6	2
Evaluating algebraic expressions by substitution	32	63	4	0	0	0	0
Simplifying algebraic expressions	32	65	2	1	0	0	0
Solving linear equations and inequalities in one variable	27	69	3	0	0	0	0
Solving absolute value equations and inequalities	5	72	21	1	0	0	0
Performing operations on radical expressions/ equations	3	56	37	3	0	2	0
Performing addition, subtraction, and multiplication of polynomials	4	82	12	1	0	0	0
Working with linear equations in two variables	6	83	9	1	0	0	0
Performing polynomial long division	0	33	58	0	1	5	2
Solving quadratic equations by factoring	2	77	19	1	0	0	0
Using the quadratic formula	1	67	31	1	0	0	0
Using the discriminant	1	33	63	1	0	1	1
Solving quadratic inequalities	1	22	67	1	1	5	4
Determining roots of polynomial and rational equations algebraically	1	27	64	0	1	6	1
Performing operations with rational expressions	2	45	49	1	0	2	1
Implementing remainder and factor theorems	1	9	65	1	3	18	3
Working with logarithmic and exponential functions	0	3	75	1	5	13	3
Solving systems of two linear equations in two variables algebraically	1	68	28	0	0	1	1
Working with equations of parabolas, circles, ellipses, and hyperbolas	0	6	72	3	4	14	3
Working with parametric equations	0	3	25	2	8	49	13
Working with transformations algebraically	3	24	40	14	1	13	5
Determining maxima/minima for quadratic functions	0	18	55	1	1	21	3
Understanding continuity	0	5	23	1	4	57	11
Finding the limit of an expression	0	2	7	0	3	74	13

Note:
HS = High school teachers

Table F.3

Content Topics "Taught" Percentage
High School Mathematics *(continued)*

	% taught prior to Algebra I	% taught in Algebra I	% taught in Algebra II	% taught in Geometry	% taught in Trigonometry	% taught in Precalculus	HS % Not taught
Graphing on a number line	76	23	1	0	0	0	0
Graphing linear equations in two variables	17	79	4	0	0	0	0
Finding the slope of a line	19	77	3	0	0	0	0
Working with equations of parallel and perpendicular lines	3	84	6	7	0	0	0
Working with graphs of quadratic equations and functions	0	57	39	1	0	1	1
Solving systems of equations and inequalities graphically	1	73	25	0	0	1	0
Graphing parabolas, circles, ellipses, and hyperbolas	0	4	76	3	2	12	3
Determining a locus of points	0	3	37	27	2	13	18
Working with transformations graphically	5	22	31	31	1	8	3
Working with linear relationships	9	75	14	0	0	0	1
Approximating roots of polynomial and rational equations from graphs	1	22	62	1	1	9	4
Recognizing relationships between a family of equations and their graphs	1	33	48	2	3	11	3
Working with graphs of rational functions	0	19	61	1	1	14	3
Finding midpoints in the plane	4	44	10	37	1	1	2
Finding distances in the plane	4	47	11	34	1	1	2
Working with discontinuous graphs	0	6	45	3	4	34	7
Using the Pythagorean theorem	35	46	2	15	0	0	1
Applying properties of right, acute, and obtuse angles	29	8	3	58	0	1	0
Applying properties of lines, segments, and rays	22	4	2	71	0	0	1
Working with parallel lines, transversals, and angle measures	10	7	2	79	0	0	1
Working with properties of special quadrilaterals	11	4	4	80	0	0	1
Working with side length relationships in 45-45-90 degree triangles and 30-60-90 degree triangles	1	5	7	84	1	0	2
Working with congruent and similar triangles	9	8	4	77	0	0	1
Working with circles (e.g., radius, diameter, arc, and chord)	17	6	4	71	0	0	2
Working with inscribed and circumscribed polygons and circles	2	2	4	88	1	0	3
Working with logic statements (e.g., converse, contrapositive, and if-then)	1	4	4	83	0	1	5
Finding the area of hybrid figures	25	12	3	43	1	3	14
Finding the volume of hybrid figures	18	11	3	49	1	2	16
Understanding the scale on, for example, rulers and protractors	64	8	1	23	0	0	3
Finding the area and perimeter of polygons and circles	49	15	2	33	0	0	1
Finding volume (e.g., cylinders, prisms, and pyramids)	34	9	4	52	0	0	1
Finding surface area	29	11	4	54	0	0	1
Understanding relations between a scale factor and length, area, volume	18	15	5	60	0	0	2
Finding the volume of a function at a given point	7	68	21	1	1	2	1
Understanding the concept of function	5	69	22	1	1	1	1
Working with functions (e.g., domain and range, composition, and inverses)	4	42	47	1	2	4	1
Using right triangle trigonometry	3	11	13	58	9	5	2
Using trigonometric identities	0	3	15	13	39	26	3
Solving trigonometric equations	0	3	15	14	40	25	3
Using the law of sines and law of cosines	0	3	16	25	34	21	2
Working with graphs of trigonometric functions, including amplitude, period, and phase shift	0	1	15	4	44	33	3
Using radian measure	0	1	16	6	40	34	3
Working with vectors in a plane	0	1	10	15	26	37	12

Note:
HS = High school teachers

Table F.4

Content Topics "Taught" Percentage
Reading

	MS % taught	HS % taught
Reading Content		
Reading and demonstrating understanding of …		
prose fiction	86	64
humanities-based texts (e.g., the arts, philosophy, architecture, religion/ethics, literary criticism, personal essays, memoirs)	53	63
social sciences–based texts (e.g., history, political science, economics, psychology, business, geography, sociology)	36	55
natural sciences-based texts (e.g., biology, chemistry, physics, physical sciences)	14	8
Reading and demonstrating understanding of …		
poetry	88	62
drama	77	55
"functional" text (e.g., brochures, business letters, maps)	65	49
graphs, charts, and diagrams	68	55
technical documents (e.g., instructional manuals, contracts)	30	17
news and feature articles	79	71
editorials/opinion pieces	78	73
research studies	53	65
primary sources (e.g., letters, speeches)	69	79
advertisements	58	42
Other reading content (Please specify.)	69	48
Main Ideas and Author's Approach		
Determining main idea(s) and purpose(s) of a paragraph or a text by identifying ideas, key words, and topic sentences	97	79
Inferring the main idea(s) and purpose(s) of a paragraph or a text	98	84
Summarizing basic ideas and events in a text	98	87
Understanding the point of view from which a text is told	96	91
Identifying an author's unstated assumptions	87	81
Determining from a text the …		
organizational pattern	80	70
major claims made	61	76
evidence and sources of information used	74	75
Recognize how writing style helps shape the meaning of a given text	75	66
Other skill relating to main ideas and author's approach (Please specify.)	63	46
Supporting Details		
Recognizing and recalling details explicitly stated in a text	96	46
Locating and interpreting details subtly stated in a text	94	88
Determining how details are used to support points made in a text	94	84
Other skill relating to supporting details (Please specify.)	60	87
Relationships		
From a text, recognizing and recalling explicitly stated …		
sequences	92	47
cause-effect relationships	93	78
comparisons and contrasts	97	88
Making reasonable inferences from a text about …		
sequences	91	89
cause-effect relationships	94	79
comparisons and contrasts	95	87
Analyzing interactions between characters in a literary text	90	88
Categorizing or classifying information in a text	82	68
Drawing appropriate analogies	79	73
Other skill relating to relationships (Please specify.)	54	74
Meaning of Words		
Determining the appropriate meaning of words and phrases from context	98	34
Distinguishing between literal and figurative meanings of words and phrases	92	85
Recognizing and understanding the use of literary devices …		
metaphor/simile	93	72
symbolism	83	60
satire	48	74
irony	70	62
foreshadowing	85	69
Other skill relating to meanings of words (Please specify.)	73	63

Note:
MS = Middle school/junior high school teachers
HS = High school teachers

Table F.4

Content Topics "Taught" Percentage
Reading *(continued)*

	MS % taught	HS % taught
Generalizations and Conclusions		
Drawing conclusions from information given in a text	98	93
Predicting outcomes based on a text	97	78
Distinguishing between fact, opinion, and reasoned judgment	92	85
Using information implied in a text to make generalizations	89	83
Recognizing stereotypes in a text	66	78
Recognizing logical fallacies in a text	41	57
Making connections between …		
two or more texts	79	75
two or more subjects or disciplines (e.g., literature and history)	77	78
a text and one's prior knowledge	94	89
Applying information gained from a text to new situations or problems	86	85
Developing an alternative hypothesis or solution to one proposed in a text	55	60
Other skill relating to generalizations and conclusions (Please specify.)	39	36
Evaluating and Judging Texts		
Evaluating information in a text for …		
specificity	46	57
relevance	63	78
significance or importance	74	86
fair and accurate treatment of differing points of view	58	71
persuasive techniques (e.g., appeals, biased assumptions, loaded language)	66	67
credibility and appropriateness of sources of information	57	71
sufficiency of evidence in support of an argument or claim	61	72
internal consistency	31	47
general soundness of reasoning	46	63
Judging a text against generally recognized standards of quality or excellence	35	48
Assessing the risks and benefits of an action described by a text	42	51
Recognizing how history and culture influence a text	60	80
Other text evaluation and judging skill (Please specify.)	17	16
Reading Strategies		
Reading independently for a variety of purposes (e.g., for enjoyment or information)	97	72
Applying strategies before, during, and after reading to increase fluency and comprehension (e.g., previewing, reading headings and boldface text, skimming, scanning)	95	70
Using a variety of "fix up" strategies (e.g., rereading, changing reading rate) to better comprehend a text	80	50
Other reading strategy (Please specify.)	70	52

Note:
MS = Middle school/junior high school teachers
HS = High school teachers

Table F.5

Content Topics "Taught" Percentage Secondary/Postsecondary Chemistry

Content Topic	HS % taught
Units of measurement; metric system	84
Classification and properties of matter	92
Density	88
Atoms, molecules, ions; mole concept	98
Chemical formulas and equations	98
Stoichiometry and percent yield	96
Heat, enthalpy, state functions	67
Ideal gas law, kinetic molecular theory	90
Electron configurations, valence electrons	98
Chemical bond formation	98
Bonding theories	80
Polarity, electronegativity	91
Kelvin temperature scale	92
Phase changes	85
Phase diagrams	67
Units of concentration	86
Colligative properties	56
Reaction rates	52
Reaction mechanisms	28
Catalysts, enzymes	55
Chemical equilibria	58
Bronsted acid/base theory	70
Lewis acid/base theory	61
pH scale	84
Acid/base reactions	85
Common ion effect and buffer solutions	33
Acid/base titration	69
Acid/base indicators	76
Solubility product	41
Qualitative analysis	48
Spontaneity and entropy	33
2nd law of thermodynamics	28
Gibbs free energy	21
Oxidation/reduction reactions	59
Electrochemical cells	30
Batteries and storage cells	26
Electrolysis	39
Corrosion	33
Chemistry of Groups 1A, 2A	80
Metals, metalloids, nonmetals	91
Chemistry of Groups 5A, 6A, 7A	77
The Noble gases	87
Basic organic nomenclature	49
Organic molecules/structures	38
Functional groups	32
Petroleum and its products	19
Molecular stereochemistry	14
Amino acids, proteins	10
Carbohydrates, nucleic acids	10
Synthetic polymers	17
Chemistry of transition metals	47
Spectroscopy/absorption	32
Nature of radioactivity	57
Rates of nuclear decay	48
Nuclear fission/fusion	52
Radiochemical dating	43

Note:
HS = High school teachers

Table F.6

Content Topics "Taught" Percentage Middle School and Junior High School Earth Science

Content topic	MS % taught
Map reading and interpretation	43
Latitude and longitude	44
Remote sensing	15
The geologic time scale	49
Fossils and fossilization	53
Interpretation of fossils	41
Properties of matter	64
Minerals and their properties	52
Rocks and their properties	54
The rock cycle	55
Biogeochemical cycles (carbon, nitrogen, etc.)	38
Weathering processes	64
Soil formation and soil properties	46
Erosion and agents of erosion	61
Deposition	61
Groundwater	58
Surface water	57
Mass movement	49
Landform creation	64
Global plate tectonics	68
Volcanism	63
Earthquakes	67
Mountain-building	64
Earth's interior	66
Types of natural resources	56
Fossil fuels	58
Alternative energy sources	59
Air, water, soil pollution	68
Conservation of resources	64
Population growth	36
The water cycle	64
Role of solar energy	67
The composition of air	59
Earth's atmosphere	62
Air pressure, temperature, density	60
Global and local winds	51
Relative humidity and dew point	51
Clouds and precipitation	53
Air masses and fronts	53
Storms	53
Weather prediction	51
Definition of climate	56
Global climate change	52
Ocean currents	38
Properties of ocean water	32
Topography of the ocean floor	41
Tides	48
Waves	42
Sea level changes	30
Constellations	40
Timekeeping	23
Historical astronomy	33
Gravity and motion	58
The Sun-Earth-Moon system	65
Origin of our solar system	50
Motions of the planets	53
Kepler's laws	30
Earth's moon	56
The terrestrial planets	43
The gas planets	45
Comets, asteroids, meteors, and other minor bodies	50
The Sun and its energy	62
The Milky Way and other galaxies	48
Birth and evolution of stars	48
Life outside our solar system	28
Formation and structure of the universe	44

Note:
MS = Middle school/junior high school teachers

Table F.7

Content Topics "Taught" Percentage High School Earth Science

Content topic	HS % taught
Map reading and interpretation	84
Latitude and longitude	77
Remote sensing	36
The geologic time scale	77
Fossils and fossilization	69
Interpretation of fossils	58
Properties of matter	63
Minerals and their properties	84
Rocks and their properties	84
The rock cycle	85
Biogeochemical cycles (carbon, nitrogen, etc.)	47
Weathering processes	86
Soil formation and soil properties	68
Erosion and agents of erosion	84
Deposition	84
Groundwater	80
Surface water	82
Mass movement	78
Landform creation	87
Global plate tectonics	93
Volcanism	87
Earthquakes	89
Mountain-building	87
Earth's interior	89
Types of natural resources	64
Fossil fuels	63
Alternative energy sources	59
Air, water, soil pollution	64
Conservation of resources	58
Population growth	25
The water cycle	82
Role of solar energy	83
The composition of air	83
Earth's atmosphere	89
Air pressure, temperature, density	83
Global and local winds	83
Relative humidity and dew point	80
Clouds and precipitation	82
Air masses and fronts	81
Storms	84
Weather prediction	75
Definition of climate	78
Global climate change	77
Ocean currents	63
Properties of ocean water	51
Topography of the ocean floor	67
Tides	71
Waves	57
Sea level changes	60
Constellations	62
Timekeeping	55
Historical astronomy	64
Gravity and motion	78
The Sun-Earth-Moon system	85
Origin of our solar system	87
Motions of the planets	80
Kepler's laws	69
Earth's moon	82
The terrestrial planets	79
The gas planets	79
Comets, asteroids, meteors, and other minor bodies	80
The Sun and its energy	87
The Milky Way and other galaxies	78
Birth and evolution of stars	82
Life outside our solar system	49
Formation and structure of the universe	77

Note:
HS = High school teachers

Table F.8

Content Topics "Taught" Percentage Middle School/Junior High School Life Science

Content Topic	MS % taught
Criteria for living things	75
Homeostasis	60
Levels of organization (e.g., cells, tissues, organs)	79
Organic molecules versus inorganic molecules	35
Structure and function of biologically important molecules (e.g., proteins, lipids, carbohydrates, and nucleic acids)	42
Metabolic reactions (e.g., fermentation, cellular respiration)	52
Matter and energy in biological systems (e.g., laws of thermodynamics)	24
Enzymes (e.g., specificity, denaturation)	18
pH scale and the importance of pH in biological systems	36
Structure and function of prokaryotic cells	63
Structure and function of eukaryotic cells and organelles (e.g., membrane structure, cytoplasm, nucleus, Golgi apparatus)	70
Protein synthesis	32
Current cell theory (e.g., all living things are composed of cells)	74
Research leading to current cell theory (e.g., experiments of Hooke, Schleiden, and Schwann)	53
Mitosis	66
Cell specialization	58
Similarities and differences between cell types (e.g., muscle, nerve, plant, bacterial)	67
Structure and function of DNA and chromosomes	64
Karyotyping	26
Molecular genetics (e.g., DNA replication, transcription, translation)	33
Mendelian genetics (e.g., Mendel's laws, genetic crosses, Punnett squares)	63
Meiosis	60
Modes of inheritance (e.g., recessive, dominant, sex-linked)	66
Mutation	61
Biotechnology (e.g., Human Genome Project, PCR, stem cell research)	34
Work of Darwin, Lamarck, Lyell, and Malthus	34
Natural selection	55
Selection and adaptation	60
Speciation	38
Fossil record and evolutionary relationships	47
Early Earth and the origin of life	39
Classification systems for organisms (e.g., three kingdom, six kingdom)	63
Binomial nomenclature	54
Dichotomous taxonomic keys	56
Major animal phyla (e.g., organisms and adaptations)	57
Vertebrates versus invertebrates	56
Animal behavior	40
Structure and function of organ systems	62
Sensory organs	45
Human health (e.g., nutrition, aging, vaccination)	42
Major plant phyla (e.g., structure, function, and adaptations)	47
Plant reproduction (e.g., life cycle)	54
Photosynthesis	71
Major phyla and life cycles of fungi (e.g., structure, function, and adaptations)	46
Role of fungi as decomposers	64
Fungi in useful products (e.g., antibiotics, bread)	59
Major phyla of bacteria (e.g., structure, function, and adaptations)	38
Viral structure and replication	43
Major phyla of protists (e.g., structure, function, and adaptations)	43
Bacteria and biotechnology	36
Ecosystems and population dynamics (e.g., food chains, energy pyramids, succession)	67
Growth models of populations	40
Population ecology (e.g., habitats, niches)	60
Species interactions (e.g., competition, predation, mutualism)	64
Human impact on the environment (e.g., pollution, greenhouse effect)	67
Abiotic factors	55
Elements cycling through ecosystems	50

Note:
MS = Middle school/junior high school teachers

Table F.9

Content Topics "Taught" Percentage
High School Biology

Content Topic	HS % taught
Criteria for living things	93
Homeostasis	95
Levels of organization (e.g., cells, tissues, organs)	94
Organic molecules versus inorganic molecules	82
Structure and function of biologically important molecules (e.g., proteins, lipids, carbohydrates, and nucleic acids)	92
Structure and function of important functional groups (e.g., phosphate group, hydroxyl group, amino group)	61
Metabolic reactions (e.g., fermentation, cellular respiration)	94
Matter and energy in biological systems (e.g., laws of thermodynamics)	56
Enzymes (e.g., specificity, denaturation)	85
Properties of water that are important for life processes	87
pH scale and the importance of pH in biological systems	78
Structure and function of prokaryotic cells	91
Structure and function of eukaryotic cells and organelles (e.g., membrane structure, cytoplasm, nucleus, Golgi apparatus)	97
Protein synthesis	95
Current cell theory (e.g., all living things are composed of cells)	94
Research leading to current cell theory (e.g., experiments of Hooke, Schleiden, and Schwann)	78
Cell cycle and its regulation (e.g., gap 1, synthesis, gap 2, mitosis)	94
Cell size factors (e.g., cell surface area to volume ratio)	88
Cell specialization (e.g., cells take on different structures and functions by expressing a subset of genes)	88
Membrane function	96
Similarities and differences between cell types (e.g., muscle, nerve, plant, bacterial)	88
Research leading to the identification of DNA as the genetic material (e.g., experiments of Griffith and Hershey and Chase)	68
Structure and function of DNA and chromosomes	96
Structure and function of RNA (e.g., rRNA, tRNA)	95
Karyotyping	81
Molecular genetics (e.g., DNA replication, transcription, translation)	95
Mendelian genetics (e.g., Mendel's laws, genetic crosses, Punnett squares)	93
Meiosis and gametogenesis	96
Modes of inheritance (e.g., recessive, dominant, sex-linked)	93
Gene expression and regulation	84
Mutation	93
Biotechnology (e.g., Human Genome Project, PCR, stem cell research)	76
Work of Darwin, Lamarck, Lyell, and Malthus	81
Natural selection	89
Fitness	78
Selection and adaptation	88
Speciation (e.g., allopatric)	70
Hardy-Weinberg equation	40
Fossil record and evolutionary relationships	77
Early Earth and the origin of life	68
Classification systems for organisms (e.g., three kingdom, six kingdom)	87
Binomial nomenclature	85
Dichotomous taxonomic keys	79
Molecular/genetic techniques to determine relationships between organisms (e.g., based on mitochondrial DNA sequence)	49
Major animal phyla (e.g., organisms and adaptations)	69
Vertebrates versus invertebrates	66
Animal behavior	42
Growth and development	61
Structure and function of organ systems	62
Sensory organs	44
Human health (e.g., nutrition, aging, vaccination)	42
Major plant phyla (e.g., structure, function, and adaptations)	57
Plant reproduction (e.g., life cycle)	58
Plant physiology (e.g., transport, hormones, response to stimuli such as light and gravity)	49
Photosynthesis	92
Major phyla and life cycles of fungi (e.g., structure, function, and adaptations)	46
Role of fungi as decomposers	75
Fungi in useful products (e.g., antibiotics, bread)	65
Major phyla of bacteria (e.g., structure, function, and adaptations)	58
Viral structure and replication	71
Major phyla of protists (e.g., structure, function, and adaptations)	57
Bacteria and biotechnology	63
Ecosystems and population dynamics (e.g., food chains, energy pyramids, succession)	83
Growth models of populations	65
Population ecology (e.g., habitats, niches)	77
Species interactions (e.g., competition, predation, mutualism)	82
Human impact on the environment (e.g., pollution, greenhouse effect)	77
Abiotic factors	78
Elements cycling through ecosystems	77

Note:
HS = High school teachers

Table F.10

Content Topics "Taught" Percentage Middle School/Junior High School Physical Science

Content Topic	MS % taught
Units of measurement	87
Metric system	83
Physical and chemical changes	84
Elements, compounds, and molecules	83
Mass, volume, and density	87
Chemical symbols and formulas	78
Atoms: protons, electrons, and neutrons	75
Forces within the atom	52
Energy levels within the atom	55
Periodic table; atomic number, mass number	75
Types of chemical bonds	48
Chemical reactions: reactants and products	60
Balancing chemical equations	46
Endothermic and exothermic reactions	57
Rates of chemical response	34
Solutions: solubility and concentration	47
Polarity	23
Freezing point depression; boiling point elevation	40
Acids and bases; salts	50
pH scale	54
Radioactive elements and radioactivity	31
Speed, velocity, and acceleration	71
Momentum	64
Force	76
Newton's three laws of motion	72
Friction	74
Gravity	80
Mass and weight	83
Projectile and orbital motion	43
Fluid pressure	32
Buoyancy; Archimedes' principle	41
Bernoulli's principle	37
Work, power, and efficiency	54
Simple mechanics (levers, pulleys, etc.)	51
Kinetic and potential energy	74
Mechanical, thermal, gravitational, chemical, electromagnetic, and nuclear energy	58
Energy conversions and conservation of energy	60
Temperature and molecular motion	58
Temperature scales	63
Heat transfer: conduction, convection, and radiation	60
Specific heat; amount of heat gained or lost	35
Melting, freezing, and boiling points	73
Heats of fusion and vaporization	28
Thermal expansion	32
Heating and cooling systems; heat engines	15
Types of waves: transverse and longitudinal	42
Amplitude, wavelength, and frequency	49
Speed of waves	41
Constructive and destructive interference	28
Transmitting sound	35
Intensity and loudness	30
Frequency (pitch); sound quality (timbre)	31
Doppler effect	32
Resonance	25
Light energy: photons	35
Electromagnetic waves	47
Electromagnetic spectrum	47
Doppler effect	31
Reflection and refraction	46
Separating white light: prisms	38
Diffraction	36
Transmittance and absorbance	25
Transparent, translucent, and opaque surfaces	37
Primary and complementary colors and pigments	27
Incandescent and fluorescent light	23
Plane, concave, and convex mirrors	27
Concave and convex lenses	34
Cameras, telescopes, and microscopes	30
Lasers; fiber optics	18
Fossil fuels	55
Solar energy; wind and water power	55
Nuclear energy	48
Alternative energy sources	54
Pollution and conservation	54
Petroleum fuels and fractional distillation	23
Polymers	21
Electronic devices (transistors, integrated circuits, etc.)	11
Communication devices (telephones, computers, etc.)	18

Note:
MS = Middle school/junior high school teachers

Table F.11

Content Topics "Taught" Percentage High School Physics

Content topic	HS % taught
Units of measurement	79
Metric system	68
Vectors	98
Distance, displacement, speed, velocity, acceleration in one and two dimensions	98
Position-time graphs and velocity-time graphs	93
Newton's laws of motion	98
Static equilibrium	90
Momentum and conservation of momentum	97
Kinetic energy and potential energy	96
Conservation of mechanical energy	95
Elastic and inelastic collisions	92
Law of gravitation	90
Free fall motion and motion on an inclined plane	98
Projectile motion	97
Uniform circular motion: centripetal acceleration	90
Simple harmonic motion—springs and pendulums	82
Work and the work-energy theorem	96
Torque and rotational motion	66
Temperature scales	47
Specific heat and calorimetry	49
Heat transfer: conduction, convection, radiation, insulation	49
Latent heat and phases of matter: solid, liquid, gas	47
Ideal gas law	27
Kinetic theory of gases	36
Laws of thermodynamics	47
Heat engines	35
Production of waves: acceleration of charges and vibration	75
Properties of waves: wavelength, frequency, speed, amplitude	85
Electromagnetic spectrum	77
Interaction of light with matter: reflection, refraction, absorption, emission	80
Doppler effect	81
Diffraction and interference	77
Images formed by mirrors and/or lenses	74
Optical instruments: microscopes and/or telescopes	41
Lasers and holography	28
Electrostatics: Coulomb's law	74
Electric field	70
Electric potential and potential difference	75
Current, resistance, voltage; Ohm's law	80
Conductivity: conductors and insulators	75
Capacitance and capacitors	50
DC circuits	74
AC circuits	39
Electrical energy and power	75
Magnetism and magnetic effects of current	62
Electromagnetic induction	50
Atomic structure: protons, neutrons, electrons	27
Density	35
Deformation of solids	16
Fluid behavior: hydrostatics and/or hydrodynamics	31
Nuclear decay: radioactivity	25
Nuclear reactions: fission and/or fusion	29
Wave-particle duality	45
Uncertainty principle	23
Quantum physics: atomic spectra	22
Pauli exclusion principle and the periodic table	11
Relativity (general and/or special)	36

Note:
HS = High school teachers

Strand Rankings for ACT's College Readiness Standards™

	MS Mean	SD	Rank	% at top rank	HS Mean	SD	Rank	% at top rank	PS Mean	SD	Rank	% at top rank
English												
Rank Ordering of Six English Categories												
(1 = most important, 6 = least)												
Topic and Idea Development	2.36	1.70	2	46	1.97	1.39	1	52	2.92	1.96	3	37
Organization, Unity, and Coherence	2.08	1.21	1	36	2.01	1.10	2	33	2.61	1.48	1	25
Word Choice in Terms of Style, Tone, Clarity, and Economy	4.00	1.40	4	2	3.72	1.40	4	5	4.32	1.33	6	2
Sentence Structure and Formation	3.29	1.25	3	11	3.47	1.08	3	5	2.90	1.20	2	16
Conventions of Usage	4.40	1.28	5	2	4.62	1.16	5	3	3.79	1.64	4	12
Conventions of Punctuation	4.77	1.46	6	2	5.07	1.34	6	2	4.22	1.72	5	7
Math												
Rank Ordering of Eight Math Categories												
(1 = most important, 8 = least)												
Basic Operations and Applications	2.06	1.89	1	67	3.06	2.19	1	40	2.16	1.66	1	55
Probability, Statistics, and Data Analysis	4.56	1.90	4	3	6.32	1.83	8	3	6.63	2.02	8	2
Numbers, Concepts, and Properties	3.33	1.78	2	6	4.14	2.01	4	5	3.62	1.69	3	5
Expressions, Equations, and Inequalities	3.96	2.10	3	16	3.25	1.76	2	15	2.73	1.59	2	24
Graphical Representations	4.80	1.94	6	4	4.02	1.74	3	4	3.96	1.49	4	2
Properties of Plane Figures	5.69	1.60	7	1	5.17	2.36	t6	16	5.81	1.54	6	0
Measurement	4.78	1.97	5	3	5.17	2.27	t6	2	6.23	1.39	7	0
Functions	6.89	1.66	8	1	4.63	2.29	5	15	4.55	2.29	5	12
Reading												
Rank Ordering of Five Reading Categories												
(1 = most important, 5 = least)												
Main Ideas and Author's Approach	1.72	1.05	1	60	2.03	1.31	1	52	1.45	0.96	1	76
Supporting Details	3.05	1.11	3	5	3.20	1.17	3	5	3.15	1.03	3	2
Relationships	3.76	1.24	5	6	3.27	1.35	4	13	3.59	1.13	4	4
Meaning of Words	2.98	1.42	2	20	3.46	1.39	5	12	3.73	1.33	5	7
Generalizations and Conclusions	3.49	1.30	4	10	3.00	1.40	2	18	2.93	1.33	2	11
All Sciences Combined												
Rank Ordering of All Science Categories Combined												
(1 = most important, 3 = least)												
Interpretation of Data	—	—	—	—	1.77	0.74	1	41	1.71	0.74	1	46
Scientific Investigation	—	—	—	—	1.91	0.82	2	38	2.18	0.79	3	24
Evaluation of Models, Inferences, and Experimental Results	—	—	—	—	2.29	0.80	3	21	2.09	0.83	2	31
Biology												
Rank Ordering of Three Biology Categories												
(1 = most important, 3 = least)												
Interpretation of Data	—	—	—	—	1.85	0.73	2	35	1.82	0.73	1	37
Scientific Investigation	—	—	—	—	1.71	0.77	1	48	1.87	0.81	2	39
Evaluation of Models, Inferences, and Experimental Results	—	—	—	—	2.43	0.77	3	17	2.28	0.83	3	24
Chemistry												
Rank Ordering of Three Chemistry Categories												
(1 = most important, 3 = least)												
Interpretation of Data	—	—	—	—	1.75	0.74	1	43	1.62	0.73	1	53
Scientific Investigation	—	—	—	—	2.00	0.83	2	34	2.30	0.75	3	17
Evaluation of Models, Inferences, and Experimental Results	—	—	—	—	2.24	0.81	3	23	2.07	0.81	2	30
Earth Science												
Rank Ordering of Three Earth Science Categories												
(1 = most important, 3 = least)												
Interpretation of Data	—	—	—	—	1.71	0.72	1	44	1.75	0.75	1	44
Scientific Investigation	—	—	—	—	1.99	0.84	2	36	2.24	0.78	3	21
Evaluation of Models, Inferences, and Experimental Results	—	—	—	—	2.28	0.78	3	20	2.01	0.84	2	35
Physics												
Rank Ordering of Three Physics Categories												
(1 = most important, 3 = least)												
Interpretation of Data	—	—	—	—	1.77	0.74	1	41	1.68	0.75	1	48
Scientific Investigation	—	—	—	—	1.97	0.82	2	35	2.27	0.76	3	18
Evaluation of Models, Inferences, and Experimental Results	—	—	—	—	2.22	0.83	3	24	2.01	0.83	2	34

Note:
MS = Middle school/junior high school teachers
HS = High school teachers
PS = Postsecondary teachers (no remedial-course teachers)
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.
A "t" before a number in the rank column indicates a tie.

Table H.1
Statistical Details for Developmental/Remedial English/Writing Topics and Skills

	REM mean rating	SD
Composition Process and Purpose		
Prewriting, brainstorming, or other techniques of invention	4.34	1.00
Mapping, clustering, outlining, or other organizational tools	4.14	1.09
Selecting a topic	4.13	1.11
Formulating a thesis	4.65	0.90
Analyzing an issue or problem	3.66	1.25
Gathering and synthesizing resources	3.09	1.48
Evaluating source materials critically	3.14	1.57
Citing sources accurately	3.21	1.65
Avoiding plagiarism	4.02	1.32
Collaborating with peers on reviews of drafts	4.05	1.10
Editing and proofreading	4.62	0.75
Revising for content rather than for grammar and mechanics	4.43	0.93
Developing one's own voice as a writer	3.70	1.20
Other writing process skill (Please specify.)	4.08	1.38
Writing to ...		
explore ideas	4.25	0.93
express one's feelings	3.77	1.23
tell a story through fiction or nonfiction	3.58	1.35
analyze literature or media	3.20	1.54
convey information	4.44	0.82
argue or persuade readers	4.07	1.19
express an opinion or take a position on an issue	4.19	1.16
describe a process or how to do something	3.81	1.13
present research	2.76	1.63
writing purpose (Please specify.)	3.77	1.65
MEAN	**3.88**	
Topic and Idea Development		
Establishing and adjusting the focus of a paper for audience and purpose	4.20	1.07
Determining the appropriateness of expression for audience and purpose	4.07	1.11
Providing appropriate context or background information for readers	4.20	1.10
Moving between general statements and specific reasons, examples, and details	4.52	0.75
Differentiating between assertions and evidence	3.54	1.52
Supporting claims with multiple sources of evidence	3.69	1.50
Using personal experience to support claims	3.99	1.05
Adding, revising, and deleting supporting details to improve the effectiveness of a piece of writing	4.58	0.75
Determining the relevancy of material to topic and purpose	4.33	0.99
Taking and maintaining a position on an issue	4.11	1.22
Fairly and accurately representing differing points of view on an issue	3.32	1.47
Anticipating and responding to counterarguments to a position taken on an issue	3.24	1.47
Addressing implications of a position taken on an issue or a proposed solution to a problem	2.87	1.51
Other topic and idea development skill (Please specify.)	2.65	1.87
MEAN	**3.81**	
Organization, Unity, and Coherence		
Using effective introductions and conclusions in a piece of writing	4.73	0.65
Establishing a logical progression of ideas	4.77	0.60
Logically grouping ideas into paragraphs within a piece of writing	4.70	0.83
Ordering paragraphs in a logical way within a piece of writing	4.66	0.83
Ordering sentences in a logical way within a paragraph	4.70	0.63
Using effective transitions between paragraphs	4.54	0.88
Choosing appropriate transition words and phrases within a sentences or to connect sentences within a paragraph	4.63	0.68
Other organization, unity, and coherence skill (Please specify.)	3.94	1.69
MEAN	**4.58**	
Word Choice in Terms of Style, Tone, Clarity, and Economy		
Choosing words and images that are specific, precise, and clear in terms of their context	4.26	0.93
Using varied words and images within a piece of writing	3.82	1.14
Maintaining consistency of style and tone within a piece of writing	3.88	1.13
Avoiding vague pronouns (i.e., pronouns without a clear antecedent)	4.32	0.92
Avoiding wordiness	4.07	1.05
Avoiding redundancy	4.06	1.02
Using rhetorically effective subordination, coordination, and parallelism	4.16	1.01
Other word choice skill (Please specify.)	3.42	1.70
MEAN	**4.00**	

Note:
REM = Remedial-course teachers
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table H.1

Statistical Details for Developmental/Remedial English/Writing Topics and Skills *(continued)*

	REM mean rating	SD
Sentence Structure and Formation		
Avoiding ...		
faulty subordination, coordination, and parallelism	4.15	1.11
awkward fused sentences (i.e., comma splices, run-on sentences)	4.66	0.75
sentence fragments that are not rhetorically defensible	4.65	0.79
dangling and misplaced modifiers	4.22	1.00
inappropriate shifts of tense, voice, mood, number or person	4.36	0.96
Using a variety of sentence types (i.e., simple, compound, complex)	4.19	0.97
Other sentence structure and formation skill (Please specify.)	3.63	1.89
MEAN	**4.27**	
Conventions of Usage		
Ensuring grammatical agreement (i.e., pronoun-antecedent, subject-verb)	4.43	0.92
Forming simple and compound tenses of regular and irregular verbs	4.16	1.19
Using the proper form of possessive pronouns	4.17	1.08
Using the appropriate case of a pronoun	4.16	1.15
Forming and using modifiers	3.84	1.25
Using the idioms of standard written English	3.89	1.35
Other convention of usage (Please specify.)	3.26	1.91
MEAN	**3.99**	
Conventions of Punctuation		
Punctuating ...		
end of sentence	4.44	1.02
between clauses of compound sentences when the conjunction is omitted	4.36	0.97
before a conjunctive adverb joining clauses of a compound sentence	4.27	1.02
parenthetical elements with commas, parentheses, and dashes	3.88	1.18
essential/nonessential elements, subordinate clauses, and appositives	3.99	1.09
possessive nouns and pronouns	4.23	1.04
items in a series	4.19	1.01
Avoiding unnecessary punctuation	4.10	1.15
Using a semicolon to indicate a relationship between the closely related independent clauses	4.20	1.04
Using a colon to introduce an example or an elaboration	3.86	1.24
Other convention of punctuation (Please specify.)	3.17	1.75
MEAN	**4.06**	
Evaluation of Writing		
Writing appropriately for purpose and audience	4.05	1.06
Writing unified and coherent text	4.66	0.63
Developing ideas using appropriate organizational strategy	4.55	0.79
Developing ideas using relevant examples and details	4.64	0.71
Using a clear beginning, middle, and ending	4.59	0.80
Using voice	3.32	1.18
Using precise word choice	3.70	0.94
Using appropriate tone	3.40	1.06
Using sentence variety	3.79	1.02
Using correct grammar, usage, and mechanics	4.48	0.82
MEAN	**4.12**	

Note:
REM = Remedial-course teachers
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table H.2
Statistical Details for Developmental/Remedial Mathematics Topics and Skills

	REM mean rating	SD
Process Skills		
Choosing an appropriate method for calculating (e.g., mental, paper and pencil, calculator, or estimation)	3.75	1.20
Using estimation to approximate solutions	3.32	1.12
Demonstrating concepts using manipulatives and/or pictorial representations	3.36	1.15
Solving problems posed in real-world settings and interpreting the solution	4.22	0.94
Recognizing when essential information is missing	3.77	1.17
Planning and carrying out a strategy for solving multistep problems	4.39	0.85
Recognizing generalizations of mathematical ideas	4.03	0.94
Recognizing and using patterns to solve problems	4.07	0.96
Applying mathematical ideas to new contexts	3.95	0.99
Formulating new patterns or structures	3.26	1.20
Solving several problems representing different aspects/components of a larger problem or scenario	3.59	1.03
Recalling basic facts, definitions, formulas, and algebraic procedures as needed to solve a problem	4.51	0.82
Recalling theorems and more complex formulas when needed to solve a problem	3.49	1.24
Applying theorems to solve a problem	3.56	1.26
Constructing and/or critiquing proofs, either informal or formal	2.20	1.20
Performing basic operations with a calculator	3.51	1.38
Using the statistical capabilities of a calculator	2.20	1.48
Using the graphical capabilities of a calculator	2.63	1.57
Using the symbolic algebra capabilities of a calculator	2.12	1.39
Solving routine problems quickly	3.82	1.06
Solving novel problems quickly	2.91	1.13
Understanding new material by reading a textbook	3.80	1.12
MEAN	**3.48**	
Basic Operations and Applications		
Performing addition, subtraction, multiplication, and division on signed rational numbers	4.73	0.65
Working with ratios and proportions	4.41	0.89
Working with percent (e.g., simple interest, tax, and markdowns)	4.17	1.10
Converting units of measure	3.68	1.26
MEAN	**4.25**	
Probability, Statistics, and Data Analysis		
Reading and interpreting graphs, charts, and other data representations	3.84	1.16
Representing data (e.g., circle graphs, scatterplots, and frequency distributions)	3.22	1.39
Determining a line of best-fit by eye for a set of data	2.23	1.28
Working with correlation	1.99	1.33
Finding the mean, median, and mode	3.21	1.57
Finding the variance and standard deviation of data	1.62	1.25
Working with the normal distribution	1.44	1.07
Computing the probability of a simple event	1.86	1.41
Using counting techniques	2.10	1.53
Working with Venn diagrams	1.84	1.24
Working with mutually exclusive, dependent, and independent events	1.48	1.08
Working with combinations, permutations, and the binomial theorem	1.52	1.08
MEAN	**2.20**	
Numbers, Concepts, and Properties		
Working with number properties (e.g., divisibility, even/odd, and positive/negative)	4.22	1.06
Performing operations with integer exponents	4.38	0.97
Working with rational exponents	4.03	1.21
Performing matrix addition and multiplication	1.68	1.15
Finding determinants	1.59	1.11
Working with series and sequences (e.g., arithmetic and geometric)	1.87	1.31
Working with sequences that are defined recursively	1.51	1.19
Computing the sum of an infinite geometric series	1.21	0.66
Working with sigma notation	1.38	0.87
Working with sets and set notation	2.85	1.34
Knowing the difference between rational and irrational numbers	3.61	1.19
Knowing the difference between real and complex numbers	3.27	1.46
Working with complex numbers	2.84	1.56
MEAN	**2.65**	

Note:
REM = Remedial-course teachers
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table H.2

Statistical Details for Developmental/Remedial Mathematics Topics and Skills *(continued)*

	REM mean rating	SD
Expressions, Equations, and Inequalities		
Evaluating algebraic expressions by substitution	4.43	0.96
Simplifying algebraic expressions	4.61	0.89
Solving linear equations and inequalities in one variable	4.68	0.80
Solving absolute value equations and inequalities	3.84	1.32
Performing operations on radical expressions/equations	3.84	1.38
Performing addition, subtraction, and multiplication of polynomials	4.36	1.12
Working with linear equations in two variables	4.10	1.32
Performing polynomial long division	3.24	1.38
Solving quadratic equations by factoring	4.25	1.28
Using the quadratic formula	3.87	1.50
Using the discriminant	2.89	1.47
Solving quadratic inequalities	2.71	1.58
Determining roots of polynomial and rational equations algebraically	3.46	1.54
Performing operations with rational expressions	3.85	1.34
Implementing remainder and factor theorems	2.36	1.48
Working with logarithmic and exponential functions	2.55	1.59
Solving systems of two linear equations in two variables algebraically	3.78	1.47
Working with equations of parabolas, circles, ellipses, and hyperbolas	2.24	1.44
Working with parametric equations	1.45	0.92
Working with transformations algebraically	1.99	1.39
Determining maxima/minima for quadratic functions	2.51	1.58
Understanding continuity	1.50	0.95
Finding the limit of an expression	1.38	0.96
MEAN	**3.21**	
Graphical Representations		
Graphing on a number line	4.10	1.12
Graphing linear equations in two variables	4.24	1.23
Finding the slope of a line	4.29	1.23
Working with equations of parallel and perpendicular lines	3.93	1.31
Working with graphs of quadratic equations and functions	3.47	1.53
Solving systems of equations and inequalities graphically	3.38	1.49
Graphing parabolas, circles, ellipses, and hyperbolas	2.38	1.50
Determining a locus of points	1.51	1.10
Working with transformations graphically	1.99	1.36
Working with linear relationships	3.37	1.55
Approximating roots of polynomial and rational equations from graphs	2.31	1.54
Recognizing relationships between a family of equations and their graphs	2.35	1.44
Working with graphs of rational functions	2.51	1.58
Finding midpoints in the plane	2.56	1.51
Finding distances in the plane	2.70	1.51
Working with discontinuous graphs	1.73	1.16
MEAN	**2.93**	
Properties of Plane Figures		
Using the Pythagorean theorem	3.77	1.29
Applying properties of right, acute, and obtuse angles	3.14	1.41
Applying properties of lines, segments, and rays	2.86	1.47
Working with parallel lines, transversals, and angle measures	2.81	1.51
Working with properties of special quadrilaterals	2.30	1.53
Working with side length relationships in 45-45-90 degree triangles and 30-60-90 degree triangles	2.37	1.55
Working with congruent and similar triangles	2.84	1.51
Working with circles (e.g., radius, diameter, arc, and chord)	2.91	1.43
Working with inscribed and circumscribed polygons and circles	1.43	0.94
Working with logic statements (e.g., converse, contrapositive, and if-then)	1.54	1.09
MEAN	**2.60**	
Measurement		
Finding the area of hybrid figures	3.03	1.51
Finding the volume of hybrid figures	2.67	1.61
Understanding the scale on, for example, rulers and protractors	3.07	1.50
Finding the area and perimeter of polygons and circles	3.54	1.23
Finding volume (e.g., cylinders, prisms, and pyramids)	3.13	1.34
Finding surface area	2.88	1.39
Understanding relations between a scale factor and length, area, volume	2.70	1.50
MEAN	**3.00**	

Note:
REM = Remedial-course teachers
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table H.2

Statistical Details for Developmental/Remedial Mathematics Topics and Skills *(continued)*

	REM mean rating	SD
Functions		
Finding the volume of a function at a given point	3.76	1.42
Understanding the concept of function	3.78	1.42
Working with functions (e.g., domain and range, composition, and inverses)	3.38	1.58
Using right triangle trigonometry	2.16	1.50
Using trigonometric identities	1.63	1.30
Solving trigonometric equations	1.59	1.26
Using the law of sines and law of cosines	1.49	1.10
Working with graphs of trigonometric functions, including amplitude, period, and phase shift	1.42	0.97
Using radian measure	1.51	1.09
Working with vectors in a plane	1.32	0.86
MEAN	**2.20**	

Note:
REM = Remedial-course teachers
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table H.3
Statistical Details for Developmental/Remedial Reading Topics and Skills

	REM mean rating	SD
Reading Content		
Reading and demonstrating understanding of …		
prose fiction	3.18	1.44
humanities-based texts (e.g., the arts, philosophy, architecture, religion/ethics, literary criticism, personal essays, memoirs)	3.52	1.32
social sciences–based texts (e.g., history, political science, economics, psychology, business, geography, sociology)	3.45	1.30
natural sciences-based texts (e.g., biology, chemistry, physics, physical sciences)	2.95	1.38
Reading and demonstrating understanding of …		
poetry	2.29	1.29
drama	1.99	1.36
"functional" text (e.g., brochures, business letters, maps)	2.81	1.34
graphs, charts, and diagrams	3.46	1.20
technical documents (e.g., instructional manuals, contracts)	2.21	1.38
news and feature articles	3.65	1.25
editorials/opinion pieces	3.62	1.22
research studies	2.81	1.37
primary sources (e.g., letters, speeches)	2.70	1.37
advertisements	2.95	1.40
Other reading content (Please specify.)	3.84	1.52
MEAN	**3.03**	
Main Ideas and Author's Approach		
Determining main idea(s) and purpose(s) of a paragraph or a text by identifying ideas, key words and topic sentences	4.89	0.51
Inferring the main idea(s) and purpose(s) of a paragraph or a text	4.82	0.62
Summarizing basic ideas and events in a text	4.74	0.62
Understanding the point of view from which a text is told	4.40	0.87
Identifying an author's unstated assumptions	4.29	1.06
Determining from a text the …		
organizational pattern	4.50	0.86
major claims made	4.24	0.97
evidence and sources of information used	4.12	1.04
Recognize how writing style helps shape the meaning of a given text	3.86	1.18
Other skill relating to main ideas and author's approach (Please specify.)	4.30	1.24
MEAN	**4.42**	
Supporting Details		
Recognizing and recalling details explicitly stated in a text	4.54	0.82
Locating and interpreting details subtly stated in a text	4.41	0.93
Determining how details are used to support points made in a text	4.70	0.72
Other skill relating to supporting details (Please specify.)	4.28	1.22
MEAN	**4.48**	
Relationships		
From a text, recognizing and recalling explicitly stated …		
sequences	4.29	0.97
cause-effect relationships	4.40	0.88
comparisons and contrasts	4.43	0.85
Making reasonable inferences from a text about …		
sequences	4.21	1.00
cause-effect relationships	4.32	0.93
comparisons and contrasts	4.37	0.87
Analyzing interactions between characters in a literary text	3.58	1.45
Categorizing or classifying information in a text	4.10	1.05
Drawing appropriate analogies	3.73	1.25
Other skill relating to relationships (Please specify.)	3.64	1.87
MEAN	**4.11**	
Meaning of Words		
Determining the appropriate meaning of words and phrases from context	4.75	0.73
Distinguishing between literal and figurative meanings of words and phrases	4.09	1.15
Recognizing and understanding the use of literary devices …		
metaphor/simile	3.57	1.30
symbolism	3.44	1.28
satire	3.35	1.36
irony	3.54	1.26
foreshadowing	3.01	1.35
Other skill relating to meanings of words (Please specify.)	3.71	1.59
MEAN	**3.68**	

Note:
REM = Remedial-course teachers
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Table H.3

Statistical Details for Developmental/Remedial Reading Topics and Skills *(continued)*

	REM mean rating	SD
Generalizations and Conclusions		
Drawing conclusions from information given in a text	4.51	0.85
Predicting outcomes based on a text	4.18	0.98
Distinguishing between fact, opinion, and reasoned judgment	4.49	0.88
Using information implied in a text to make generalizations	4.35	0.93
Recognizing stereotypes in a text	3.57	1.40
Recognizing logical fallacies in a text	3.67	1.41
Making connections between …		
two or more texts	3.46	1.39
two or more subjects or disciplines (e.g., literature and history)	3.20	1.44
a text and one's prior knowledge	4.35	1.00
Applying information gained from a text to new situations or problems	3.93	1.23
Developing an alternative hypothesis or solution to one proposed in a text	3.08	1.45
Other skill relating to generalizations and conclusions (Please specify.)	3.31	1.92
MEAN	**3.84**	
Evaluating and Judging Texts		
Evaluating information in a text for …		
specificity	3.44	1.40
relevance	3.73	1.27
significance or importance	3.85	1.24
fair and accurate treatment of differing points of view	3.52	1.36
persuasive techniques (e.g., appeals, biased assumptions, loaded language)	3.61	1.34
credibility and appropriateness of sources of information	3.68	1.33
sufficiency of evidence in support of an argument or claim	3.79	1.33
internal consistency	3.09	1.39
general soundness of reasoning	3.70	1.29
Judging a text against generally recognized standards of quality or excellence	2.60	1.39
Assessing the risks and benefits of an action described by a text	2.69	1.40
Recognizing how history and culture influence a text	3.21	1.38
Other text evaluation and judging skill (Please specify.)	2.56	1.71
MEAN	**3.34**	
Reading Strategies		
Reading independently for a variety of purposes (e.g., for enjoyment or information)	4.41	0.94
Applying strategies before, during, and after reading to increase fluency and comprehension (e.g., previewing, reading headings and boldface text, skimming, scanning)	4.72	0.66
Using a variety of "fix up" strategies (e.g., rereading, changing reading rate) to better comprehend a text	4.30	1.03
Other reading strategy (Please specify.)	4.53	1.10
MEAN	**4.49**	

Note:
REM = Remedial-course teachers
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Six-Point Holistic Scoring Rubric for the ACT Writing Test

Papers at each level exhibit *all* or *most* of the characteristics described at each score point.

Score = 6
Essays within this score range demonstrate effective skill in responding to the task.

The essay shows a clear understanding of the task. The essay takes a position on the issue and may offer a critical context for discussion. The essay addresses complexity by examining different perspectives on the issue, or by evaluating the implications and/or complications of the issue, or by fully responding to counterarguments to the writer's position. Development of ideas is ample, specific, and logical. Most ideas are fully elaborated. A clear focus on the specific issue in the prompt is maintained. The organization of the essay is clear: the organization may be somewhat predictable or it may grow from the writer's purpose. Ideas are logically sequenced. Most transitions reflect the writer's logic and are usually integrated into the essay. The introduction and conclusion are effective, clear, and well developed. The essay shows a good command of language. Sentences are varied and word choice is varied and precise. There are few, if any, errors to distract the reader.

Score = 5
Essays within this score range demonstrate competent skill in responding to the task.

The essay shows a clear understanding of the task. The essay takes a position on the issue and may offer a broad context for discussion. The essay shows recognition of complexity by partially evaluating the implications and/or complications of the issue, or by responding to counterarguments to the writer's position. Development of ideas is specific and logical. Most ideas are elaborated, with clear movement between general statements and specific reasons, examples, and details. Focus on the specific issue in the prompt is maintained. The organization of the essay is clear, although it may be predictable. Ideas are logically sequenced, although simple and obvious transitions may be used. The introduction and conclusion are clear and generally well developed. Language is competent. Sentences are somewhat varied and word choice is sometimes varied and precise. There may be a few errors, but they are rarely distracting.

Score = 4
Essays within this score range demonstrate adequate skill in responding to the task.

The essay shows an understanding of the task. The essay takes a position on the issue and may offer some context for discussion. The essay may show some recognition of complexity by providing some response to counterarguments to the writer's position. Development of ideas is adequate, with some movement between general statements and specific reasons, examples, and details. Focus on the specific issue in the prompt is maintained throughout most of the essay. The organization of the essay is apparent but predictable. Some evidence of logical sequencing of ideas is apparent, although most transitions are simple and obvious. The introduction and conclusion are clear and somewhat developed. Language is adequate, with some sentence variety and appropriate word choice. There may be some distracting errors, but they do not impede understanding.

Score = 3
Essays within this score range demonstrate some developing skill in responding to the task.

The essay shows some understanding of the task. The essay takes a position on the issue but does not offer a context for discussion. The essay may acknowledge a counterargument to the writer's position, but its development is brief or unclear. Development of ideas is limited and may be repetitious, with little, if any, movement between general statements and specific reasons, examples, and details. Focus on the general topic is maintained, but focus on the specific issue in the prompt may not be maintained. The organization of the essay is simple. Ideas are logically grouped within parts of the essay, but there is little or no evidence of logical sequencing of ideas. Transitions, if used, are simple and obvious. An introduction and conclusion are clearly discernible but underdeveloped. Language shows a basic control. Sentences show a little variety and word choice is appropriate. Errors may be distracting and may occasionally impede understanding.

Score = 2
Essays within this score range demonstrate inconsistent or weak skill in responding to the task.

The essay shows a weak understanding of the task. The essay may not take a position on the issue, or the essay may take a position but fail to convey reasons to support that position, or the essay may take a position but fail to maintain a stance. There is little or no recognition of a counterargument to the writer's position. The essay is thinly developed. If examples are given, they are general and may not be clearly relevant. The essay may include extensive repetition of the writer's ideas or of ideas in the prompt. Focus on the general topic is maintained, but focus on the specific issue in the prompt may not be maintained. There is some indication of an organizational structure, and some logical grouping of ideas within parts of the essay is apparent. Transitions, if used, are simple and obvious, and they may be inappropriate or misleading. An introduction and conclusion are discernible but minimal. Sentence structure and word choice are usually simple. Errors may be frequently distracting and may sometimes impede understanding.

Score = 1
Essays within this score range show little or no skill in responding to the task.

The essay shows little or no understanding of the task. If the essay takes a position, it fails to convey reasons to support that position. The essay is minimally developed. The essay may include excessive repetition of the writer's ideas or of ideas in the prompt. Focus on the general topic is usually maintained, but focus on the specific issue in the prompt may not be maintained. There is little or no evidence of an organizational structure or of the logical grouping of ideas. Transitions are rarely used. If present, an introduction and conclusion are minimal. Sentence structure and word choice are simple. Errors may be frequently distracting and may significantly impede understanding.

No Score
Blank, Off-Topic, Illegible, Not in English, or Void

Postsecondary Algebra by Importance

PS		HS Course First Taught							
Alg 2	Rank	Arith	Alg 1	Alg 2	Geo	Trig	Pcal	NOT	
4.79	1	76	22	1	0	0	0	0	Performing addition, subtraction, multiplication, and division on signed rational numbers
4.58	2	32	65	2	1	0	0	0	Simplifying algebraic expressions
4.56	3	76	23	1	0	0	0	0	Graphing on a number line
4.41	4	27	69	3	0	0	0	0	Solving linear equations and inequalities in one variable
4.39	5	28	59	6	7	0	0	0	Recalling basic facts, definitions, formulas, and algebraic procedures as needed to solve a problem
4.38	6	29	66	5	0	0	0	0	Performing operations with integer exponents
4.38	7	32	63	4	0	0	0	0	Evaluating algebraic expressions by substitution
4.20	8	37	60	3	0	0	0	0	Planning and carrying out a strategy for solving multistep problems
4.18	9	76	21	2	0	0	0	1	Working with number properties (e.g., divisibility, even/odd, and positive/negative)
4.18	10	4	82	12	1	0	0	0	Performing addition, subtraction, and multiplication of polynomials
4.07	11	70	27	1	2	0	0	0	Working with ratios and proportions
3.99	12	19	77	3	0	0	0	0	Finding the slope of a line
3.97	13	17	79	4	0	0	0	0	Graphing linear equations in two variables
3.96	14	78	20	1	0	0	0	0	Working with percent (e.g., simple interest, tax, and markdowns)
3.93	15	52	42	1	4	0	1	0	Recognizing and using patterns to solve problems
3.92	16	2	77	19	1	0	0	0	Solving quadratic equations by factoring
3.81	17	57	34	6	0	0	0	3	Solving routine problems quickly
3.80	18	36	49	6	7	0	1	0	Applying mathematical ideas to new contexts
3.79	19	56	36	3	3	0	0	2	Recognizing when essential information is missing
3.76	20	37	49	6	5	0	1	1	Recognizing generalizations of mathematical ideas
3.73	21	7	35	57	1	0	1	0	Working with rational exponents
3.72	22	78	19	1	0	0	0	2	Choosing an appropriate method for calculating
3.72	23	24	58	15	0	0	1	1	Knowing the difference between rational and irrational numbers
3.70	24	1	67	31	1	0	0	0	Using the quadratic formula
3.69	25	35	46	2	15	0	0	1	Using the Pythagorean theorem
3.68	26	53	42	3	1	0	0	0	Solving problems posed in real-world settings and interpreting the solution
3.65	27	6	83	9	1	0	0	0	Working with linear equations in two variables
3.63	28	3	56	37	3	0	2	0	Performing operations on radical expressions/equations
3.56	29	82	14	1	1	0	0	2	Performing basic operations with a calculator
3.52	30	3	84	6	7	0	0	0	Working with equations of parallel and perpendicular lines
3.41	31	28	28	6	9	2	7	20	Understanding new material by reading a textbook
3.37	32	68	30	1	0	0	0	0	Reading and interpreting graphs, charts, and other data representations
3.37	33	5	72	21	1	0	0	0	Solving absolute value equations and inequalities
3.30	34	2	45	49	1	0	2	1	Performing operations with rational expressions
3.28	35	5	69	22	1	1	1	1	Understanding the concept of function
3.25	36	76	19	1	0	0	0	3	Using estimation to approximate solutions
3.24	37	3	31	17	46	1	0	1	Recalling theorems and more complex formulas when needed to solve a problem
3.24	38	4	24	8	63	0	0	1	Applying theorems to solve a problem
3.23	39	2	12	81	0	0	3	1	Knowing the difference between real and complex numbers
3.21	40	24	46	17	8	1	2	3	Solving several problems representing different aspects/components of a larger problem of scenario
3.10	41	33	43	10	9	0	2	3	Formulating new patterns or structures or scenario
3.10	42	0	57	39	1	0	1	1	Working with graphs of quadratic equations and functions
3.08	43	76	21	1	1	0	0	1	Converting units of measure
3.04	44	4	42	47	1	2	4	1	Working with functions (e.g., domain and range, composition, and inverses)
2.99	45	9	75	14	0	0	0	1	Working with linear relationships
2.90	46	71	23	1	3	0	0	2	Demonstrating concepts using manipulatives and/or pictorial representations
2.89	47	1	73	25	0	0	1	0	Solving systems of equations and inequalities graphically
2.80	48	49	15	2	33	0	0	1	Finding the area and perimeter of polygons and circles
2.75	49	1	68	28	0	0	1	1	Solving systems of two linear equations in two variables algebraically
2.66	50	4	47	11	34	1	1	2	Finding distances in the plane
2.63	51	16	39	22	3	1	10	9	Working with sets and set notation
2.58	52	30	40	13	3	0	4	11	Solving novel problems quickly
2.58	53	0	33	58	0	1	5	2	Performing polynomial long division
2.58	54	1	27	64	0	1	6	1	Determining roots of polynomial and rational equations algebraically
2.58	55	1	33	63	1	0	1	1	Using the discriminant
2.52	56	64	8	1	23	0	0	3	Understanding the scale on, for example, rulers and protractors
2.49	57	1	33	48	2	3	11	3	Recognizing relationships between a family of equations and their graphs
2.49	58	3	55	28	2	5	6	2	Using the graphical capabilities of a calculator

Note:
HS = High school teachers
PS = Postsecondary teachers (no remedial-course teachers)
Arith = Arithmetic course
Alg 1 = Algebra 1 course
Alg 2 = Algebra 2 course
Geo = Geometry course
Trig = Trigonometry course
Pcal = Precalculus course
NOT = Not taught

Postsecondary Algebra by Importance *(continued)*

PS		HS Course First Taught							
Alg 2	Rank	Arith	Alg 1	Alg 2	Geo	Trig	Pcal	NOT	
2.46	59	29	8	3	58	0	0	1	Applying properties of right, acute, and obtuse angles
2.42	60	49	39	8	0	0	1	2	Representing data (e.g., circle graphs, scatterplots, and frequency distributions)
2.38	61	1	4	86	0	1	6	2	Working with complex numbers
2.37	62	4	44	10	37	1	1	2	Finding midpoints in the plane
2.35	63	22	4	2	71	0	0	1	Applying properties of lines, segments, and rays
2.31	64	34	9	4	52	0	0	1	Finding volume (e.g., cylinders, prisms, and pyramids)
2.24	65	1	22	67	1	1	5	4	Solving quadratic inequalities
2.24	66	17	6	4	71	0	0	2	Working with circles (e.g., radius, diameter, arc, and chord)
2.15	67	29	11	4	54	0	0	1	Finding surface area
2.10	68	0	18	55	1	1	21	3	Determining maxima/minima for quadratic functions
2.08	69	0	3	75	1	5	13	3	Working with logarithmic and exponential functions
2.08	70	0	4	76	3	2	12	3	Graphing parabolas, circles, ellipses, and hyperbolas
2.07	71	18	15	5	60	0	0	2	Understanding relations between a scale factor and length, area, volume
2.07	72	9	8	4	77	0	0	1	Working with congruent and similar triangles
2.06	73	1	22	62	1	1	9	4	Approximating roots of polynomial and rational equations from graphs
2.03	74	10	7	2	79	0	0	1	Working with parallel lines, transversals, and angle measures
2.01	75	1	9	65	1	3	18	3	Implementing remainder and factor theorems
1.96	76	0	19	61	1	1	14	3	Working with graphs of rational functions
1.93	77	67	28	2	1	0	1	1	Finding the mean, median, and mode
1.92	78	5	22	31	31	1	8	3	Working with transformations graphically
1.90	79	0	6	72	3	4	14	3	Working with equations of parabolas, circles, ellipses, and hyperbolas
1.87	80	1	5	7	84	1	0	2	Working with side length relationships in 45-45-90 degree triangles and 30-60-90 degree triangles
1.87	81	3	24	40	14	1	13	5	Working with transformations algebraically
1.85	82	9	68	16	0	0	3	5	Determining a line of best-fit by eye for a set of data
1.85	83	7	68	21	1	1	2	1	Finding the volume of a function at a given point
1.82	84	45	25	7	12	0	2	8	Working with Venn diagrams
1.80	85	1	6	4	82	1	1	5	Constructing and/or critiquing proofs, either informal or formal
1.75	86	0	6	45	3	4	34	7	Working with discontinuous graphs
1.69	87	11	4	4	80	0	0	1	Working with properties of special quadrilaterals
1.63	88	42	27	16	1	1	6	7	Using counting techniques
1.62	89	3	11	13	58	9	5	2	Using right triangle trigonometry
1.62	90	7	45	24	2	2	6	14	Working with correlation
1.61	91	25	12	3	43	1	3	14	Finding the area of hybrid figures
1.61	92	0	3	37	27	2	13	18	Determining a locus of points
1.55	93	0	5	23	1	4	57	11	Understanding continuity
1.52	94	5	29	32	1	5	11	18	Using the statistical capabilities of a calculator
1.51	95	41	43	9	1	0	4	3	Computing the probability of a simple event
1.51	96	2	31	55	1	2	3	6	Performing matrix addition and multiplication
1.50	97	18	11	3	49	1	2	16	Finding the volume of hybrid figures
1.49	98	1	4	4	83	0	1	5	Working with logic statements (e.g., converse, contrapositive, and if-then)
1.49	99	2	21	20	1	3	11	41	Using the symbolic algebra capabilities of a calculator
1.44	100	11	29	30	4	3	13	10	Working with mutually exclusive, dependent, and independent events
1.41	101	6	12	47	2	2	21	11	Working with combinations, permutations, and the binomial theorem
1.38	102	2	12	32	2	4	15	34	Finding the variance and standard deviation of data
1.37	103	0	3	15	13	39	26	3	Using trigonometric identities
1.37	104	2	2	4	88	1	0	3	Working with inscribed and circumscribed polygons and circles
1.36	105	7	18	45	7	3	19	2	Working with series and sequences (e.g., arithmetic and geometric)
1.34	106	0	1	16	6	40	34	3	Using radian measure
1.34	107	2	12	28	1	5	14	39	Working with the normal distribution
1.34	108	0	3	15	14	40	25	3	Solving trigonometric equations
1.31	109	0	3	39	2	4	42	9	Working with sigma notation
1.30	110	0	13	72	1	1	5	7	Finding determinants
1.28	111	0	3	25	2	8	49	13	Working with parametric equations
1.25	112	0	2	7	0	3	74	13	Finding the limit of an expression
1.24	113	0	1	15	4	44	33	3	Working with graphs of trigonometric functions, including amplitude, period, and phase shift
1.23	114	1	8	47	4	3	27	10	Working with sequences that are defined recursively
1.23	115	0	3	16	25	34	21	2	Using the law of sines and law of cosines
1.20	116	0	4	45	7	2	34	7	Computing the sum of an infinite geometric series
1.15	117	0	1	10	15	26	37	12	Working with vectors in a plane

Note:
HS = High school teachers
PS = Postsecondary teachers (no remedial-course teachers)
Arith = Arithmetic course
Alg 1 = Algebra 1 course
Alg 2 = Algebra 2 course
Geo = Geometry course
Trig = Trigonometry course
Pcal = Precalculus course
NOT = Not taught

Reading "Not Taught" Percentages by Grade

Grade 9	Grade 10	Grade 11	Grade 12	Mean Rating	
7	11	20	25	4.64	Inferring the main idea(s) and purpose(s) of a paragraph or a text
0	9	14	23	4.61	Summarizing basic ideas and events in a text
0	9	3	19	4.61	Drawing conclusions from information given in a text
4	16	31	27	4.57	Determining main idea(s) and purpose(s) of a paragraph or a text by identifying ideas, key words and topic sentences
4	11	7	17	4.53	Understanding the point of view from which a text is told
4	9	14	22	4.51	Determining how details are used to support points made in a text
4	9	9	21	4.51	From a text, recognizing and recalling explicitly stated comparisons and contrasts
2	11	18	26	4.48	Determining the appropriate meaning of words and phrases from context
7	13	7	23	4.47	From a text, recognizing and recalling explicitly stated cause-effect relationships
4	9	11	19	4.44	Recognizing and recalling details explicitly stated in a text
11	11	14	23	4.44	Distinguishing between fact, opinion, and reasoned judgment
9	11	12	13	4.43	Making connections between a text and one's prior knowledge
7	16	10	20	4.41	Making reasonable inferences from a text about comparisons and contrasts
16	16	10	17	4.39	Evaluating information in a text for significance or importance
9	13	14	25	4.38	Locating and interpreting details subtly stated in a text
9	13	41	39	4.38	Reading independently for a variety of purposes (e.g., for enjoyment or information)
18	24	20	18	4.35	Identifying an author's unstated assumptions
9	20	8	21	4.35	Making reasonable inferences from a text about cause-effect relationships
17	7	17	16	4.34	Applying information gained from a text to new situations or problems
9	33	32	45	4.33	Applying strategies before, during, and after reading to increase fluency and comprehension
15	9	18	25	4.32	Using information implied in a text to make generalizations
7	16	26	36	4.31	Predicting outcomes based on a text
11	22	21	35	4.28	From a text, recognizing and recalling explicitly stated sequences
27	23	20	21	4.23	Evaluating information in a text for relevance
36	25	30	25	4.23	Evaluating information in a text for credibility and appropriateness of sources of information
16	20	31	41	4.22	Distinguishing between literal and figurative meanings of words and phrases
18	31	27	30	4.21	Recognizing and understanding the use of literary devices: symbolism
33	23	28	29	4.20	Evaluating information in a text for sufficiency of evidence in support of an argument or claim
13	18	23	28	4.18	Making connections between two or more subjects or disciplines (e.g., literature and history)
11	21	22	30	4.17	Making reasonable inferences from a text about sequences
11	16	33	26	4.15	Making connections between two or more texts
22	25	18	27	4.13	Determining from a text the evidence and sources of information used
22	24	43	32	4.13	Analyzing interactions between characters in a literary text
20	25	42	33	4.12	Recognizing and understanding the use of literary devices: irony
40	32	28	22	4.12	Evaluating information in a text for fair and accurate treatment of differing points of view
18	23	13	25	4.12	Recognizing how history and culture influence a text
22	23	21	28	4.09	Recognizing stereotypes in a text
27	11	24	27	4.05	Determining from a text the major claims made
44	41	38	30	4.03	Evaluating information in a text for general soundness of reasoning
33	18	42	31	4.00	Recognize how writing style helps shape the meaning of a given text
24	27	56	43	4.00	Recognizing and understanding the use of literary devices: metaphor/simile
20	31	68	65	4.00	Using a variety of "fix up" strategies (e.g., rereading, changing reading rate) to better comprehend a text
20	25	53	43	3.99	Recognizing and understanding the use of literary devices: foreshadowing
22	29	19	34	3.97	Drawing appropriate analogies
36	34	43	37	3.96	Recognizing and understanding the use of literary devices: satire
36	32	38	34	3.96	Evaluating information in a text for persuasive techniques (e.g., appeals, biased assumptions, loaded language)
32	24	20	37	3.94	Categorizing or classifying information in a text
16	25	40	32	3.90	Determining from a text the organizational pattern
29	14	13	22	3.83	Reading and demonstrating understanding of primary sources (e.g., letters, speeches)
43	42	42	34	3.83	Developing an alternative hypothesis or solution to one proposed in a text
26	50	79	58	3.82	Other reading strategy (Please specify.)
15	23	55	37	3.81	Reading and demonstrating understanding of prose fiction
50	43	59	58	3.79	Other skill relating to main ideas and author's approach (Please specify.)
46	44	40	44	3.79	Recognizing logical fallacies in a text
42	47	46	39	3.79	Evaluating information in a text for specificity
27	26	24	36	3.68	Reading and demonstrating understanding of editorials/opinion pieces
19	33	67	57	3.68	Recognizing and understanding the use of literary devices: Other skill relating to meanings of words (Please specify.)
42	31	32	39	3.60	Reading and demonstrating understanding of research studies
60	52	59	46	3.60	Evaluating information in a text for internal consistency
29	37	23	36	3.58	Reading and demonstrating understanding of news and feature articles
50	44	64	56	3.58	Other skill relating to supporting details (Please specify.)
58	55	51	48	3.57	Judging a text against generally recognized standards of quality or excellence
56	57	45	58	3.56	Other reading content (Please specify.)
60	62	22	52	3.55	Reading and demonstrating understanding of social sciences–based texts
27	31	59	49	3.54	Reading and demonstrating understanding of drama
70	67	70	67	3.52	Other skill relating to relationships (Please specify.)
37	41	31	36	3.50	Reading and demonstrating understanding of humanities-based texts
24	18	52	45	3.50	Reading and demonstrating understanding of poetry
47	45	53	44	3.50	Assessing the risks and benefits of an action described by a text
55	67	87	56	3.24	Other skill relating to generalizations and conclusions (Please specify.)
47	52	32	58	3.17	Reading and demonstrating understanding of graphs, charts, and diagrams
44	48	45	62	2.99	Reading and demonstrating understanding of "functional" text
79	92	88	80	2.76	Other text evaluation and judging skill (Please specify.)
53	53	49	74	2.63	Reading and demonstrating understanding of advertisements
84	84	78	88	2.07	Reading and demonstrating understanding of technical documents
93	88	94	96	1.69	Reading and demonstrating understanding of natural sciences-based texts

General Science Skill Items

	MS mean rating	SD	HS mean rating	SD	PS mean rating	SD
Interpretation of Data						
Understanding the basic features of, or data points in, tables or graphs	4.19	0.97	4.12	1.01	4.03	1.06
Translating data or other information into a graph or diagram	4.15	1.03	4.13	1.01	3.65	1.09
Predicting outcomes on the basis of given data	4.10	1.02	4.09	1.02	3.38	1.05
Applying statistical concepts and methods of data analysis to the results of an experiment	3.04	1.43	3.18	1.39	2.22	1.07
MEAN	**3.87**		**3.88**		**3.32**	
Scientific Investigation						
Understanding the components of an experimental design or procedure (e.g., identify the control)	4.30	0.99	4.05	1.10	3.16	1.16
Evaluating the similarities and differences, or the strengths and weaknesses, of experimental procedures	3.81	1.18	3.52	1.19	2.81	1.07
Identifying an alternative way of testing a hypothesis or scientific viewpoint, or identifying an alternative way of producing the same experimental results	3.45	1.30	3.18	1.28	2.73	1.06
Predicting outcomes based on the description or results of an experiment	4.18	0.95	3.93	1.09	3.24	1.08
Extending experimental procedures to new situations to gain new information	3.58	1.23	3.53	1.23	2.84	1.13
Designing and conducting an experiment	4.32	0.94	3.82	1.22	2.69	1.17
MEAN	**3.94**		**3.67**		**2.91**	
Evaluation of Models, Inferences, and Experimental Results						
Understanding the basic scientific concepts or assumptions underlying given information	4.23	1.02	4.32	0.92	3.76	1.08
Determining whether data or other information supports or is consistent with a stated hypothesis or conclusion	4.28	0.93	4.10	1.02	3.71	1.07
Selecting a hypothesis or conclusion that supports or is consistent with given data or other information	4.27	0.98	4.07	1.05	3.53	1.07
Evaluating the similarities and differences, or strengths and weaknesses, of scientific viewpoints	3.52	1.27	3.59	1.20	3.24	1.09
Selecting a generalization or model that is consistent with given data or other information	3.47	1.31	3.65	1.15	3.17	1.05
Predicting outcomes based on a scientific viewpoint	3.83	1.19	3.70	1.20	3.20	1.05
Extending scientific concepts or hypotheses to new situations to gain new information	3.63	1.19	3.65	1.13	3.14	1.09
Formulating a model using the results of an experiment	3.32	1.42	3.48	1.20	2.74	1.09
Communicating the results of an experiment through writing a properly organized report	4.10	1.16	4.07	1.17	3.38	1.25
MEAN	**3.85**		**3.85**		**3.32**	

Note:
MS = Middle school/junior high school teachers
HS = High school teachers
PS = Postsecondary teachers (no remedial-course teachers)
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

Ratings of Science Content and Skill Groupings

	No. of items	Mean	SD
Middle School/Junior High School Science			
Scientific Investigation	6	3.99	0.88
Interpretation of Data	4	3.90	0.85
Meteorology	13	3.84	1.21
Evaluation of Models, Inferences, and Experimental Results	9	3.83	0.87
Animal Systems	6	3.75	1.39
Taxonomy	3	3.70	1.38
Cell Biology	8	3.66	1.21
Environmental Science	6	3.65	1.16
Plants	3	3.62	1.29
Ecology	7	3.57	1.34
Fungi	3	3.45	1.14
Geology	24	3.35	1.27
Physical Science	78	3.24	1.08
Genetics and Heredity	8	3.17	1.41
Oceanography	6	3.14	1.50
Astronomy	17	3.08	1.37
Evolution	6	3.05	1.30
Microbiology	4	2.98	1.51
Biochemistry	6	2.72	1.23
High School Science			
Mechanics	15	4.51	0.49
Genetics and Heredity	11	4.37	0.68
Cell Biology	10	4.35	0.58
Meteorology	13	4.23	0.94
Ecology	7	4.05	1.05
Biochemistry	8	4.00	0.73
Interpretation of Data	4	3.98	0.85
Geology	24	3.97	0.78
Taxonomy	4	3.92	0.93
Astronomy	17	3.89	0.95
Evaluation of Models, Inferences, and Experimental Results	9	3.88	0.87
Evolution	8	3.85	0.96
Electricity and Magnetism	11	3.82	1.06
Waves: Light and Sound	9	3.78	0.92
Scientific Investigation	6	3.72	0.96
Plants	4	3.70	1.08
Microbiology	4	3.47	1.16
Oceanography	6	3.47	1.26
Animal Systems	7	3.46	1.03
Fungi	3	3.44	1.12
Environmental Science	6	3.37	1.32
Chemistry Topics	56	3.34	0.75
Thermal Physics	8	3.33	1.32
Properties of Matter	6	2.94	1.25
Modern Physics	5	2.79	1.27
Postsecondary Science			
Interpretation of Data	4	3.32	0.82
Evaluation of Models, Inferences, and Experimental Results	9	3.32	0.82
Evolution	8	3.02	1.09
Biochemistry	8	2.95	0.92
Cell Biology	10	2.92	0.93
Scientific Investigation	6	2.91	0.89
Ecology	7	2.88	1.11
Genetics and Heredity	11	2.87	0.97
Taxonomy	4	2.78	1.06
Animal Systems	7	2.75	0.97
Plants	4	2.70	1.08
Mechanics	15	2.58	1.08
Fungi	3	2.55	1.13
Environmental Science	6	2.53	1.10
Geology	24	2.50	0.95
Properties of Matter	6	2.47	0.93
Waves: Light and Sound	9	2.38	1.06
Meteorology	13	2.34	1.04
Chemistry Topics	56	2.31	0.71
Thermal Physics	8	2.28	1.00
Microbiology	4	2.26	0.99
Oceanography	6	2.25	1.03
Electricity and Magnetism	11	2.22	1.20
Modern Physics	5	1.88	1.06

Note:
SD = Standard deviation. A measure of the range of values in a set of numbers. The more spread apart the data, the higher the standard deviation.

To help schools derive maximum benefit from their participation in ACT programs and services, ACT maintains a staff of consultants in regional offices. If you need additional ACT information or assistance, please contact the ACT office that serves your state.

ACT Offices

ACT National Office

500 ACT Drive
P.O. Box 168
Iowa City, IA 52243-0168
Telephone: 319/337-1000

West Region

2880 Sunrise Blvd., Suite 214
Rancho Cordova, CA 95742-6549
Telephone: 916/631-9200
Fax: 916/631-8263

3131 S. Vaughn Way, Suite 218
Aurora, CO 80014-3507
Telephone: 303/337-3273
Fax: 303/337-2613

Southwest Region

8303 MoPac Expressway N.,
Suite A-110
Austin, TX 78759-8369
Telephone: 512/345-1949
Fax: 512/345-2997

Midwest Region

300 Knightsbridge Parkway, Suite 300
Lincolnshire, IL 60069-9498
Telephone: 847/634-2560
Fax: 847/634-1074

700 Taylor Road, Suite 210
Gahanna, OH 43230-3318
Telephone: 614/470-9828
Fax: 614/470-9830

East Region

4 Pine West Plaza, Suite 403
Albany, NY 12205-5564
Telephone: 518/869-7378
Fax: 518/869-7392

3355 Lenox Rd. N.E., Suite 320
Atlanta, GA 30326-1332
Telephone: 404/231-1952
Fax: 404/231-5945

1315 E. Lafayette St., Suite A
Tallahassee, FL 32301-4757
Telephone: 850/878-2729
Fax: 850/877-8114

Washington, DC Office

One Dupont Circle N.W., Suite 340
Washington, DC 20036-1170
Telephone: 202/223-2318
Fax: 202/293-2223

Hunt Valley Office

Executive Plaza I, Suite 200
11350 McCormick Rd.
Hunt Valley, MD 21031-1080
Telephone: 410/584-8000
Fax: 410/785-1714

Olathe Office

1365 N. Winchester St.
Olathe, KS 66061-5880
Telephone: 913/768-1696
Fax: 913/768-0184