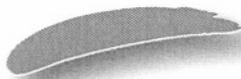


# COLLEGE READINESS



COLORADO

Nationally, 51 percent of 2005 ACT-tested high school graduates are ready for college-level reading.

**ACT**<sup>®</sup>

## Reading Between the Lines: What the ACT Reveals About College Readiness in Reading

### Executive Summary for Colorado

Based on 2005 ACT-tested Colorado high school graduates, 48 percent are ready for college-level reading. What's worse, more Colorado students are on track to being ready for college-level reading in eighth and tenth grade than are actually ready by the time they reach twelfth grade.

College readiness—the level of preparation students need in order to be ready to enroll and succeed without remediation in credit-bearing entry-level coursework at a two- or four-year institution, trade school, or technical school—is currently inadequate and should be an expectation for all high school students.

It is also recognized today that the knowledge and skills needed for college are equivalent to those needed in the workplace (American Diploma Project, 2004; Barth, 2003). We and others have documented that improving college and workforce readiness is critical to developing a diverse and talented labor force that will help ensure our nation's economic competitiveness in a growing global economy (Callan & Finney, 2003; Cohen, 2002; Somerville & Yi, 2002).

Reading is an essential component of college and workplace readiness. Low literacy levels often prevent students from mastering other subjects (Alliance for Excellent Education, 2002). Poor readers struggle to learn in text-heavy courses and are frequently blocked from taking academically more challenging courses (Au, 2000).

Much has been written about the literacy problem in U.S. high schools. Approximately six million of the nation's secondary school students are reading well below grade level (Alliance for Excellent Education, 2002, 2003). More than 3,000 students drop out of high school every day (Alliance for Excellent Education, 2003), and one of the most commonly cited reasons for the dropout rate is that students do not have the literacy skills to keep up with the curriculum (Kamil, 2003; Snow & Biancarosa, 2003).

Students at the college level are not faring much better. Eleven percent of entering postsecondary school students are enrolled in remedial reading coursework (National Center for Education Statistics, 2003). Seventy percent of students who took one or more remedial reading courses do not attain a college degree or certificate within eight years of enrollment (Adelman, 2004).

According to Greene (2000), the shortage of basic literacy skills costs U.S. businesses, universities, and underprepared high school graduates as much as \$16 billion per year in decreased productivity and remedial costs.

ACT data suggest that the readiness of the nation's high school students for college-level reading is far too low. But ACT data also show that, while it is important for students to be able to comprehend both explicit and implicit material in texts, as well as to understand how various textual elements (such as main ideas, relationships, or generalizations) function in a text, **the clearest differentiator in reading between students who are college ready and students who are not is the ability to comprehend complex texts.** These results are summarized below and are followed by recommended action steps that Colorado policymakers and educators can take to help all students read at the level of proficiency necessary to ensure that they are ready to succeed in college without remediation.

1. **Only 48 percent of 2005 ACT-tested Colorado high school graduates are ready for college-level reading—and, what's worse, more students are on track to being ready for college-level reading in eighth and tenth grade than actually are ready by the time they reach twelfth grade.**
  - **Just under half of Colorado students are able to meet the demands of college-level reading, based on ACT's readiness indicator.** Only 48 percent of ACT-tested Colorado high school graduates met ACT's College Readiness Benchmark for Reading, demonstrating their readiness to handle the reading requirements for typical credit-bearing first-year college coursework, based on the 2004–2005 results of the ACT.\* This percentage is less than that seen nationally. ACT's College Readiness Benchmark for Reading represents the level of achievement required for students to have a high probability of success (a 75 percent chance of earning a course grade of C or better, a 50 percent chance of earning a B or better) in such college courses as Psychology or U.S. History—first-year courses generally considered to be typically reading dependent.
  - **Unfortunately, the percentage of Colorado students who are ready for college-level reading is substantially smaller in some groups.** As shown in the figure below, male students, African American students, Asian American students, Hispanic American students, Native American students, and students from families whose yearly income is below

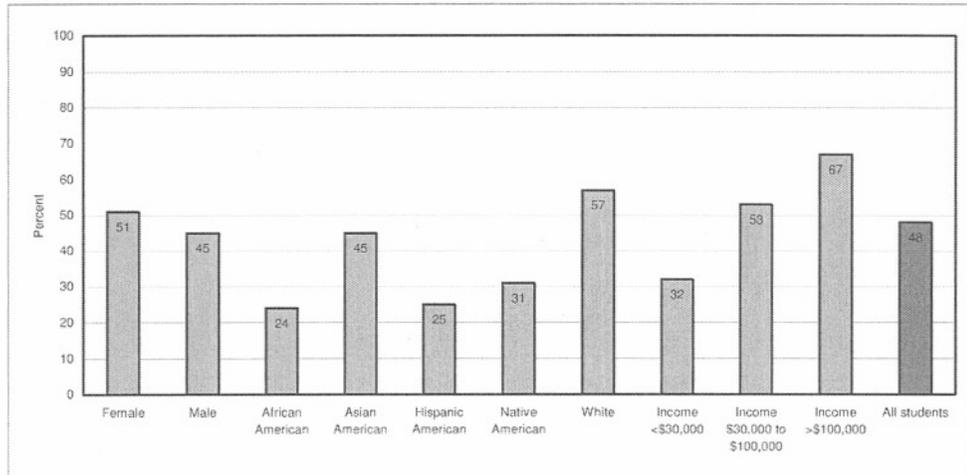
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\* The findings in this report are based on the performance of Colorado's students who took the ACT. The ACT participation rate is an indicator of the extent to which students are encouraged to consider, and are provided opportunities to prepare for, postsecondary education. In 2004–2005, approximately 47,400 high school graduates in Colorado took the ACT, a figure representing **100 percent** of the Colorado graduating class of 2005.

The college readiness results in reading for these ACT-tested graduates are accompanied in many cases by the national results as a basis for comparison. Throughout this document, some data may be missing due to the lack of sufficient numbers of students on which to base reliable conclusions. To learn more about ACT's analysis of national college readiness in reading, please consult the report entitled *Reading Between the Lines: What the ACT Reveals About College Readiness in Reading*. You may access the report on line at <http://www.act.org/path/policy/index.html> or contact ACT at (319) 337-1353 for a paper copy.

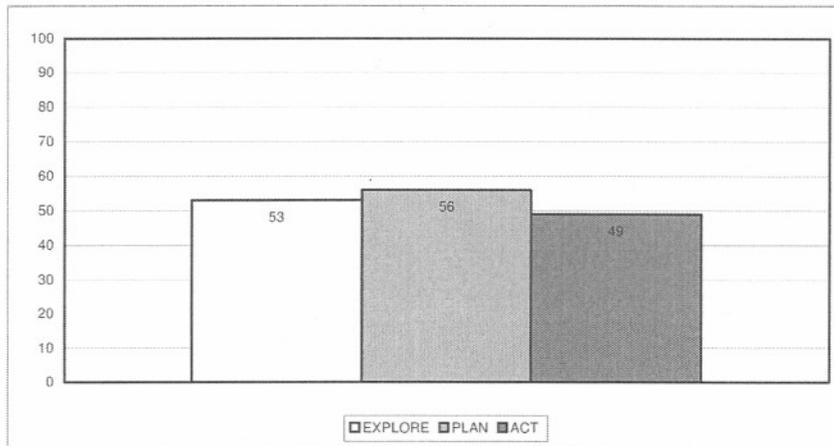
\$30,000 in Colorado are less likely than that of the Colorado population as a whole to be ready for college-level reading—in some instances, as much as one and a half to two times less.

*2005 ACT-tested Colorado High School Graduates Meeting ACT College Readiness Benchmark for Reading*



- More eighth- and tenth-graders nationally are on track to being ready for college-level reading than are actually ready when they graduate from high school. The same trend is occurring in Colorado. ACT has developed College Readiness Benchmarks for the eighth- and tenth-grade components of its early college readiness preparation system, EPAS™ (which includes EXPLORE®, PLAN®, and the ACT). These Benchmarks are based on the College Readiness Benchmarks for the ACT, adjusted to reflect expected growth between eighth and tenth grades and between tenth and twelfth grades. The figure below shows that, in a combined testing population of four recent cohorts of Colorado students who participated in all three EPAS programs, 53 percent of Colorado's eighth-grade students are on track to being ready for college-level reading by the time they graduate from high school. The percentage of these same students who are on track to being ready increases slightly when they reach the tenth grade. However, by the time they take the ACT, a smaller percentage of these same students are actually college ready in reading.

*EXPLORE-, PLAN-, and ACT-tested Colorado Students Meeting Reading Benchmarks, 1998–2002 to 2001–2005 (Combined)*



- State standards in high school reading may be insufficient—or nonexistent. The ACT is a curriculum-based college readiness test. Its specifications are based on ACT’s National Curriculum Survey<sup>®</sup>, which is conducted every two to three years. The results of the Survey define what is taught in high schools that is deemed most important for success in entry-level college coursework, and these skills are reflected in ACT’s College Readiness Standards, which describe what students need to know to be ready for college. As of December 2005, ACT has compared its College Readiness Standards to the state standards in thirty-five states.\*

Why are Colorado students losing momentum in high school? One reason may be that they are not being asked to meet specific, rigorous reading standards during their high school years—a time when it is crucial for them to continue refining their reading skills. Our research indicates that 28 of the 49 states with standards—more than half—fully define grade-level standards in reading only through the eighth grade.

- At the high school level, 20 of these 28 states specify only a single group of reading standards intended to cover grades 9 through 12, standards that do not recognize expectations for increasing proficiency in reading during those years.
- Six additional states specify standards for only one, two, or three high school grades, ignoring the other grades altogether.
- Two additional states specify just one set of standards for a subset of grades.

Overall (including Iowa, which has not identified state standards), nearly 60 percent—29 states—do not have grade-specific standards that define the expectations for reading achievement in high school. If such

\* For a copy of the full report documenting the comparison between Colorado’s standards and ACT’s College Readiness Standards, which covers grades 7 through 12 and each of ACT’s three EPAS assessments (EXPLORE, PLAN, and the ACT), please contact ACT at [statematch@act.org](mailto:statematch@act.org).

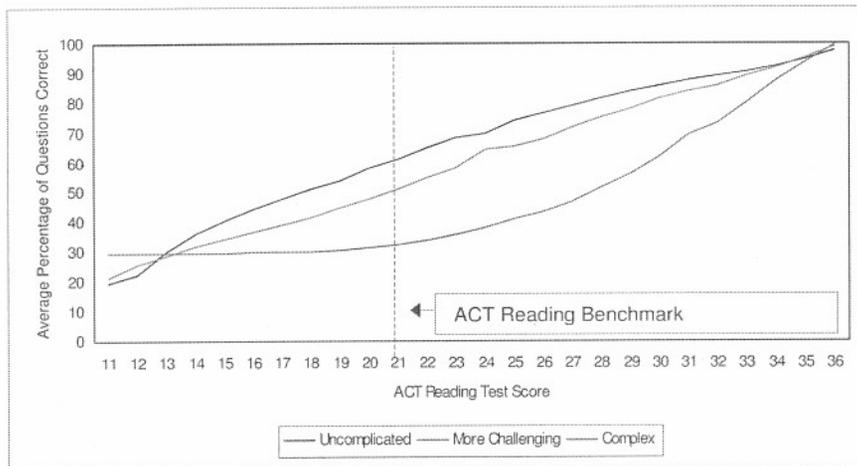
standards don't exist, teachers can't teach to them and students can't learn them. You can't get what you don't ask for.

- **Beyond-core coursework in social studies only slightly improves Colorado students' ACT Reading Test score.** ACT research has well documented the strong positive impact of taking rigorous courses in high school, particularly in English, mathematics, and science (ACT, Inc., 2004). According to 2005 national data, students who take additional, beyond-core science courses (i.e., Physics) earn ACT Science Test scores that are up to 3 points higher, on average, than the scores of students who take only the core science curriculum. In mathematics, students who take additional courses (i.e., advanced math beyond Algebra II) have ACT Mathematics Test scores that are up to 6.8 points higher, on average, than the scores of students who take only the core mathematics curriculum. These increases are on a score scale ranging from 1 to 36 and represent statistically significant gains. However, additional coursework in social studies—the high school subject area that overlaps most closely with the kinds of college social sciences courses used to establish the ACT College Readiness Benchmark for Reading—results in an average ACT Reading Test score no more than 1 point higher than that associated with the recommended three years of social studies. And this includes even those students who took the equivalent of five years of social studies in high school. For Colorado students, the comparable score increase is 1 point.

This suggests that taking additional years of social studies coursework alone does not have a large differential impact on the readiness of ACT-tested students to handle the level of reading required in college social sciences courses. However, what appears to matter in readiness for college-level reading is not the *number* of courses students take, but what is being asked of students in these courses. We examined student performance on the ACT Reading Test in an attempt to answer the question of what *really* matters in reading.

2. **Nationally, those ACT-tested students who can read *complex* texts are more likely to be ready for college. Those who cannot read complex texts are less likely to be ready for college.**
  - **Performance on complex texts is the clearest differentiator in reading between students who are more likely to be ready for college and those who are less likely to be ready.** Texts used in the ACT Reading Test reflect three degrees of complexity: uncomplicated, more challenging, and complex. The results of the analysis by degree of text complexity are presented below.

*Performance on the ACT Reading Test by Degree of Text Complexity (Averaged across Seven Forms)*



In this figure, student performance on questions associated with uncomplicated and more challenging texts shows no difference across the score range, either above or below the ACT College Readiness Benchmark for Reading. Improvement on each of the two kinds of questions is uniform and gradual—that is, as performance on one kind of text increases, so does performance on the other, and to almost exactly the same degree. Certainly, increased proficiency with these texts is helpful to all students, but given these steadily increasing linear relationships between ACT Reading Test score and reading proficiency, there is no clear differentiator here between those students who are ready for college-level reading and those who are not.

But when we look at performance on questions associated with complex texts, we see a substantially different pattern. Below the Reading Benchmark, the percentage of questions answered correctly remains virtually constant—and not much higher than the level suggested by chance (25 percent, given that each question contains four answer choices). Most importantly, above the Reading Benchmark performance improves more steeply than it does with either of the other two levels of text complexity, indicating that students who can master the skills necessary to read and understand complex texts are more likely to be college ready than those who cannot. It is not until the uppermost end of the score scale that student performance on questions associated with all three degrees of text complexity is roughly the same.

What does this mean? Because of its distinct pattern of performance increases relative to the ACT College Readiness Benchmark, *performance on complex texts is the clearest differentiator in reading between students who are likely to be ready for college and those who are not.* And this is true for both genders, all racial/ethnic groups, and all annual family income levels.

A complex text can be described with respect to the following six aspects (which can be abbreviated to “RSVP”):

- **Relationships:** Interactions among ideas or characters in the text are subtle, involved, or deeply embedded.
  - **Richness:** The text possesses a sizable amount of highly sophisticated information conveyed through data or literary devices.
  - **Structure:** The text is organized in ways that are elaborate and sometimes unconventional.
  - **Style:** The author's tone and use of language are often intricate.
  - **Vocabulary:** The author's choice of words is demanding and highly context dependent.
  - **Purpose:** The author's intent in writing the text is implicit and sometimes ambiguous.
- **Colorado state standards do not address text complexity.** Although 10 of the 49 states with standards provide names of works or authors that could be used as indices of the complexity of recommended high school reading material, *none* of the 49 state standards attempts to define explicitly the degree of complexity a specific grade-level text should have. Relationships, Richness, Structure, Style, Vocabulary, Purpose—none of these “RSVP” aspects is described in detail anywhere in Colorado’s reading standards. So, just as with grade-specific state reading standards, when it comes to defining and requiring certain specific levels of complexity in students’ high school reading materials, we’re getting what we’re asking for. And Colorado students’ college and workplace readiness is the worse for it.
3. **We can no longer afford to ignore reading instruction in high school. Something must be done to improve the reading proficiency of all Colorado students.**

- **Strengthen reading instruction in *all* high school courses in Colorado by incorporating complex reading materials into course content.** The type of text to which students are exposed in high school has a significant impact on their readiness for college-level reading. Specifically, students need to be able to read complex texts if they are to be ready for college. All courses in high school, not just English and social studies but mathematics and science as well, must challenge students to read and understand complex texts. In most cases, a complex text will contain multiple layers of meaning, not all of which will be immediately apparent to students upon a single superficial reading. Rather, such texts require students to work at unlocking meaning by calling upon sophisticated reading comprehension skills and strategies.

Certainly, Colorado students will need to make the effort, both inside and outside of school, to enhance their comprehension of complex texts. But in a nation where 13- and 17-year-olds have increasingly less exposure to or interaction with books outside of the classroom, high schools must still play the primary role in providing students with the kinds of complex reading materials and experiences they need in order to be college and work ready and must continue to teach and reinforce reading strategies that deal with increasingly more complex reading tasks.

Colorado students must have the opportunity to improve their reading skills and strategies at a time when they need to build upon the

foundational skills in reading that they developed when they entered high school. They must be given more opportunities to read challenging materials across the curriculum so that they are better positioned to comprehend complex texts in all subjects once they enter college or the workplace.

- **Revise Colorado state standards so that they both explicitly define reading expectations across the high school curriculum and incorporate increasingly complex texts into the English, mathematics, science, and social studies courses in grades 9 through 12.** Without specific reading standards across the curriculum, teachers cannot be expected to know what level of reading proficiency students should be expected to attain or what degree of text complexity is appropriate in each subject and grade. Reading standards that address text complexity should be embedded in English, mathematics, science, and social studies standards.
- **Make targeted interventions to help Colorado students who have fallen behind in their reading skills.** As we strengthen high school courses and state standards with respect to text complexity, we must also address the reading skills of those students who begin high school with reading deficiencies. Such deficiencies need to be diagnosed much earlier, in upper elementary and middle school, so that earlier interventions can be made. If a greater number of Colorado students can be identified and helped before they reach high school, they will be more likely to have developed the necessary foundational reading skills upon which college-ready skills can be based.
- **Provide high school teachers in Colorado with guidance and support to strengthen reading instruction and to incorporate the kinds of complex texts that are most likely to increase students' readiness for college-level reading.** Teachers need the support and professional development opportunities necessary to ensure that they understand the types of reading skills Colorado students need to have by the time they graduate from high school.
- **Strengthen Colorado high school assessments so that they align with improved state standards and high school instruction across the curriculum.** As we strengthen the high school curriculum by incorporating complex reading materials into all courses as defined by improved state standards, so must we also reflect this greater degree of complexity in the high-stakes assessments that Colorado high school students take. These assessments need to reflect a wider range of reading materials by including complex texts in all subject areas.

## Action Steps

### *What Can Colorado Policymakers Do?*

- Consistent with the National Governors Association's recommendation that comprehensive literacy plans be developed in each state (NGA Center for Best Practices, 2005), incorporate reading expectations into state standards across the curriculum so that they specify the inclusion,

by grade level, of increasingly complex reading materials in English, mathematics, science, and social studies.

- Build support for a legislative focus on improving reading achievement in middle school and high school.
- Encourage local efforts to improve reading achievement at the school and district levels.
- Disseminate best practices found in middle schools and high schools that are achieving results and promote similar efforts on a wider scale.
- Increase funding for school or district programs that improve middle-school and high-school reading achievement.
- Provide resources for professional development opportunities for teachers so that they are equipped to provide the necessary reading instruction in their subject areas and grade levels.
- Make provisions both for assessing students' college readiness in reading to evaluate their progress and for making timely interventions when they encounter difficulties.

#### *What Can Colorado Educators Do?*

- Consistent with the National Governors Association's recommendation that schools and districts develop comprehensive literacy plans, incorporate reading expectations into state standards across the curriculum so that they specify the inclusion, by grade level, of increasingly complex reading materials in English, mathematics, science, and social studies.
- Diagnose reading deficiencies and intervene earlier, before high school.
- Incorporate complex reading materials into all high school courses, not just English and social studies, to strengthen students' reading skills throughout high school.
- Require all teachers in all courses to teach reading strategies so that students are able to progress from comprehension of simpler texts to comprehension of more complex texts.
- Push students to read texts that are personally challenging, and support their efforts by giving them a variety of critical reading strategies to use.
- Systematically assess students' college readiness in reading to evaluate their progress and make timely interventions when they encounter difficulties.

These are important and far-reaching missions that no one group of concerned individuals in Colorado can accomplish alone. Teachers, school administrators, and policymakers have crucial roles to play. By helping all Colorado students to become better readers, they can become ready to succeed in college and work. It's a difficult goal, but a worthy one. And with greater effort on all our parts, it's a goal we can achieve.

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# State Integrated Summary 2004-2005

## Colorado - All Schools



### AP: Performance & Participation Overview

	Colorado - All Schools				Nation - All Schools			
	# of Test Takers	% of Total	# of Exams Taken	# of Grades 3-5	# of Test Takers	% of Total	# of Exams Taken	# of Grades 3-5
<b>All</b>								
Total	20,453	100.0%	33,764	21,017	1,221,016	100.0%	2,105,803	1,254,626
Change from last year	+9.6%		+12.0%	+8.8%	+10.8%		+11.5%	+7.9%
<b>Gender</b>								
Male	8,795	43.0%	14,821	9,584	531,921	43.6%	947,169	598,682
Change from last year	+8.0%		+11.2%	+6.9%	+10.1%		+10.6%	+7.9%
Female	11,658	57.0%	18,943	11,433	689,095	56.4%	1,158,634	655,944
Change from last year	+10.8%		+12.6%	+10.4%	+11.4%		+12.3%	+7.8%
<b>Ethnic Group</b>								
American Indian	131	0.6%	197	120	5,707	0.5%	9,012	3,978
Change from last year	+24.8%		+30.5%	+41.2%	+13.9%		+15.4%	+10.0%
Asian	1,209	5.9%	2,262	1,331	143,117	11.7%	290,221	185,912
Change from last year	+7.2%		+15.3%	+12.7%	+12.7%		+13.7%	+12.8%
Black	550	2.7%	861	283	68,447	5.6%	104,656	29,958
Change from last year	+16.8%		+25.7%	+13.2%	+18.7%		+19.2%	+7.7%
Hispanic Overall	1,786	8.7%	2,651	1,269	151,152	12.4%	240,432	112,709
Change from last year	+22.4%		+24.8%	+20.7%	+14.5%		+16.6%	+8.5%
<i>Mexican American</i>	1,061	5.2%	1,557	677	76,802	6.3%	121,376	51,154
Change from last year	+28.0%		+27.7%	+17.1%	+15.6%		+17.4%	+8.0%
<i>Puerto Rican</i>	64	0.3%	116	86	9,271	0.8%	14,391	6,892
Change from last year	+10.3%		+24.7%	+72.0%	+12.2%		+14.5%	+10.9%
<i>Other Hispanic</i>	661	3.2%	978	506	65,079	5.3%	104,665	54,663
Change from last year	+15.6%		+20.3%	+19.6%	+13.4%		+15.9%	+8.7%
White	15,677	76.6%	25,947	16,883	772,700	63.3%	1,323,850	840,675
Change from last year	+7.6%		+9.2%	+6.5%	+8.6%		+9.3%	+6.5%
Other	581	2.8%	1,011	630	42,071	3.4%	74,881	44,794
Change from last year	+4.7%		+14.4%	+16.7%	+7.7%		+7.4%	+5.2%
No Response	519	2.5%	835	501	37,822	3.1%	62,751	36,600
Change from last year	+41.8%		+46.5%	+37.6%	+29.2%		+26.9%	+18.4%

AP: Exam Participation & Performance (Part 1 of 3)

	'03-'04							'04-'05						
	# of Exams	% of Total	Score of 1	Score of 2	Score of 3	Score of 4	Score of 5	# of Exams	% of Total	Score of 1	Score of 2	Score of 3	Score of 4	Score of 5
Total # of Exams	30,144	100%	3,858	6,964	8,910	6,441	3,971	33,764	100%	4,672	8,075	9,521	7,151	4,345
Art: History of % of Total	130	0%	4 3%	14 11%	54 42%	52 40%	6 5%	128	0%	5 4%	23 18%	47 37%	37 29%	16 13%
Art: Studio-2D Design % of Total	87	0%	2 2%	23 26%	40 46%	20 23%	2 2%	114	0%	9 8%	38 33%	34 30%	23 20%	10 9%
Art: Studio-3D Design % of Total	42	0%	5 12%	10 24%	14 33%	6 14%	7 17%	38	0%	5 13%	5 13%	15 39%	7 18%	6 16%
Art: Drawing Portfolio % of Total	136	0%	9 7%	43 32%	51 38%	27 20%	6 4%	178	1%	5 3%	44 25%	76 43%	42 24%	11 6%
Biology % of Total	1,481	5%	201 14%	349 24%	336 23%	322 22%	273 18%	1,696	5%	212 13%	398 23%	442 26%	376 22%	268 16%
Chemistry % of Total	1,348	4%	336 25%	267 20%	332 25%	221 16%	192 14%	1,509	4%	336 22%	327 22%	334 22%	289 19%	223 15%
Computer Science A % of Total	166	1%	58 35%	18 11%	28 17%	39 23%	23 14%	161	0%	49 30%	21 13%	33 20%	35 22%	23 14%
Computer Science AB % of Total	91	0%	29 32%	10 11%	19 21%	14 15%	19 21%	75	0%	26 35%	3 4%	18 24%	12 16%	16 21%
Economics: Macroeconomics % of Total	369	1%	46 12%	125 34%	86 23%	76 21%	36 10%	382	1%	61 16%	98 26%	68 18%	120 31%	35 9%
Economics: Microeconomics % of Total	260	1%	20 8%	52 20%	87 33%	71 27%	30 12%	271	1%	30 11%	47 17%	71 26%	84 31%	39 14%
English Language & Composition % of Total	3,584	12%	143 4%	1,047 29%	1,328 37%	758 21%	308 9%	4,191	12%	223 5%	1,185 28%	1,574 38%	805 19%	404 10%
English Literature & Composition % of Total	4,255	14%	234 5%	1,161 27%	1,546 36%	920 22%	394 9%	4,592	14%	228 5%	1,292 28%	1,589 35%	1,043 23%	440 10%
Environmental Science % of Total	201	1%	34 17%	38 19%	43 21%	66 33%	20 10%	256	1%	57 22%	46 18%	52 20%	71 28%	30 12%
French Language % of Total	309	1%	75 24%	67 22%	90 29%	52 17%	25 8%	395	1%	88 22%	96 24%	108 27%	62 16%	41 10%

# State Integrated Summary 2004-2005



## Colorado - All Schools

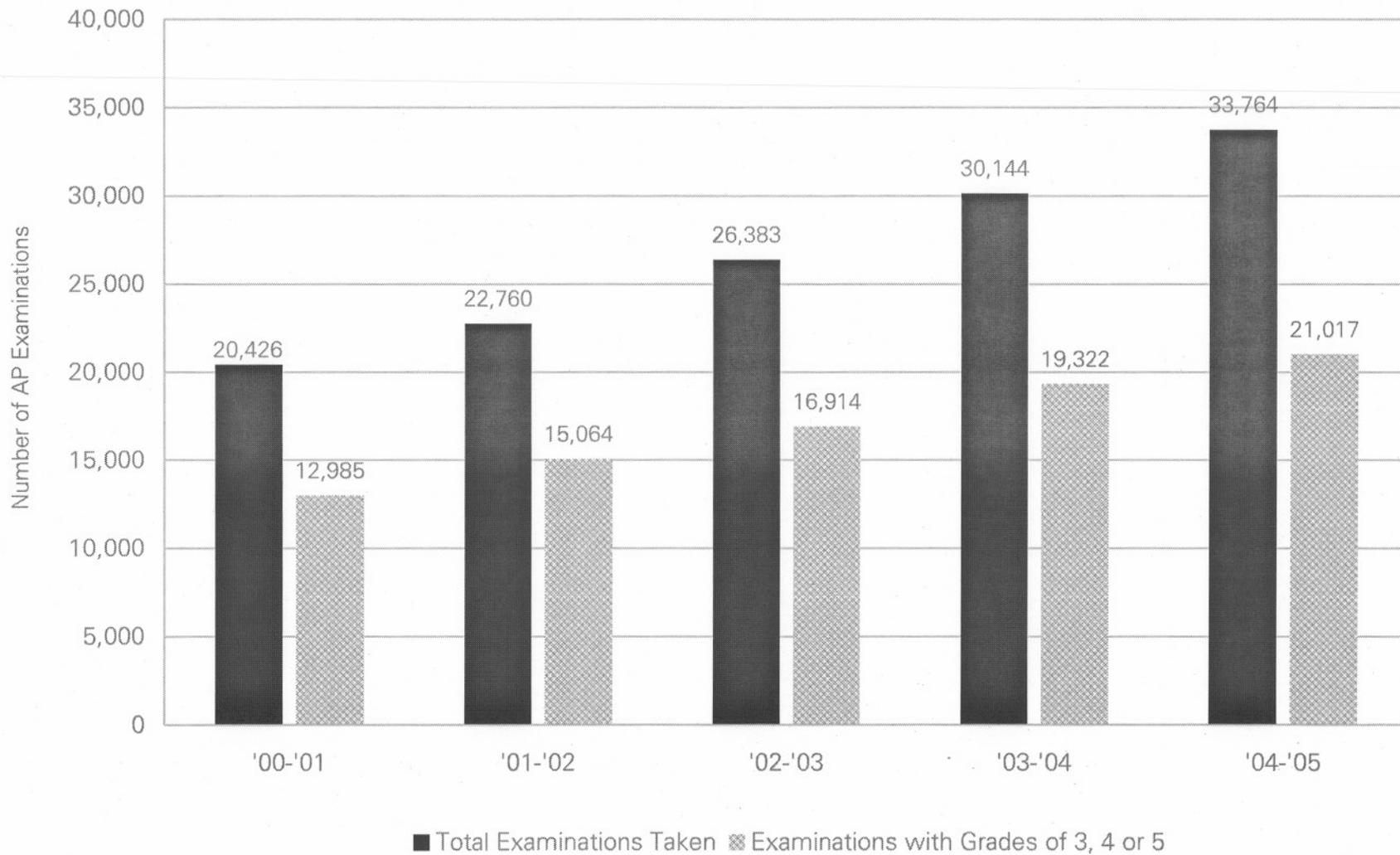
### AP: Exam Participation & Performance (Part 2 of 3)

	'03-'04					'04-'05								
	# of Exams	% of Total	Score of 1	Score of 2	Score of 3	Score of 4	Score of 5	# of Exams	% of Total	Score of 1	Score of 2	Score of 3	Score of 4	Score of 5
French Literature % of Total	27	0%	2 7%	2 7%	4 15%	6 22%	13 48%	39	0%	4 10%	7 18%	14 36%	11 28%	3 8%
German Language % of Total	119	0%	17 14%	30 25%	34 29%	18 15%	20 17%	118	0%	17 14%	34 29%	29 25%	23 19%	15 13%
Government & Politics: Comparative % of Total	136	0%	1 1%	12 9%	47 35%	32 24%	44 32%	153	0%	5 3%	21 14%	53 35%	34 22%	40 26%
Government & Politics: United States % of Total	1,098	4%	111 10%	350 32%	335 31%	236 21%	66 6%	1,513	4%	126 8%	492 33%	488 32%	294 19%	113 7%
History: European % of Total	1,813	6%	268 15%	353 19%	734 40%	284 16%	174 10%	1,925	6%	306 16%	352 18%	711 37%	370 19%	186 10%
History: United States % of Total	4,431	15%	729 16%	1,209 27%	1,198 27%	897 20%	398 9%	4,366	13%	927 21%	1,334 31%	960 22%	813 19%	332 8%
History: World % of Total	494	2%	73 15%	112 23%	152 31%	92 19%	65 13%	825	2%	123 15%	182 22%	242 29%	176 21%	102 12%
Human Geography % of Total	898	3%	88 10%	136 15%	232 26%	260 29%	182 20%	1,059	3%	101 10%	173 16%	296 28%	298 28%	191 18%
Latin: Literature % of Total	8	0%	1 13%	1 13%	5 63%	1 13%	0 0%	18	0%	5 28%	7 39%	3 17%	1 6%	2 11%
Latin: Vergil % of Total	24	0%	3 13%	5 21%	8 33%	6 25%	2 8%	25	0%	1 4%	3 12%	13 52%	5 20%	3 12%
Mathematics: Calculus AB % of Total	2,593	9%	581 22%	491 19%	517 20%	575 22%	429 17%	2,763	8%	677 25%	542 20%	518 19%	561 20%	465 17%
Mathematics: Calculus BC % of Total	1,220	4%	148 12%	111 9%	292 24%	246 20%	423 35%	1,397	4%	185 13%	139 10%	302 22%	262 19%	509 36%
Music: Theory % of Total	129	0%	1 1%	22 17%	37 29%	33 26%	36 28%	136	0%	1 1%	26 19%	50 37%	29 21%	30 22%
Physics B % of Total	454	2%	76 17%	73 16%	167 37%	93 20%	45 10%	548	2%	92 17%	94 17%	177 32%	102 19%	83 15%

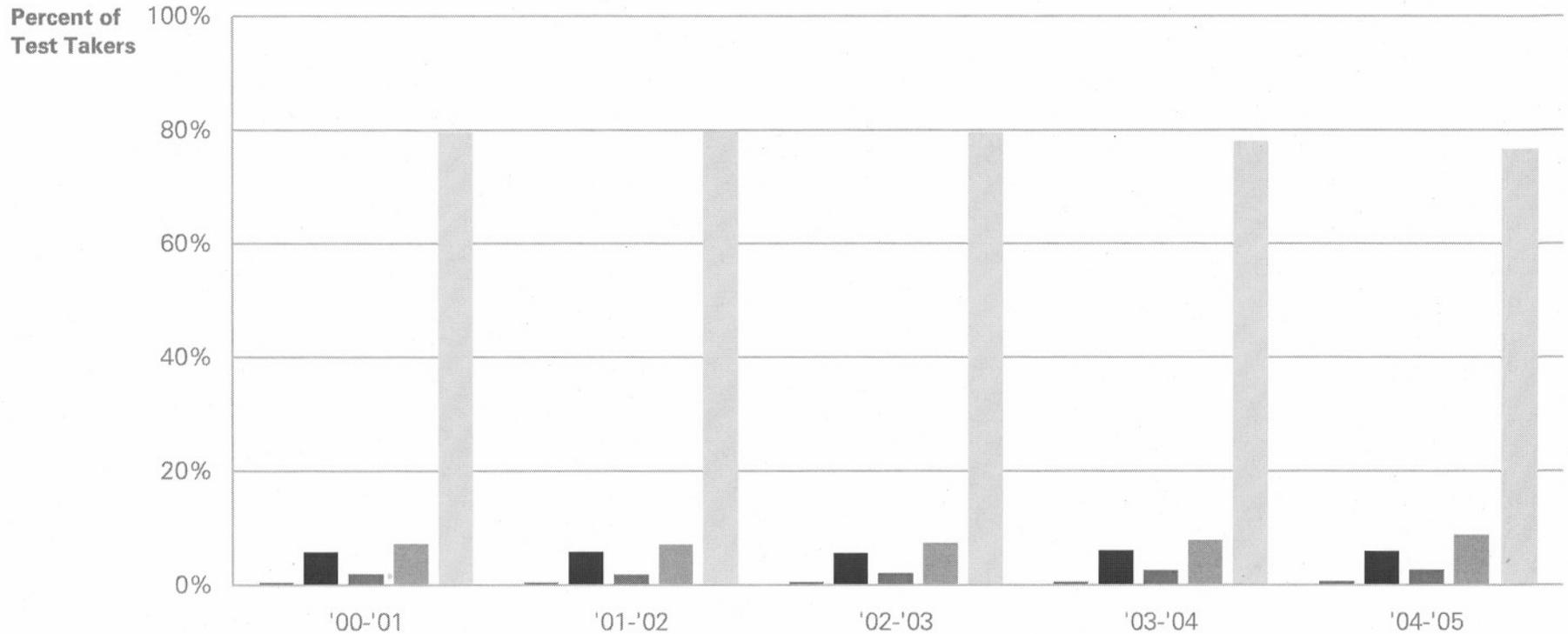
**AP: Exam Participation & Performance (Part 3 of 3)**

	'03-'04					'04-'05								
	# of Exams	% of Total	Score of 1	Score of 2	Score of 3	Score of 4	Score of 5	# of Exams	% of Total	Score of 1	Score of 2	Score of 3	Score of 4	Score of 5
Physics C: Electricity & Magnetism % of Total	314	1%	62 20%	49 16%	45 14%	80 25%	78 25%	277	1%	58 21%	76 27%	34 12%	56 20%	53 19%
Physics C: Mechanics % of Total	519	2%	40 8%	115 22%	136 26%	116 22%	112 22%	500	1%	69 14%	122 24%	127 25%	114 23%	68 14%
Psychology % of Total	862	3%	74 9%	136 16%	240 28%	225 26%	187 22%	1,166	3%	173 15%	191 16%	233 20%	355 30%	214 18%
Spanish Language % of Total	1,258	4%	161 13%	255 20%	306 24%	303 24%	233 19%	1,425	4%	193 14%	331 23%	402 28%	290 20%	209 15%
Spanish Literature % of Total	149	0%	40 27%	11 7%	38 26%	42 28%	18 12%	222	1%	32 14%	23 10%	65 29%	56 25%	46 21%
Statistics % of Total	1,139	4%	186 16%	267 23%	329 29%	252 22%	105 9%	1,303	4%	243 19%	303 23%	343 26%	295 23%	119 9%

**AP: Number of Examinations & Number of Examinations with Grades of 3, 4 or 5**



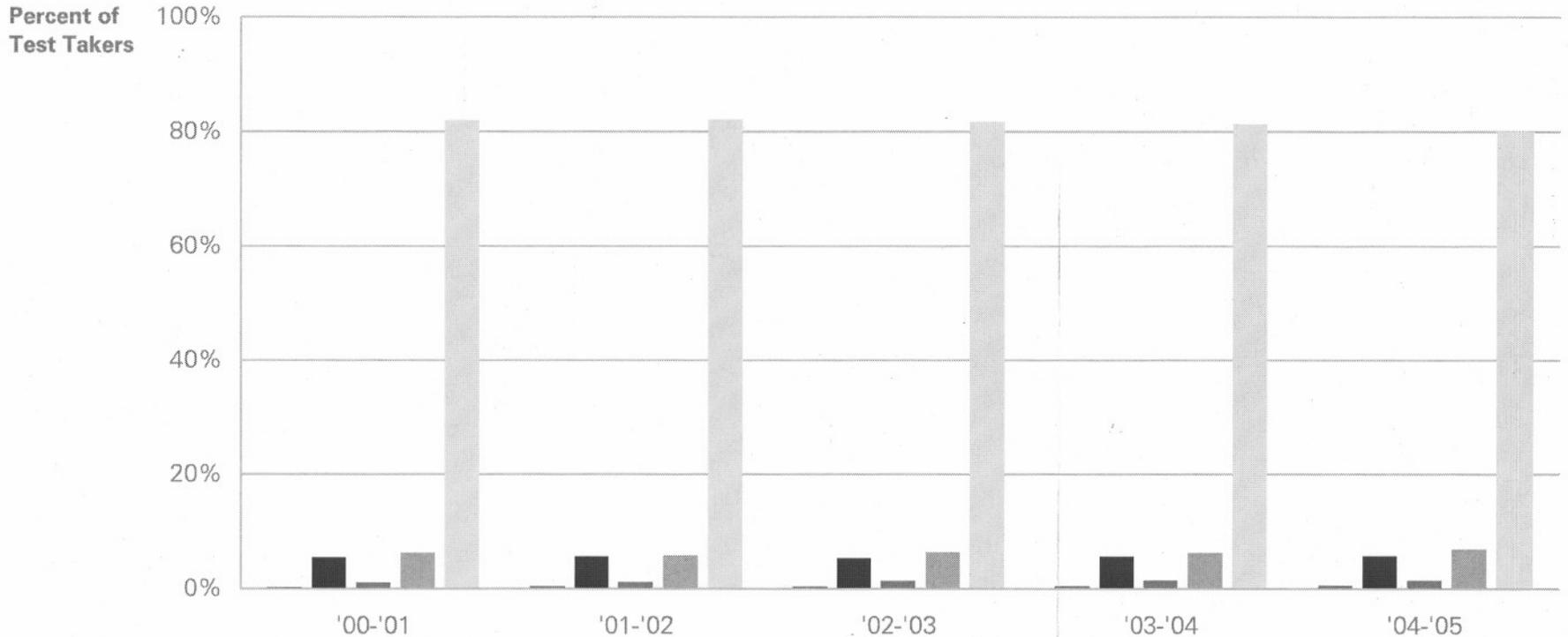
**AP: Participation by Ethnic Groups Taking One or More Exam**



**Number of Students Taking One or More AP Exam:**

■ American Indian	56	66	79	105	131
■ Asian	749	846	906	1,128	1,209
■ Black	253	260	340	471	550
■ Hispanic	935	1,029	1,199	1,459	1,786
■ White	10,323	11,542	12,927	14,576	15,677
Other	381	418	505	555	581
No Response	277	296	304	366	519
Total	12,974	14,457	16,260	18,660	20,453

**AP: Participation by Ethnic Groups with Grades 3, 4 or 5**



**Number of Students With Grades 3, 4 or 5 on an AP Exam:**

American Indian	20	40	38	57	74
Asian	461	541	564	685	748
Black	90	111	141	178	186
Hispanic	527	556	674	765	904
White	6,862	7,869	8,664	9,892	10,439
Other	229	277	329	346	361
No Response	181	193	194	233	326
Total	8,370	9,587	10,604	12,156	13,038



## Colorado Public Schools

### Advanced Placement Program Participation & Performance

In Colorado, the AP Program is growing steadily in public schools with marked increases in the number of low-income, African-American, and Latino students.

#### Overall Participation and Performance

In 2004: 17,210 CO public school students took AP Exams

In 2005: 18,863 CO public school students took AP Exams

**9.6% increase in number of students participating**

In 2004: 27,745 AP Exams taken by CO public school students

In 2005: 31,114 AP Exams taken by CO public school students

**12.1% increase in number of exams taken**

In 2004: 17,534 CO public school exams scored 3+

In 2005: 19,171 CO public school exams scored 3+

**9.3% increase in the number of exams scoring 3+**

- Since 2000, the number of AP Exams taken by CO public school students has grown by 14,942.
- By way of contrast, the number of AP Exams taken by CO public school students from 1995 to 2000 grew by 7000.
- Since 2000, the number of AP Exams receiving a grade of 3 or higher by CO public school students has grown by 8640.
- By way of contrast, the number of AP Exams receiving a grade of 3 or higher by CO public schools from 1995 to 2000 grew by 4435.

#### Low-income Student Participation

- Since 2000, the number of AP Exams taken by low-income CO public school students has grown by 1357.
- By way of contrast, the number of AP Exams taken by low-income CO public school students from 1995 to 2000 grew by 228.

*\*\*For 1995 and 2000, the totals are listed by the number of fee reductions (low-income and other); this was not broken out in the data at this time. For 2005, the totals are listed by the number of fee reductions only for students from low-income families.*

#### African-American Student Participation

- Since 2000, the number of AP Exams taken by African-American CO public school students has grown by 409.
- By way of contrast, the number of AP Exams taken by African-American CO public school students from 1995 to 2000 grew by 281.

#### Latino Student Participation

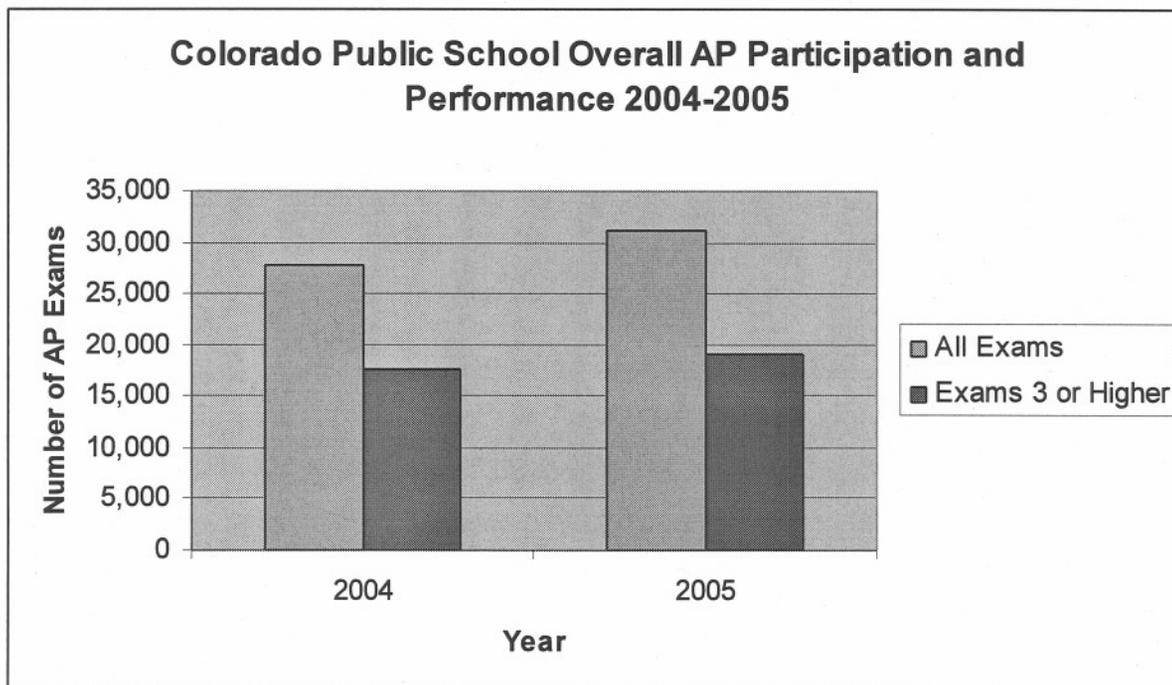
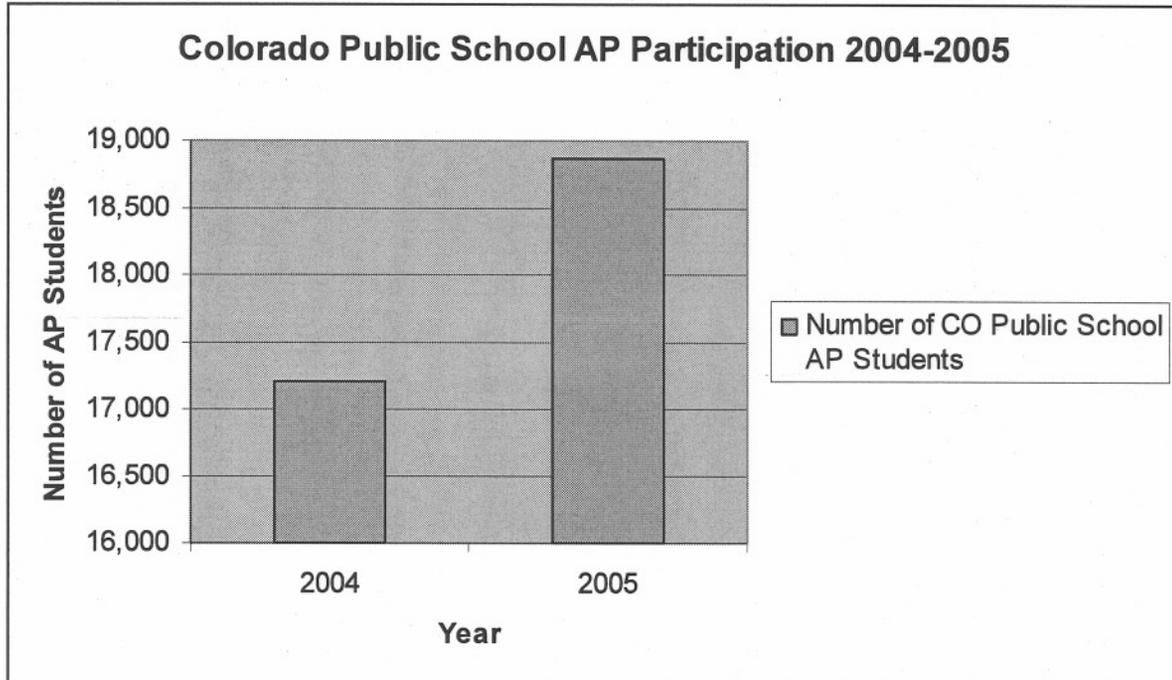
- Since 2000, the number of AP Exams taken by Latino CO public school students has grown by 1409.
- By way of contrast, the number of AP Exams taken by CO public school students from 1995 to 2000 grew by 580.

A 1999 study by the U.S. Department of Education found that participation in rigorous, college-level courses such as AP courses was the best indicator of whether a student would successfully complete a bachelor's degree. The State of Colorado deserves commendation for its commitment to helping students, particularly traditionally underserved minority and low-income students, prepare themselves for college success by taking AP courses and exams.

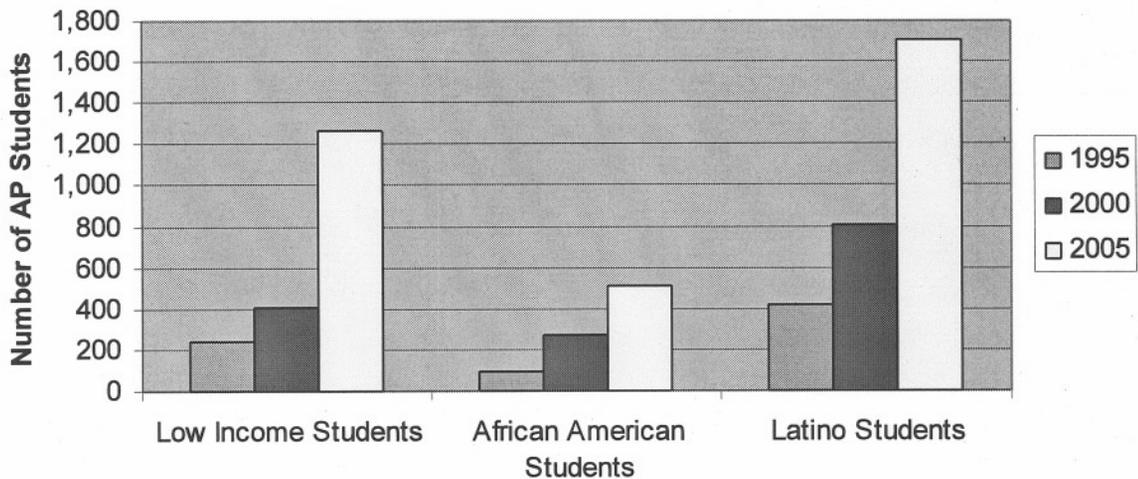
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### **Why Is Access to AP Important?**

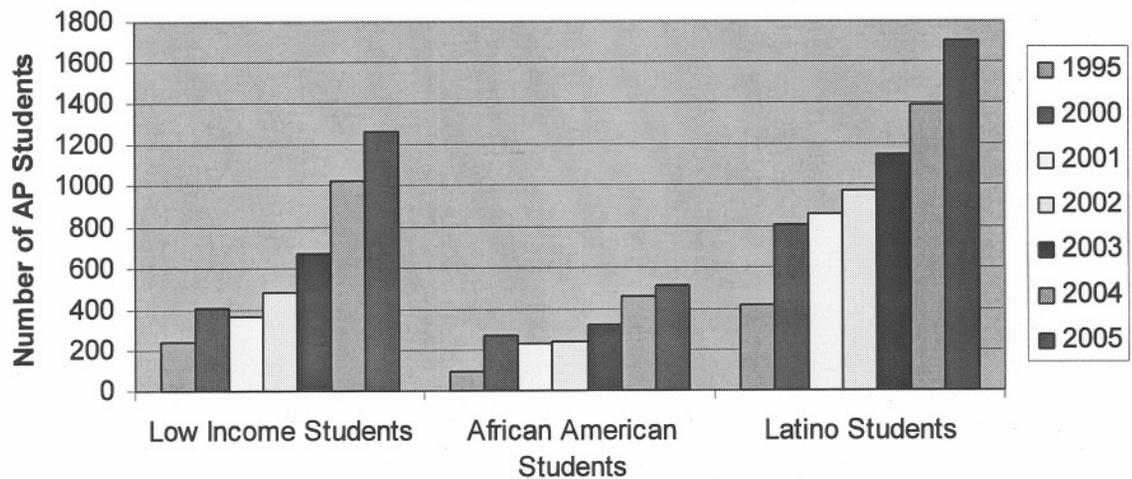
- **45%** of students who have taken one AP course and **61%** of students who have taken two or more AP courses are completing their bachelor's degrees in four years or less.
- **Only 29%** of students who enroll in colleges without having taken AP are completing their bachelor's degrees on schedule.
- **60%** of all recent high school graduates entering a community college last year needed to take at least one remedial course.



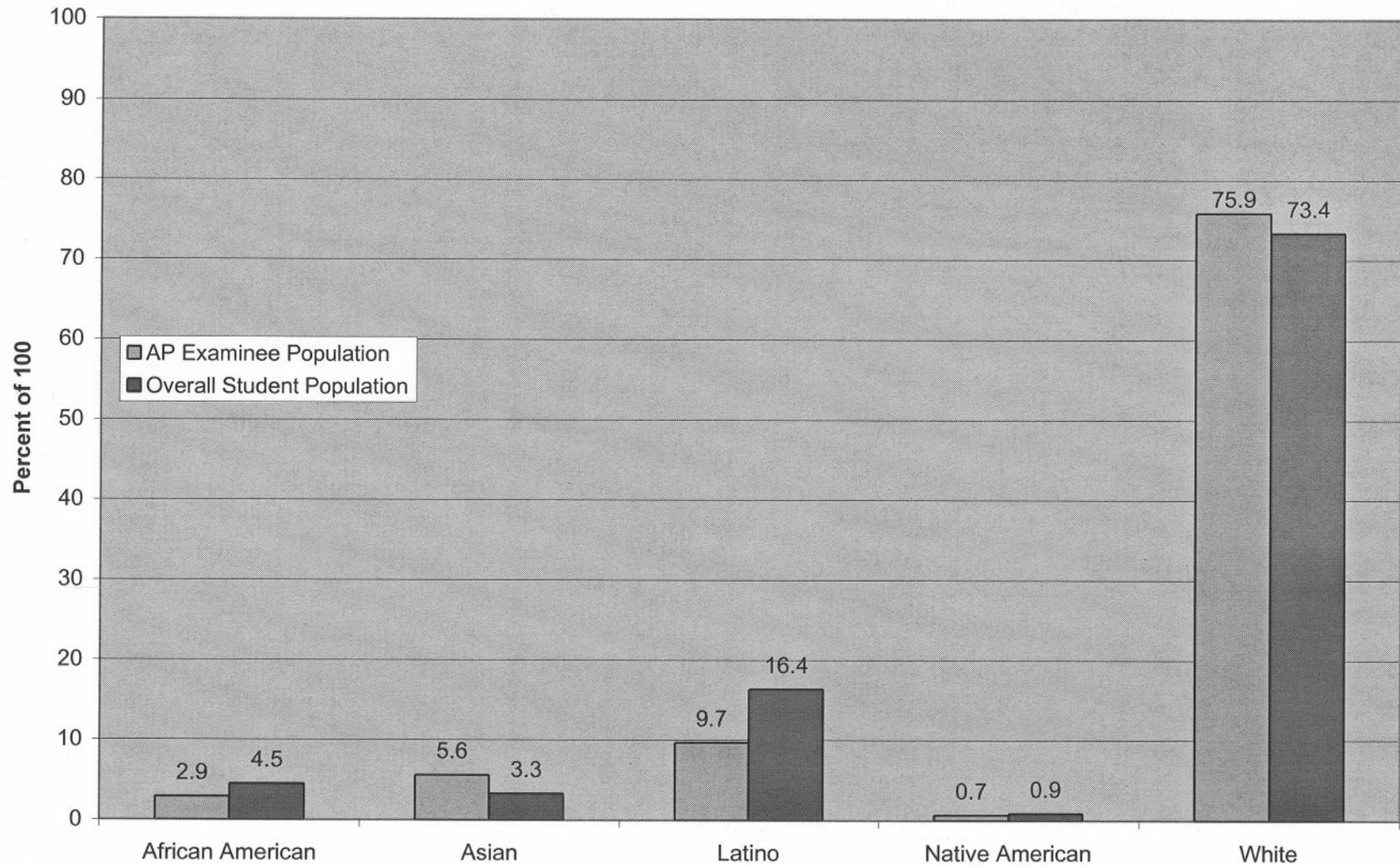
**Colorado Public School AP Participation by Underserved Students 1995-2005**



**Colorado Public School AP Participation by Underserved Students by Year 1995-2005**



The Class of 2005 for the State of Colorado: AP Examinee<sup>9</sup> Populations vs. Overall Student Populations<sup>4</sup> in U.S. Public Schools



# Developing the STEM Education Pipeline

For almost 50 years, ACT has played a pivotal role in promoting student access into and success in science, technology, engineering, and mathematics (STEM) careers. Through academic and career assessments, career development tools, and extensive research, we have helped inform students, parents, teachers, career counselors, employers, and policymakers about the skills that are needed to perform effectively in STEM fields.

Our research and recommendations for policymakers and educators are based on the more than one million U.S. high school graduates who take the ACT® college admission and placement exam each year. The ACT is the only national college admission test that includes an interest inventory as well as both math and science assessments. The results provide a clear picture of high school students' interest and academic achievement in STEM, and the news is mixed. Interest in STEM is declining, and most students are not adequately prepared to succeed in college-level coursework. However, students who plan early and strategically and have access to high-level and rigorous coursework are more likely to be prepared for and succeed in the STEM fields.

## Measuring Student Readiness, Progress, and Success

ACT's Educational Assessment and Planning System (EPAS™) is the only longitudinal assessment system that begins measuring students' college readiness in middle school and follows students into high school and college to evaluate their persistence and success. The data gathered through EPAS provide ACT with keen insight into what works in preparing students to succeed in college science, technology, engineering, and mathematics coursework. What ACT's research shows is clear: The students most likely to major in STEM fields in college and persist to earn their degrees are those who develop interests in STEM careers through early career planning and take challenging classes that prepare them for college-level science and math coursework.

## Declining Student Interest in STEM Majors

ACT research suggests that, at the very time our nation most needs promising students to enter STEM majors and careers, students' interest in these fields is on the decline.

**FACT:** Over the past ten years, the percentage of ACT-tested students who said they were interested in majoring in engineering has dropped steadily from 7.5 percent to 4.9 percent.<sup>1</sup>

**FACT:** Over the past five years, the percentage of ACT-tested students who said they were interested in majoring in computer and information science has dropped steadily from 4.9 percent to 2.9 percent.<sup>2</sup>

The ACT logo is located in the bottom left corner of the page. It consists of the letters "ACT" in a bold, serif font, with a registered trademark symbol (®) to the upper right of the "T".

## Fewer Than Half of High School Graduates Ready for First-Year College Math and Science

ACT developed College Readiness Benchmarks based on a nationally representative sample of thousands of ACT-tested students enrolled at U.S. colleges and universities. With respect to these College Readiness Benchmarks, score results for the 2005 high school graduating class are not encouraging:

**FACT: Fewer than half (41 percent) of ACT-tested 2005 high school graduates achieved or exceeded the ACT College Readiness Benchmark in Math.<sup>3</sup>**

**FACT: Only a quarter (26 percent) of ACT-tested 2005 high school graduates achieved or exceeded the ACT College Readiness Benchmark in Science.<sup>4</sup>**

Students who fall short of ACT's College Readiness Benchmark scores likely lack at least some of the skills they'll need during their first year of college. Although some of these students may still succeed in college though hard work, our research shows—not surprisingly—that they are more likely to require remedial help, which is expensive and time-consuming, and less likely to persist to a degree than students who leave high school ready for college-level coursework.

The ACT College Readiness Benchmark for Math is 22 and for Science 24. Students who meet or surpass the Benchmark in a particular subject area have a high chance—75 percent or greater—of earning a course grade of C or higher and a 50 percent chance of earning a B or higher in a typical first-year college course in that area.

**FACT: Nearly three-quarters (70 percent) of college students majoring in science fields who met the ACT College Readiness Benchmark in Science persist in those majors, compared to only 61 percent of students who did not meet the benchmark.<sup>5</sup>**

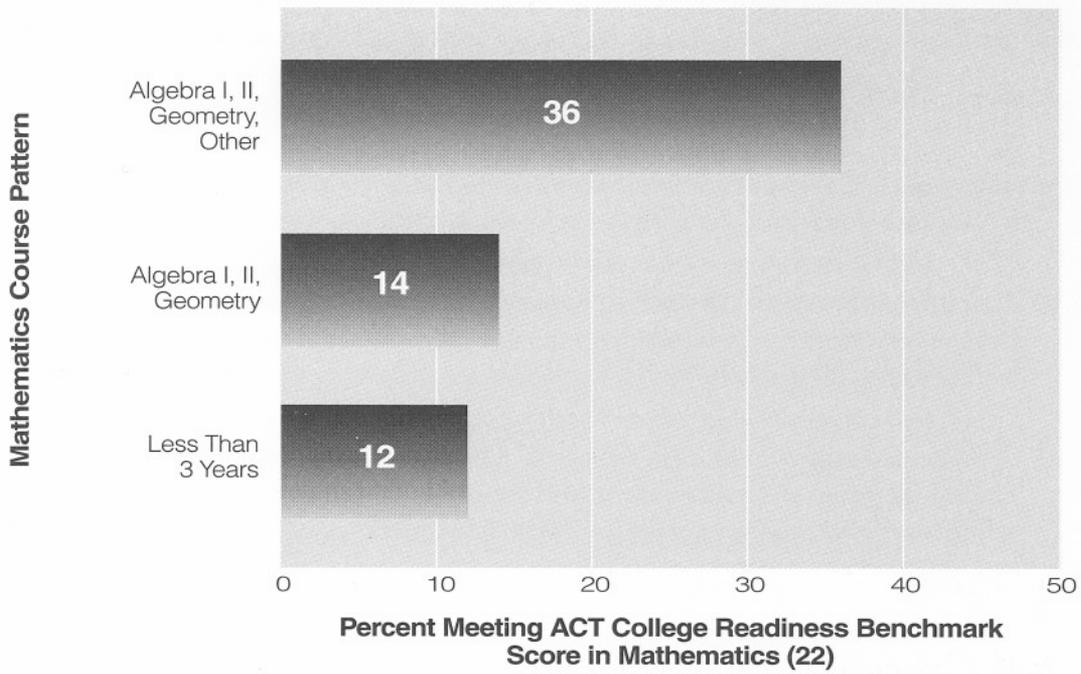
### Course Selection and Rigor— Keys to College Readiness

ACT research clearly demonstrates a strong relationship between the amount and kind of high school courses students take and their readiness for college.

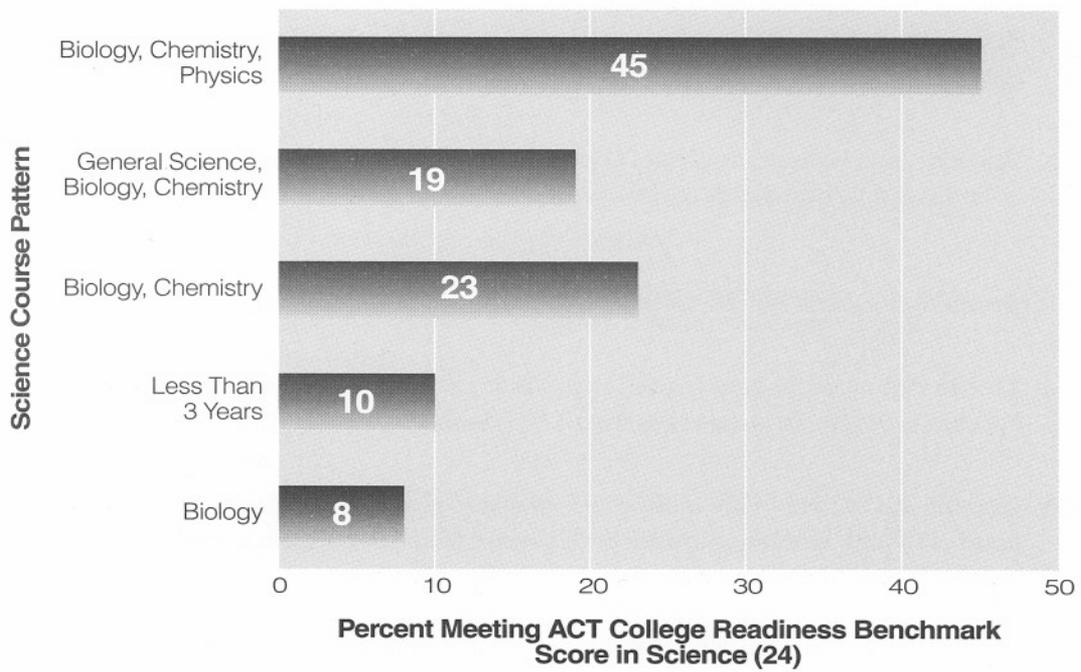
**FACT: In the graduating class of 2005, just slightly more than half (56%) of ACT-tested students reported taking the recommended core curriculum for college-bound students: four years of English and three years each of math (algebra and higher), science, and social studies.<sup>6</sup>**

ACT data indicate that high school students must take not only the right *number* of courses in high school, but also the right *kinds* of courses—rigorous courses that will prepare them for the demands of college and the workplace.<sup>7</sup>

Students who take more than three years of math (Algebra I & II, Geometry, and additional higher-level courses) are significantly more likely to meet the College Readiness Benchmark in Math (22) than those who take only three years or less of mathematics.<sup>8</sup>



Similarly, students who take an upper-level sequence of science courses that includes Physics are substantially more likely to reach the College Readiness Benchmark in Science (24) than students who took only Biology and Chemistry or less.<sup>9</sup>



## What Can Policymakers and Educational Leaders Do?

ACT research points to several key steps federal and state policymakers and educational leaders can take to strengthen science, technology, engineering, and mathematics education.

### *Common Focus*

- Align rigorous, relevant academic standards—across the entire K–16 system—that prepare all students for further education and work.
- Establish a common understanding among secondary and postsecondary educators and business leaders of what students need to know to be ready for college and workplace success in scientific, technological, engineering, and mathematical fields.
- Evaluate and improve the alignment of K–12 curriculum frameworks in English/language arts, mathematics, and science to ensure that the important college and work readiness skills in STEM fields are being introduced, reaffirmed, and mastered at the appropriate times.

### *High Expectations*

- Raise expectations that all students need strong skills in mathematics, science, and technology and that all students can meet rigorous college and workplace readiness standards.
- Require all high school students to take at least three years of rigorous, specific college-preparatory course sequences in math and science.
- Recruit, train, mentor, motivate, reward, and retain highly qualified mathematics, science, and technology professionals to teach in middle school and beyond.

### *Expanded, Rigorous 8–12 Course Offerings*

- Ensure that every student has the opportunity to learn college readiness skills and has access to key courses in the STEM fields.
- Evaluate and improve the quality and intensity of all STEM core and advanced courses in high schools to ensure both greater focus on in-depth content and greater secondary-to-postsecondary curriculum alignment.

- Sponsor model demonstration programs that develop and evaluate a variety of rigorous science, mathematics, and technology courses and end-of-course assessments for all students.
- Provide opportunities for dual enrollment, distance learning, and other enrichment activities that will expand opportunities for students to pursue advanced coursework in STEM areas.

### ***Student Guidance and Motivation***

- Establish and support model programs that identify students with STEM academic potential and interests and expose them to STEM opportunities.
- Include parents, teachers, and counselors in outreach programs that help them learn about STEM professions so they can encourage students to go into those fields.
- Initiate new and expand existing scholarship programs to attract more students into STEM fields.

### ***Measure Progress***

- Assess foundational science and math skills in elementary school to identify students who are falling behind while there is still time to intervene and strengthen their skills.
- Identify and improve middle and high school student readiness for college and work using longitudinal student progress assessments that include science and mathematics components.
- Establish and support model programs that utilize end-of-course assessments for STEM courses to ensure rigor and effectiveness.
- Incorporate college and workforce readiness measures into federal and statewide school improvement systems.

## Helping Students Prepare

Students who participate in a longitudinal college readiness system, like ACT's EPAS, are significantly more likely than those who do not to:

- earn higher scores on the ACT,
- take a college-preparatory core curriculum in high school that includes rigorous courses,
- be ready for credit-bearing college work,
- enroll in college, and
- return for their second year.

### Conclusion

Not since the mid-1950s has our nation faced a more serious shortage of skilled workers in science, technology, engineering, and mathematics fields. We can and must reinvigorate these professions if the United States is to maintain a strong position in the competitive global marketplace. The solution lies in education—inspiring our young people to enter these challenging fields and providing the rigorous education these disciplines demand. ACT is well equipped and eager to support policymakers, educators, parents, and students in this important endeavor. Working together to provide all students with the opportunity and resources to succeed in STEM, we can ensure that our nation continues to be a global leader.

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### References

- <sup>1</sup> *ACT National High School Profile Reports, 1995–2005*
- <sup>2</sup> *ACT National High School Profile Report, 2000–2005*
- <sup>3</sup> *ACT National High School Profile Report, 2005*
- <sup>4</sup> *ACT National High School Profile Report, 2005*
- <sup>5</sup> *ACT Science Literacy Research Report* (in progress, 2006)
- <sup>6</sup> *ACT National High School Profile Report, 2005*
- <sup>7</sup> *Crisis at the Core: Preparing All Students for College and Work*, ACT, 2005
- <sup>8</sup> Data based on ACT-tested 2005 high school graduates.
- <sup>9</sup> Data based on ACT-tested 2005 high school graduates.

## About the ACT

The ACT is a unique resource that provides information useful to STEM education:

- The only nationally standardized college entrance exam that covers science and higher-level mathematics.
- A *curriculum*-based assessment developed from nationwide curriculum surveys of high school and college faculty to determine the skills taught in high school that are needed to succeed in college.
- The third part of a comprehensive developmental system—EXPLORE® at the 8th grade, PLAN® at the 10th grade, and the ACT at the 11th and 12th grades. These assessments track progress toward college readiness and include education and career exploration and planning components.

## ACT Programs and Services

EXPLORE (8th grade), PLAN (10th grade), and the ACT (11th/12th grade) inform the nation about:

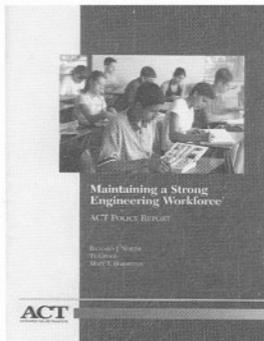
- The readiness of our high school graduates for entry-level college mathematics and science classes
- Their levels of interest in science, technology, engineering, and mathematics fields
- The skills and interests of middle school and high school students who are in the pipeline to enter college and the workforce in the coming years

ACT's WorkKeys® system, first introduced in the early '90s, measures the foundational skills required to enter occupations and job training programs. The WorkKeys assessments include Applied Mathematics and Applied Technology, and more than 2.7 million of those exams have been administered in the last decade. The system also includes a substantial database of information from thousands of job profiles—more than 70 percent of them concerning STEM-related occupations—that have been conducted by trained job profilers. These data provide valuable insights into the current match between the skills required for occupations in science, technology, engineering, and mathematics and the current level of these skills in the U.S. workforce.

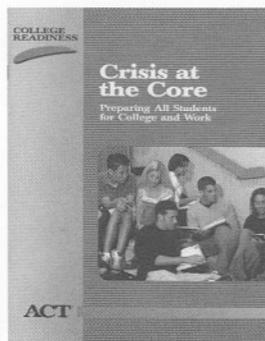
ACT's DISCOVER® is an Internet-delivered educational and career planning system that provides accurate information to middle school, high school, and college students about STEM and other careers.

## For more information:

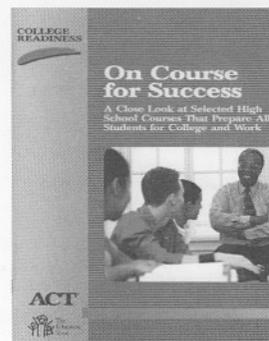
- Each year ACT produces High School Profile Reports—a national report and one for each state. The 2005 national report can be found at [www.act.org/news/data.html](http://www.act.org/news/data.html) and reports for each state at [www.act.org/news/data/05/states.html](http://www.act.org/news/data/05/states.html). Using ACT test score results for the current year and preceding years, the reports offer a wealth of information—presented in tabular format by academic preparation, gender, racial/ethnic group, and other characteristics—that educators can use to evaluate the effectiveness of their curricula and the college readiness of their students.
- ACT policy reports and other information are available for reading and downloading at [www.act.org/path/policy/index.html](http://www.act.org/path/policy/index.html).



This 2003 report, which focuses on the national need to attract and develop a well-prepared and diverse engineering workforce, is based on 12 years of data for 750,000 college-bound students planning to major in engineering.



This 2004 report urges high schools and state education leaders to strengthen the required core curriculum to better prepare all students for college and work.



This 2005 report—prepared in collaboration with The Education Trust—documents that high schools with sizable minority and low-income student populations can prepare their students to succeed in college if they provide rigorous coursework, well-qualified teachers, and tutorial support.

# ACT<sup>®</sup>

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