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RESEARCH REPORT

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Washington State Board of Education Transcript Study

FINAL REPORT

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Members of *The* **BERC** *Group* have K–20, experiences as teachers, counselors, psychologists, building administrators, district administrators, and college professors. The team is currently working on research and evaluation projects at the national, state, regional, district, school, classroom, and student levels in over 700 schools in Washington State and nationally.

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Executive Summary

Across the nation, there are growing concerns as to whether public schools adequately prepare students to enter a competitive global economy and to achieve financial independence. As reliance on knowledge-based industry grows, there are predictions that by 2010 the majority of jobs will require education beyond a high school degree. Thus, if schools are to prepare students for the future, they must prepare them to enter and to succeed in college. Although the skill sets needed for post-secondary success have changed, contemporary high schools look much as they did at the beginning of the 20th century, when they prepared students for work in an industrial economy.

Many states across the United States have recognized this need for change, however, the minimum total credit requirement for graduating high school in Washington State is among the lowest in the country. The majority of states also have higher requirements for individual subject areas than does Washington. In addition, few Washington State school districts require specific course sequences that include college preparatory classes. Student survey data from a number of schools in Washington State show many students aspire to attend college but do not believe their high school has prepared them adequately (Baker, Gratama, Peterson, & Bianchi, 2007).

Questions about the preparedness of Washington State high school graduates for college and career prompted the current study. The Washington State Board of Education commissioned this research to determine the extent to which the state's high schools are currently providing students the academic background necessary for admittance to and success in college. The study also investigated the relationship between the numbers of credits required and the level of courses taken by students. This information is critical as the State Board of Education considers revisions to state regulations around graduation requirements.

To obtain this information, the study examined course-taking patterns for a large number of students from the graduating class of 2008 across Washington. The sample consisted of 14,875 high school seniors from 100 schools in 100 districts.

Findings from the study indicate that just under half of the high school graduates from 2008 in this study took the requisite courses for admission to a Washington four-year college. This pattern emerged in spite of the fact that students frequently take more credits than needed for graduation. This suggests that the majority of students graduating from Washington State high schools are ineligible for college admittance by Washington State Higher Education Coordinating Board standards because of deficiencies in specific courses. Overall results indicate that while high school graduation requirements meet the state's minimum for a high school diploma, they do not align with college admission requirements.

A closer examination of the course-taking patterns of graduates who failed to meet college entrance requirements revealed some important themes. Disaggregating the results by individual subject area, students most frequently failed to meet college preparation requirements in math, world language, and English. In these three subject areas, state graduation requirements are lower than the minimum, public four-year college admission standards identified by the Higher Education Coordinating Board by at least one credit. In addition, course-taking patterns showed a lack of

overall alignment between students' courses and a college preparatory curriculum. Specifically, students completed college entrance requirements in some subject areas but not in others.

This study also investigated the relationship between the number of credits required and the types of courses students take. Findings indicated that higher credit requirements did not ensure students completed the specific courses necessary for college admittance, such as advanced math, laboratory science, or literature. Further, the number of math and science credits required for graduation was not related to the percentage of students graduating college eligible. Some students filled higher credit requirements with lower level courses rather than advanced courses. Conversely, in districts with lower credit requirements, some students took college preparatory course sequences that exceeded district requirements. Thus, requiring a higher *number* of math or science credits without specifying the *levels* of classes does not ensure students are prepared for college.

This study also found that there is room in students' schedules for more stringent requirements, including higher numbers of credits and more advanced courses. In fact, 34% of the graduating seniors took less than a full load of credits. With appropriate planning and sequencing of courses throughout secondary school, students can advance through college preparatory course requirements. The results for math, in particular, reflected difficulties in planning and executing appropriate course sequences: Although a high percentage of seniors took math, one-third did not meet math college eligibility requirements. It is noteworthy that students graduating in 2008 who do not pass the math WASL are required to take math credits in their senior year, which likely resulted in more students taking math in their senior year. These numbers are striking, given that one-quarter of the students entered 9th grade high school having previously taken high school math. Taken together, these results suggest requirements, schedules, and/or advising do not provide the structure necessary for guiding students through college preparatory course sequences.

Disparities in college readiness across ethnic and gender groupings also emerged. Disaggregated data showed the percentage of students meeting college entrance requirements across ethnic groups varied from 29% to 61%, with Asian and White students most prepared and Black, American Indian/Alaskan Native, and Hispanic students least prepared. These findings suggest that current approaches to academic preparation may limit access to college along ethnic lines. A smaller discrepancy was evident in gender, with somewhat fewer males meeting course requirements for admission to a four-year college compared to females.

This study also shows a relationship between college eligibility and student achievement, as measured by performance on the Washington Assessment of Student Learning. Not surprisingly, students who met college entrance requirements in math and science by 10th grade were more likely to meet standard on the WASL in those subject areas. This suggests that participating in a college preparatory curriculum from the 9th grade forward raises student achievement. This is a particularly important finding when considering steps for closing the achievement gap.

Finally, this study examined the extent to which students are already meeting the CORE 24 requirements. Findings indicate that only 17% of 2008 graduating students met the CORE 24 requirements. Students were least likely to meet the requirements in fine arts, science, and world languages. These are the areas where the credit requirements are more rigorous than current

Executive Summary

Washington State and Higher Education Coordinating Board graduation requirements. This suggests that if CORE 24 is implemented as adopted, these are the subject areas that warrant the most support, particularly in staffing and materials.

If the state is truly determined to establish a world-class education system, college and work readiness must take center stage in education policy development. College and career readiness *must* be a priority. The State Board of Education's intention to revise high school graduation requirements is an essential step toward improving outcomes for students. The current study and existing research provide critical guideposts for improving college and career preparation for Washington State students.

- Raising the number of credits alone does not ensure students will complete the courses necessary for admittance to college. However, it does ensure there is room in students' schedules to complete the necessary course sequences, including additional coursework for students who need extra support.
- Requiring specific course levels is necessary to ensure students complete the college preparatory course sequences.
- High school graduation requirements must be considered in their totality if they are to be aligned with college entrance requirements across all subjects. In other words, aligning individual subject areas does not ensure students graduate prepared for college in all areas.
- As revisions to graduation requirements are implemented, it will be important to provide support to schools and students that will enable students to meet the requirements of more rigorous courses. This includes effective advising for planning course sequences in advance.
- If CORE 24 requirements are implemented as adopted, schools will need more support to offer all students additional courses in science, fine arts, and world language, as these are the subject areas where the fewest students meet the requirements. Schools may require additional resources for staffing and materials.
- While high school graduation requirements focus on credits earned in the 9th through 12th grades, preparing for college and career must be a focus throughout all secondary education (7th – 12th grades). Junior highs and middle schools must prepare students for high school, and vertical articulation is necessary for this to occur.
- Education pertaining to the evolving requirements for entering the workforce may be helpful for schools and their communities as they implement more rigorous expectations for students.

Washington State Board of Education Transcript Study

FINAL REPORT

INTRODUCTION

This report summarizes findings from a transcript study in Washington State. The purpose of this study is to gather and to analyze a sample of transcripts from high schools across the state in order to provide the State Board of Education (SBE) information about student course-taking patterns in relation to district graduation requirements. This study also aims to provide information around the proposed new graduation requirements passed by the SBE in July 2008 (CORE 24). The report begins by summarizing the research on course-taking patterns and achievement to place the current findings in the context of previous research. The introductory section is followed by a description of the research design, research findings, and discussion and conclusions.

Preparing Students for a Global Economy

National concerns in education over the last several years have centered on whether schools are adequately preparing students to enter a competitive global economy. As reliance on knowledge-based industry grows, new jobs increasingly require education beyond a high school degree. Some researchers estimate that by 2010 approximately two-thirds of all jobs will require a bachelor's degree or at least some post-secondary education (Carnevale & Desrochers, 2003). Similarly, the Education Commission of the States (2005) asserts that students need at least two years of post-secondary education to be successful in a today's workforce. Thus, for today's students, there is little difference between being "workforce ready" and "college ready". In addition, current high school graduates must possess skills and knowledge to adapt rapidly to the ever-changing landscape of a knowledge-based economy. Although the skill sets needed for post-secondary success have changed, contemporary high schools look much as they did at the beginning of the 20th century, when they prepared students for work in an industrial economy.

In addition to determining employability, college education influences income. Individuals who lack college education are often unable to earn a living wage, even in today's competitive job market. Figure 1 displays the median yearly income for Washingtonians by education level. Recent information from the U.S. Census Bureau suggests that the wage gap between individuals with baccalaureate or advanced degrees and individuals with high school diplomas has been widening since the mid-1980s. In 2004, individuals with advanced degrees earned about 2.7 times what high school graduates earned, and individuals with baccalaureate degrees earned about 1.8 times what high school graduates earned (Washington State Board for Community and Technical Colleges, Research Report, 2005).

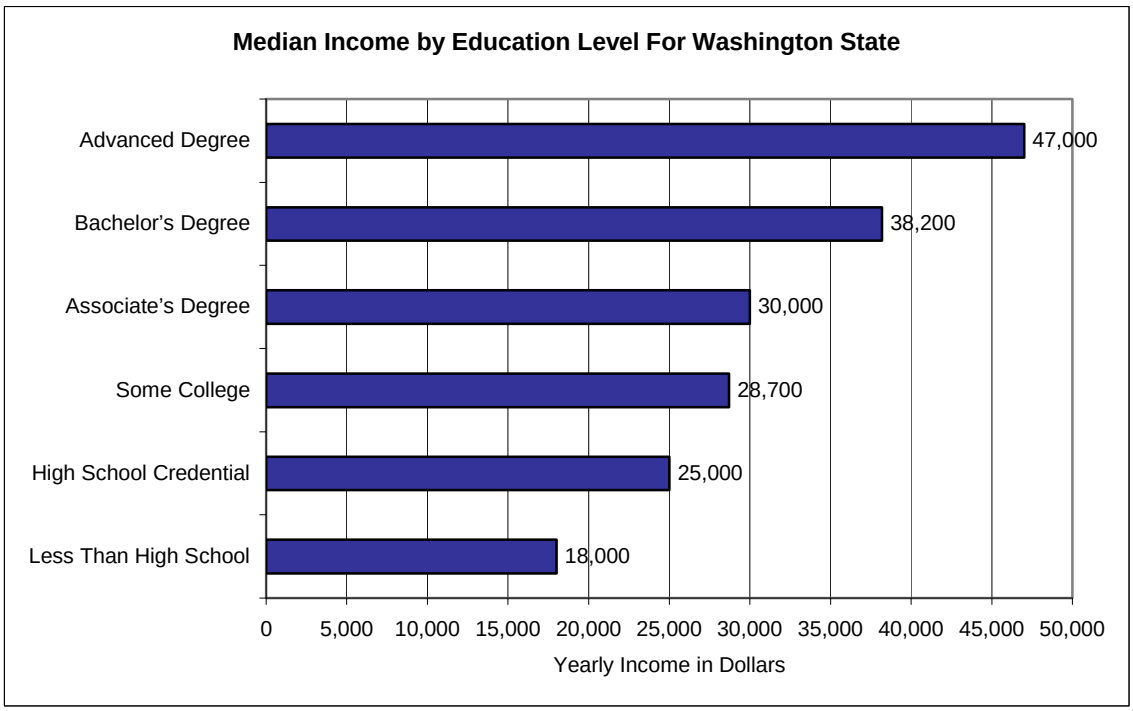

Figure 1. **Median Income by Education Level for Washington State**
Note. Data collected from the U.S. Census Bureau, Census 2000
5 Percent Public Use Microdata Sample (PUMS) for Washington.

The disconnect between what students need for success beyond high school and what they actually learn in high school is illustrated by remediation rates during the first year of college. This has been demonstrated in Washington State. The Social and Economic Sciences Research Center (SESRC) at Washington State University conducted a follow-up study on Washington State's graduating class of 2004. Their 2006 report found that 55% of the class of 2004 attended college the first year after graduation. Thirty-seven percent of these college attendees required some form of remediation prior to entering college level courses. Students were least prepared in math, with twice as many enrolled in remedial math courses (32%) as compared to remedial English courses (16%).

A similar report indicates that 76% of Washington State's high school graduates enroll in college within two years of graduation, but many require remedial classes before admitted to credit-bearing courses (Washington State Board for Community and Technical Colleges, 2006). This is particularly evident at community and technical colleges. For example, 52% of students entering Washington's community and technical colleges in 2005 required remedial classes. These needs were most pronounced in math. Unfortunately, remedial courses do not fully compensate for academic unpreparedness. A national study has shown that students taking remedial courses (particularly remedial reading) are more likely to drop out of college (NCES, 2004). The consequences of academic unpreparedness also extend beyond the individual. For example, one study estimated the cost of remedial education at $3.7 billion a year (Alliance for Excellent Education, 2006). In 2005, the estimated cost of remedial education in Washington State was $64.9 million, which included $17.7 million for recent high school graduates and 47.7 million for older adults entering college (Washington State Board for Community and Technical Colleges, 2006).

College Awareness, Eligibility, and Preparedness

In their 2005 research review, Baker, Clay, and Gratama, asserted that college readiness is composed of three elements: *college awareness, college eligibility*, and *college preparation* (see Table 1). *College awareness* includes providing students and their parents with timely and accurate information about all aspects of attending college. *College awareness* is an overarching aspect of college readiness that should be cultivated by teachers, parents, and students throughout a student's secondary education. *College eligibility* refers to obtaining a high school diploma and completing the courses necessary for admission to a particular college. College admission requirements typically include advanced level courses and a specified number of credits across a range of subjects. Finally, *college preparation* refers to providing students the emotional, social, and academic skills necessary for college success. These three elements are essential requirements for college readiness, and they must be cultivated throughout a student's secondary educational program.[1]

Table 1.
CR = CA + CE + CP

College Readiness =	College Awareness +	College Eligibility +	College Preparedness
	Students	Requirements	Emotional
	Parents	Course Selection	Social
	Teachers		Academic

A rigorous and well-planned high school curriculum is fundamental to college success. Indeed, a challenging high school curriculum is one of the leading indicators of college readiness (Adelman, 2006). Not surprisingly, high school students engaged in a rigorous course of study including four years of college preparatory English and three years of college preparatory math, science, and social studies are less likely to take remedial courses (Abraham & Creech, 2002). In addition, ACT (2005) found that taking one or more years of a world language increased achievement and success in college-level English composition. In an effort to define a college-preparatory curriculum, ACT (2005) has recommended the following minimum core course sequences: four years of English; four years of mathematics (algebra 1, geometry, algebra 2, and one additional upper level math course such as trigonometry); three years of natural sciences (biology, chemistry, physics); and three years of social studies (American history, world history, American government).

Currently, 45 states mandate specific graduation requirements (Achieve, 2008). In a report published by Achieve in 2004, however, no state required every student to take a college- and work-preparatory curriculum to earn a diploma. Recently, some states have begun taking steps in this direction. As of 2008, 20 states require students to complete a college and career ready curriculum, which includes taking Algebra 2. An additional 10 states are considering increasing graduation requirements to better prepare students for college and career.

[1] The primary inquiries in this study focus on College Eligibility as it relates to course taking patterns that meet the minimum college entrance requirements in Washington State. Certainly, there are other entrance "criteria" for college such as SAT/ACT scores and GPAs that also play a role in college admissions. We consider these under College Prepared: Academic.

In a number of recent evaluations of Washington State high schools, The BERC Group and its affiliates administered a student survey that includes an assessment of students' plans for college (Baker, Gratama, Peterson, and Bianchi, 2007). Data obtained between 2002 and 2007 showed the majority of the students planned to attend a two- or four-year college (Figure 2). Additionally, the vast majority believed college is important for a successful job and career. Unfortunately, only between 43% and 58% of the students believe high school prepared them for college.

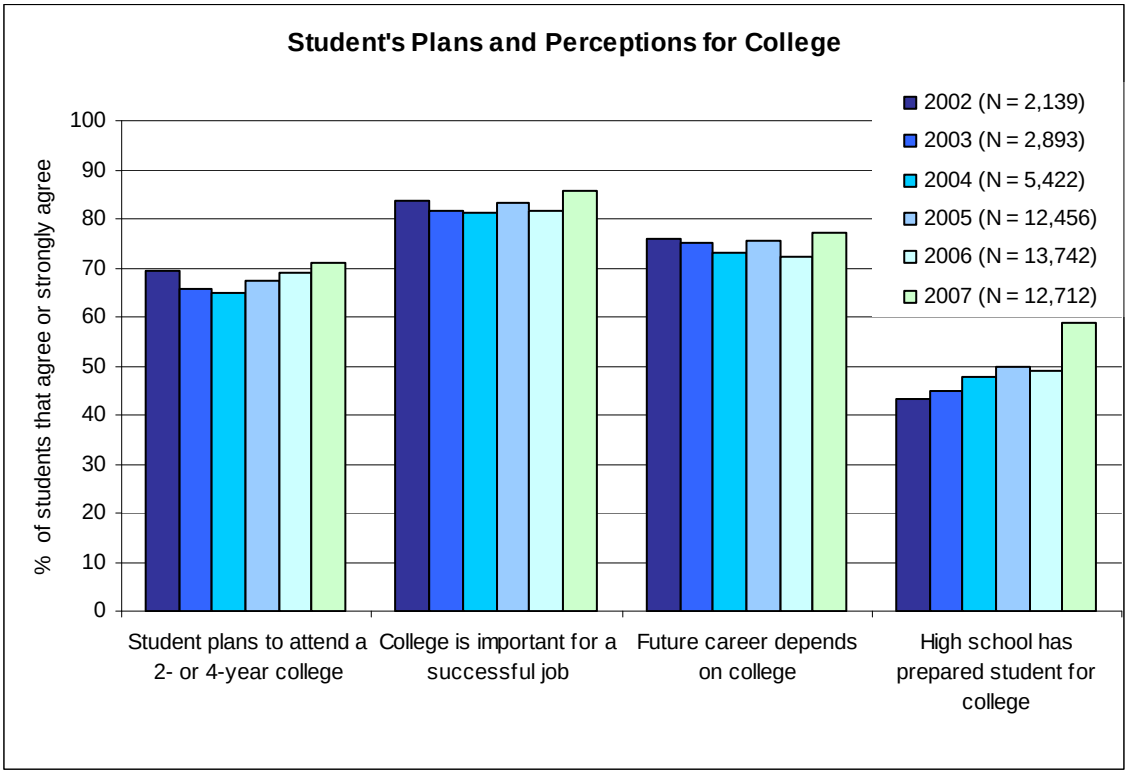

Figure 2. **Students' Plans and Perceptions for College 2002-2007**

Advanced Course-Taking and Academic Achievement

Current research demonstrates a relationship between students' high school course-taking patterns and high school academic achievement. In 2000 and 2001, the Southern Regional Education Board conducted studies of 51 rural high schools across 12 states to examine the relationship between course-taking patterns and academic achievement, as measured by the National Assessment of Educational Progress (NAEP). Results demonstrated that course-taking patterns strongly influenced individual and school performance on the NAEP. Students who took the *High Schools that Work*-recommended academic core and career/technical or college preparatory courses, including three math and three science credits, scored higher on the NAEP reading, mathematics, and science sections than students who did not, regardless of race/ethnicity or socioeconomic status (Bottoms & Feagin, 2003). These findings were even stronger when students took four math and four science credits instead of the recommended three credits.

There is particular concern about math and science, given workforce demands and data on student outcomes. A recent national study showed that students earned lower Grade Point Averages (GPA) in mathematics and science courses compared to 14 other subject areas (NCES, 2004). However, advanced math and science courses appear to be correlated with higher GPAs and achievement test outcomes. For example, one study found that high school graduates who took Advanced Placement (AP) and/or International Baccalaureate (IB) courses in both mathematics and science earned a higher GPA than graduates who took AP/IB mathematics courses only or AP/IB science courses only. Furthermore, graduates who did not take AP/IB mathematics or science courses earned a lower overall mean GPA than the AP/IB course-taking subgroups (NCES, 2004).

Investigations based on transcripts found similar patterns. A study of 17,400 transcripts from 2005 graduates across the nation revealed that students who took more rigorous math and science courses obtained higher NAEP scores (Shettle et al., 2005). Specifically, graduates who completed the math sequence through the level of calculus scored at the Proficient level on the NAEP math test, whereas those who advanced only through geometry scored below the Basic level. Students who completed physics or an advanced science class scored at the Basic level on the NAEP in science, while those who completed only biology or chemistry scored below the Basic level. Similarly, findings from a report analyzing course-taking patterns of students in Washington, D.C., found that students who take college-preparatory courses perform better on the ACT (Council of Great City Schools, 2003). Interestingly, even when students' GPAs decrease because they are taking more rigorous courses, these courses appear to result in better performance on college placement or subject assessment tests. For example, researchers analyzed transcripts of nearly 20,000 Florida high school students and found that students were more likely to pass a mathematics computerized placement test if they had taken advanced math courses, even at the expense of lowering their GPA (Roth, Crans, Carter, Ariet, & Resnick, 2001).

With the growing concern around preparing students to compete in a global economy and the research linking advanced high school courses to improved student achievement, education leaders and policy makers have begun to recommend raising graduation requirements in core academic subjects for all students. The National Commission of Excellence in Education recommended students take at least three courses of math and science. In response to these recommendations, 41 out of 50 states implemented or increased requirements for the number of high school math and science credits needed for graduation (Teitelbaum, 2003). The Council of Chief State School Officers (2004) also found that many states increased graduation requirements, particularly in mathematics, science, and social studies from 1987 and 2004. This trend continues to the present date (Education Commission of the States, 2007). For example, in 2008, 37 and the District of Columbia required four credits of English and by 2012, 43 states plan to require four credits in English. With these higher credit requirements, policy makers expect students to take additional courses, including advanced math and science, which will improve student achievement and college eligibility.

Graduation Requirements and College Eligibility

Longitudinal studies can determine whether raising district or state graduation requirements increases the percentage of high school students who take advanced courses and become college

eligible. One longitudinal study examined a nationally representative sample of 26,000 high school transcripts of high school graduates from 1990 and from 2005. The study analyzed the type of courses taken, the amount of credits earned, and the grades received (Shettle et al., 2007). Researchers found the percentage of students completing course work above the standard level (defined as three credits of math including geometry and algebra, three credits of science including two lab sciences, and one credit of world language) increased from 31% to 51% from 1990 to 2005. Comparisons between 1990 and 2005 graduates also revealed that 2005 graduates earned approximately three additional credits in core and academic courses. In 2005, the mean number of English credits (4.3) was greater than that of other subjects, with the least credits earned in math (3.8) and in science (3.4). The 2005 graduates also earned an additional 0.6 credits in social studies, mathematics, and science and 0.2 credits in English. The authors suggested that increases in state requirements for earned credits may have contributed to this upward trend.

Teitelbaum (2003) investigated high school graduation requirements in math and science as they relate to course-taking patterns and to achievement. Students from the National Educational Longitudinal Survey study of 1988 were surveyed again in 1990 and 1992, as they reached their 11th and 12th grade years of high school. Students reported their school's graduation requirements influenced them to take more credits in science and math than they would have otherwise taken. However, this did not necessarily include additional *advanced* math and science courses. Rather, students often fulfilled the higher graduation requirements in lower-level courses. Other studies have reported similar findings, suggesting that states, districts, and schools need to define their graduation requirements based on specific courses rather than by specifying only the number of credits (Blank & Engler, 1992; Chaney, Burgdorf, & Atash, 1997). For example, the vast majority of Washington State school districts do not require a specific level of math for graduation. This further suggests that school evaluators, researchers, and education policy makers must consider course level, not only credit numbers, when addressing course-taking patterns and graduation requirements. In particular, requirements pertaining to course level must be considered if students are to graduate college eligible.

Course-Taking Patterns and the Achievement Gap

In efforts to raise academic achievement for all students, many recent studies examined the effect of advanced courses on closing the achievement gap. Schiller and Muller (2003) used nationally representative longitudinal data to analyze mathematics course-taking patterns and states' high school graduation requirements, assessment, and accountability policies. The researchers found that students in states with higher mathematics graduation requirements tended to enroll in higher-level mathematics courses as freshmen and to persist in these courses.

In a more recent study by Adelman (2006), students who took advanced math courses were more likely to attend college and earn degrees, regardless of race or socioeconomic status. Taking an advanced math course was also the best predictor for obtaining a college degree. According to Stern and Pavelchek (2006), the strongest predictor for high school graduates to enroll in a college level course was high school course work in pre-calculus, calculus, or AP/Honors English. Further, advanced high school course work was a stronger predictor of college enrollment than ethnicity. In a review of trends in academic progress for The Nation's Report Card™ (Shettle, 2007), the NAEP

analyzed course-taking patterns and academic achievement. Findings showed the percentage of 17-year olds taking higher-level math classes, such as calculus and second-year algebra, increased dramatically between 1971 and 2004, as did their scores on mathematics tests. This trend was especially evident for Black and Hispanic students (NAEP, 2005). Evan, Gray, and Olchefske (2008) assert that algebra, in particular, is the "gate-keeper" for student access to the upper level high school math and science courses, which are drivers of college readiness and completion. The authors found that rigorous mathematics and science course work in middle and early high school prepared students for these upper level courses and helped close the achievement gap.

In a longitudinal study investigating the effects of compliance with current requirements for high standards for all students, Burris, Hebuert, and Levin (2004) investigated the association of advanced math courses and the level of student achievement. The authors found an increased benefit for studying accelerated math in heterogeneous groups. There was a "statistically significant increase in the percentage of all students who took math courses beyond Algebra 2 in high school" (p. 70). Percentages increased for students who completed trigonometry for all subgroups, including students with low socioeconomic status, African American and Latino students, initial low-achievers, initial medium-achievers, and initial high-achievers. Completion rates for pre-calculus and Advanced Placement calculus courses also increased.

Summary

As the nature of the nation's economy and industrial base changes, the skills necessary to enter and to be successful in the workforce have also changed. A high school education no longer guarantees economic viability, and increasing numbers of jobs will require some college education. This means high schools must prepare all students for continuing their education after graduation. Research on course-taking patterns and achievement clearly demonstrates the benefits of advanced courses on academic achievement for all students. Students who take advanced courses are better prepared for college and for career. They are more likely to enroll in college and to earn degrees, regardless of race or socio-economic status. Thus, preparing students to succeed in advanced courses ultimately contributes to closing the achievement gap and ensures that students graduate from high school with the skills and knowledge to succeed in the 21st century. In developing policies that promote more rigorous coursework and higher graduation requirements, however, educators will need to ensure that students are prepared in middle and early high school for more advanced courses, and that students have the support they need to succeed in these courses.

CORE 24

At a minimum of 19 credits, current graduation requirements in Washington State are among the lowest in the nation. Compared to other states, requirements are lower within specific content areas, as well (Education Commission of the States, 2006). However, districts vary widely in the number of credits required. According to Taylor (2007), the majority of districts require 22 credits, with a statewide mean of 24.5. Larger districts, which serve the vast majority of students, tend to require fewer credits. In math and science, the majority of districts adhere to the minimum state requirements of two credits for graduation. In contrast, credit requirements in English and social

studies exceed minimum state requirements in the majority of districts. Graduation requirements in only four districts include one or more credits in world language.

The credit requirements for students graduating from high schools in Washington State have not changed since 1985. Since that time, the skills and knowledge essential for succeeding in an increasingly competitive economy have changed substantially. Therefore, the Washington State Board of Education is in the process of revising high school graduation requirements to better prepare students for career, college, and citizenship. The SBE began creating a draft of new graduation requirements called CORE 24. Students, parents, educators, administrators, and business and community leaders provided information to the board in order to inform the new requirements. According to SBE, "Under CORE 24, all students would be enrolled automatically in college and career ready courses that would keep all postsecondary college and career options open unless they chose to pursue a college emphasis or a career emphasis only." (Retrieved December 4, 2008 from: http://www.sbe.wa.gov/mhsd.htm). The credit requirements involved in CORE 24 are more rigorous than current Washington State and Higher Education Coordinating (HEC) Board graduation requirements (see Table 2) and specify not only the number of credits required, but also in some cases the level of the courses. The current HEC Board Requirements were used in this study to define the minimum, public four-year college admission standards because those are the requirements for the class of 2008.

New HEC Board graduation requirements were adopted in May 2007, and the requirements will be fully implemented by summer 2012 (Higher Education Coordinating Board, 2007). The SBE considered the new HEC Board requirements in developing the CORE 24 framework.

Table 2.
Graduation Requirement Comparison[2]

Subject	Current Washington State Graduation Requirements	Current Higher Education Coordinating Board Graduation Requirements	CORE 24 Graduation Requirements
English	3 Credits	4 Credits*	4 Credits
Math	2 Credits	3 Credits**	3 Credits
Science	2 Credits***	2 Credits***	3 Credits****
Social Studies	2.5 Credits	3 Credits	3 Credits
Arts	1 Credit	1 Credit	2 Credits
World Language	0 Credits	2 Credits	2 Credits*****

*Including 3 years of literature
**Including advanced math (e.g. Introduction to trigonometry)
*** Including at least one year of laboratory science
****Including at least two years of laboratory science
*****Substitutions are allowed based up on the High School and Beyond Plan

[2] Credits required for Career and Technical Education, Physical Education and Health, and electives are not included in this list.

METHODOLOGY

The purpose of this study was to gather transcripts from a representative sample of high schools across the state, to analyze the transcripts, and to provide the SBE general information about student course-taking patterns, as well as specific information pertaining to district requirements.

Research Questions

This project is guided by a series of research questions. These questions call for sophisticated coding of transcripts and for descriptive and inferential statistical analysis. The questions are listed below.

1. What percentage of Washington students are taking courses that meet the minimum, public four-year Washington college admissions standards set by the Higher Education Coordinating Board?

    a. What is the relationship between districts that require more than the state minimum requirements in math and science and the number of students who take courses that meet the minimum, public four-year Washington college admissions standards?

    b. What is the relationship between districts that require only the state minimum credits in math and science and the number of students who take courses that meet the minimum, public four-year Washington college admissions standards?

    c. What required college admissions courses are most frequently not taken?

2. What does a typical senior schedule look like—how many credits are seniors taking, and what types of courses?

3. How do course-taking patterns differ for students who meet standard on the math, reading, writing, and science Washington Assessment of Student Learning (WASL) and for those who don't?

4. How many students earn high school credits in math and world language prior to entering 9th grade?

5. How many credits in each subject area required for high school graduation (e.g., English, mathematics, science, social studies, arts, occupational education) are students actually taking?

6. What is the relationship between the number of credits required for graduation at the district level and the number of credits students actually take?

7. What courses are students taking in each subject area?

8. What percentage of honors courses (Advanced Placement, IB) are students taking, and in what types of districts are these courses likely to be available?

9. What differences emerge if the responses to each of these questions are cross-referenced by gender and ethnicity?

Sampling Procedure

In an effort to represent students across the state, we selected 100 high schools to participate in the study, using stratified random sampling procedures. We selected districts for the sample based on the percentage of total student enrollment for each county in Washington State (see Table 3). The study intended to have, and succeeded to have, at least one district (and one high school) from every county represented in the final sample. Washington State has 39 counties, and since there are 100 schools in the sample, some counties are allocated more districts than others based on student enrollment percentages. [3]

Table 3.
District Distributions

County	% of total student enrollment*	# of districts allotted
Adams	0.38%	1
Asotin	0.33%	1
Benton	3.00%	2
Chelan	1.23%	1
Clallam	0.97%	1
Clark	7.33%	6
Columbia	0.06%	1
Cowlitz	1.73%	3
Douglas	0.62%	1
Ferry	0.10%	1
Franklin	1.40%	1
Garfield	0.03%	1
Grant	1.67%	2
Grays Harbor	1.20%	1
Island	0.85%	1
Jefferson	0.30%	1
King	25.27%	17
Kitsap	3.81%	3
Kittitas	0.50%	1
Klickitat	0.32%	1
Lewis	1.19%	1
Lincoln	0.20%	1
Mason	0.82%	1
Okanogan	0.60%	1
Pacific	0.29%	1
Pend Orielle	0.18%	1

[3] Percent Total Enrollment equals the number of students in the county divided by the number of students in the state. Enrollment information was obtained from the State Board of Education High School Graduation Database: http://www.sbe.wa.gov/documents/GraduationRequirementsDatabase_000.xls.

Pierce	12.64%	12
San Juan	0.16%	1
Skagit	1.87%	2
Skamania	0.12%	1
Snohomish	10.65%	9
Spokane	7.02%	6
Stevens	0.59%	1
Thurston	3.85%	4
Wahkiakum	0.05%	1
Walla Walla	0.84%	1
Whatcom	2.54%	3
Whitman	0.44%	1
Yakima	4.83%	5

Once we identified the number of districts allotted in each county, the next step in the sampling process involved choosing the districts to be included from a particular county. In some cases, this process was very easy, as some counties contain only one district. In order to perform some of the analyses required by the study, a relatively even distribution of districts requiring 2.0 credits each of math and science and those requiring 3.0 or more credits each of math and science was desirable. We selected districts with higher math and/or science credit requirements first because there are fewer of these districts in the state. Districts requiring the minimum number of math and science credits were then selected using a random number array. The credit requirements of districts in the final sample are displayed in Table 4.

Table 4.
Math and Science Credits Required by Districts in Sample

	Subject	
Credits Required	**Math**	**Science**
2.0	54 districts	69 districts
2.5	2 districts	1 district
3.0	42 districts	29 districts
4.0	2 districts	1 district

After choosing the districts within each county, the next step in the process was the selection of high schools within each district. We compiled a list of all of the high schools within each of the selected districts from the Office of Superintendent of Public Instruction (OSPI) website. We included schools in this database if the grade span extended through 12th grade. Therefore, some K-12 schools, some 6-12 schools, and some alternative high schools are represented in the final sample. We did not include schools OSPI identified as home-based schools, learning centers, special education schools, technical skills centers, parent partnership schools, night schools, and schools located in justice centers. After eliminating these schools from the list, we selected high schools using a random number array. After selecting all of the high schools for the study, we averaged the demographics of the sample to compare them with the demographics of all eligible high schools in the state (see Table 5). The sample was deemed to be representative of the state demographics, with

a slightly higher percentage of white students represented in the sample and a higher mean enrollment compared to the state.[4,5]

Table 5.
Demographics of Schools in Sample

	Entire Population* (n = 504)	Student Sample (n = 100)
Enrollment	Mean =637 (Range = 5 – 3142)	Mean = 787 (Range = 26 – 3142)
Free/Reduced Lunch	35%	34%
Amer Ind/Ala Native	3%	3%
Asian	8%	5%
Black	6%	4%
Hispanic	14%	13%
White	68%	75%

*Note. Entire Population = all eligible high schools in the state.

Five of the original districts and schools identified in the sample did not participate in the study. One district declined to participate; the other four agreed to participate but did not submit the transcripts after multiple requests. We identified alternates that matched the original schools. Table 6 details the participating districts and schools selected for this study by county.

Table 6.
Selected Districts and Schools

County	District	School
Adams	Othello School District	Othello High School
Asotin	Clarkston School District	Charles Francis Adams High School
Benton	Kennewick School District	Kamiakin High School
Benton	Richland School District	Rivers Edge High School
Chelan	Cashmere School District	Cashmere High School
Clallam	Quillayute Valley School District	Forks High School
Clark	Vancouver School District	Columbia River High
Clark	Washougal School District	Excelsior High School
Clark	Hockinson School District	Hockinson High School
Clark	La Center School District	La Center High School
Clark	Evergreen School District (Clark)	Legacy High School
Clark	Ridgefield School District	Ridgefield High School
Columbia	Dayton School District	Dayton High School

[4] To explore how the sample would have been different had we drawn a purely random sample, a second sample of 100 high schools was selected using a random approach. This approach differed from the one described above in that districts were selected randomly rather than with consideration to credit requirements. The demographics from this sample were very similar to the original sample. The original sample was chosen for the study because there would be no relative advantage to the random progress; that is, the analyses would prove more valid with a more equal distribution of districts requiring 2.0 credits each of math and science and those requiring 3.0 or more credits each of math and science.
[5] Information was obtained from the OSPI website: www.k12.wa.us.

Cowlitz	Castle Rock School District	Castle Rock High School
Cowlitz	Kalama School District	Kalama Jr Sr High
Cowlitz	Woodland School District	Woodland High School
Douglas	Eastmont School District	Eastmont Senior High
Ferry	Curlew School District	Curlew Elem & High School
Franklin	Pasco School District	Pasco Senior High School
Garfield	Pomeroy School District	Pomeroy Jr Sr High School
Grant	Royal School District	Royal High School
Grant	Warden School District	Warden High School
Grays Harbor	Wishkah Valley School District	Wishkah Valley Elementary/High School
Island	South Whidbey School District	Bayview Alternative School
Jefferson	Quilcene School District	Quilcene High And Elementary
King	Auburn School District	Auburn Mountainview High School
King	Northshore School District	Bothell High School
King	Riverview School District	Cedarcrest High School
King	Enumclaw School District	Enumclaw Sr High School
King	Tukwila School District	Foster Senior High School
King	Highline School District	Global Connections High School
King	Federal Way School District	H. S. Truman High School
King	Bellevue School District	International School
King	Issaquah School District	Issaquah High School
King	Lake Washington School District	Lake Washington High
King	Mercer Island School District	Mercer Island High School
King	Snoqualmie Valley School District	Mount Si High School
King	Seattle Public Schools	Rainier Beach High School
King	Renton School District	Renton Senior High School
King	Skykomish School District	Skykomish High School
King	Tahoma School District	Tahoma Senior High School
King	Vashon Island School District	Vashon Island High School
Kitsap	Bainbridge Island School District	Bainbridge High School
Kitsap	Central Kitsap School District	Central Kitsap High School
Kitsap	Bremerton School District	Renaissance Alternative High School
Kittitas	Thorp School District	Thorp Elem & Jr Sr High
Klickitat	Klickitat School District	Klickitat Elem & High
Lewis	Mossyrock School District	Mossyrock Middle & High Schl
Lincoln	Davenport School District	Davenport Senior High School
Mason	North Mason School District	North Mason Senior High School
Okanogan	Brewster School District	Brewster High School
Pacific	Willapa Valley School District	Willapa Valley Jr Sr High
Pend Oreille	Newport School District	Newport High School
Pierce	Bethel School District	Bethel High School
Pierce	Sumner School District	Bonney Lake High School
Pierce	University Place School District	Curtis Senior High
Pierce	Eatonville School District	Eatonville High School
Pierce	Fife School District	Fife High School

Pierce	Peninsula School District	Henderson Bay Alt High School
Pierce	Clover Park School District	Lakes High School
Pierce	Tacoma School District	Mt Tahoma
Pierce	Orting School District	Orting High School
Pierce	Franklin Pierce School District	Washington High School
Pierce	White River School District	White River High School
Pierce	Puyallup School District	EB Walker High School
San Juan	Orcas Island School District	Orcas Island High School
Skagit	Anacortes School District	Anacortes High School
Skagit	Sedro-Woolley School District	Sedro Woolley Senior High School
Skamania	Stevenson-Carson School District	Stevenson High School
Snohomish	Snohomish School District	Aim High School
Snohomish	Everett School District	Everett High School
Snohomish	Granite Falls School District	Granite Falls High School
Snohomish	Lake Stevens School District	Lake Stevens High School
Snohomish	Mukilteo School District	Mariner High School
Snohomish	Marysville School District	Marysville Mountain View High School
Snohomish	Edmonds School District	Mountlake Terrace High School
Snohomish	Sultan School District	Sultan Senior High School
Snohomish	Arlington School District	Weston High School
Spokane	Deer Park School District	Deer Park High School
Spokane	East Valley School District (Spokane)	East Valley High School & Extension
Spokane	Freeman School District	Freeman High School
Spokane	Mead School District	Mead Alternative High School
Spokane	Spokane School District	North Central High School
Spokane	Central Valley School District	University High School
Stevens	Colville School District	Colville Senior High School
Thurston	Olympia School District	Avanti High School
Thurston	Rainier School District	Rainier Senior High School
Thurston	North Thurston Public Schools	River Ridge High School
Thurston	Yelm School District	Yelm High School 12
Wahkiakum	Wahkiakum School District	Wahkiakum High School
Walla Walla	Waitsburg School District	Waitsburg High School
Whatcom	Lynden School District	Lynden High School
Whatcom	Mount Baker School District	Mount Baker Senior High
Whatcom	Nooksack School District	Nooksack Valley High School
Whitman	Colfax School District	Colfax High School
Yakima	Highland School District	Highland High School
Yakima	Yakima School District	Stanton Alternative School
Yakima	Sunnyside School District	Sunnyside High School
Yakima	Toppenish School District	Toppenish High School
Yakima	Wapato School District	Wapato High School

Transcript Collection

Upon selecting the schools, the SBE sent a letter to superintendents and principals briefly describing the study. Shortly thereafter, a representative from The BERC Group contacted the principals to describe the study in more detail and to address their questions and concerns, if any. We requested that each school provide transcripts for their 2008 graduating students, along with gender, ethnicity, and WASL results for math and science. In the majority of the schools, the principals were supportive of the study and identified a point-person (usually the Registrar) to work with a BERC representative. A BERC representative worked with the registrar by phone to obtain this additional information and offered to provide technical assistance if needed.

Transcript Sample

A team of researchers and school counselors scored 14,875 graduating students' transcripts by hand from the 100 schools (Range = 3 to 454 per school) to determine student course-taking patterns and to determine if districts/schools are creating opportunities for all students to access a college preparatory curriculum. This is approximately 25.3% of the total 2008 graduating population, based on estimates from the 2007 graduating class size (n = 58,750).[6]

Of the 14,875 students in the sample 47.1% were male, 51.3% female, and 1.6% not reported. The ethnic distribution aligns more closely to the state demographics. Table 7 details the demographics of the students compared to the state.

Table 7.
Demographics of Students in Sample

	Entire Population (n = 1,031,846)	**Sample by School (n = 14,875)**
Amer Ind/Ala Native	2.7%	1.2%
Asian	8.4%	6.3%
Black	5.5%	3.4%
Hispanic	14.7%	10.5%
White	66.2%	66.5%
Other		0.6%
Not Reported		11.5%

Transcript Analysis

Researchers received training from college admissions specialists from a local college to analyze courses and transcripts to determine if the courses align with minimum, public four-year college admissions standards as defined by the HEC Board. Along with this training, we consulted course catalogs, course information on high school websites, and the National Collegiate Athletic

[6] According to the OPSI website 58,750 students graduated in 2007. This information was not available for the 2008 graduates.

Association list of approved courses to determine if the courses aligned with college admission standards. After coding the transcripts, we transferred information onto a detailed coding form aligned with the research questions, and entered all data into a database.

The analyses include both descriptive and inferential statistics to describe general course-taking patterns, to determine if there are differences among students meeting four-year college eligibility based on district requirements, and to determine if there are group differences in course-taking patterns for students who meet standard on the math and science WASL.

RESEARCH FINDINGS

The following sections provide the results for this study. The results are organized around the original research questions identified in the Request for Proposal.

Research Question #1: What percentage of Washington students are taking courses that meet the minimum, public four-year Washington college admissions standards set by the Higher Education Coordinating Board?

Of the 2008 high school graduates, 48.5% met the minimum, public four-year Washington college admissions standards set by the HEC Board, meaning the majority of students graduating from Washington State high schools are not eligible for college admittance by Washington State HEC Board standards because of course-taking deficiencies (see Figure 3).[7] Overall results indicate that, while the graduation requirements meet the state's minimum requirements for a high school diploma, requirements do not align with Washington colleges' admission requirements.

[7] See Table 1 for a list of the HEC Board requirements.

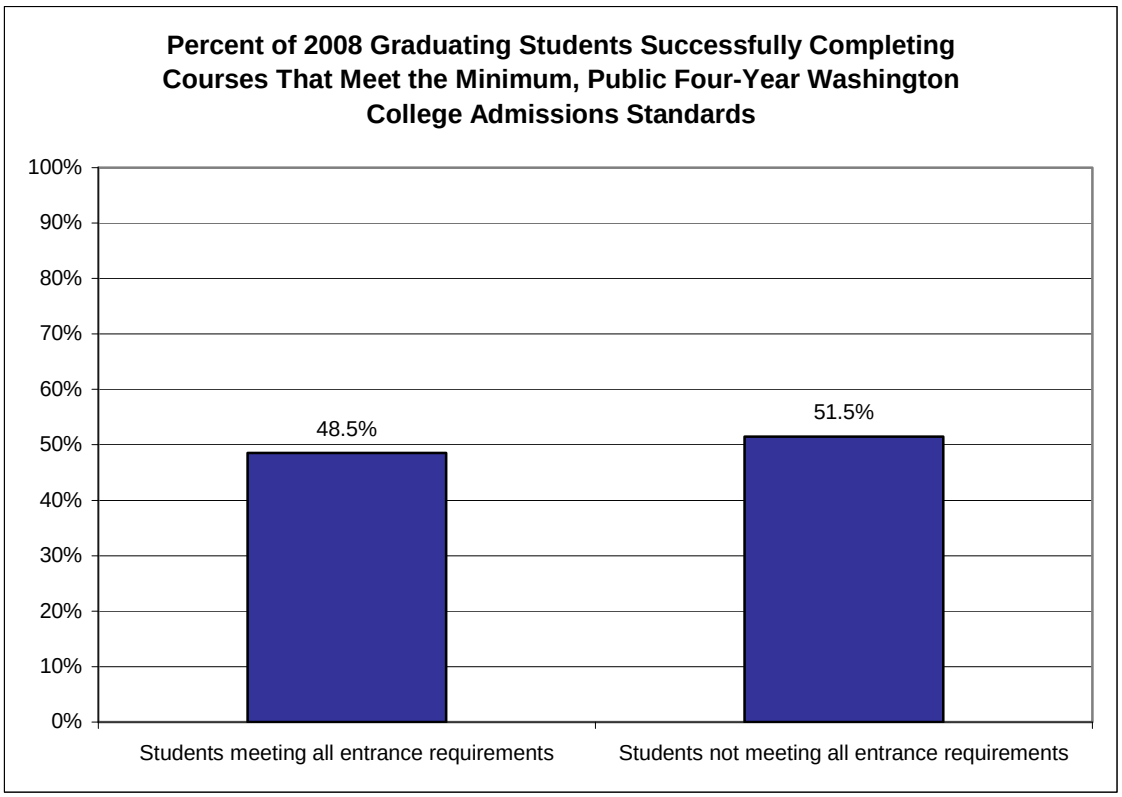

Figure 3. **Percent of 2008 Graduating Students Successfully Completing Courses That Meet the Minimum, Public Four-Year Washington College Admissions Standards**

Research Question #1A and #1B: What is the relationship between district requirements in math and science and the number of students who take courses that meet the minimum, public four-year Washington college admissions standards?

To determine if the number of course credits required by a district in math and science affect the number of students who take and complete courses that meet the minimum, public Washington college admissions standards, two analyses of covariance (ANCOVA) were conducted; one for math and one for science. The dependent variable in both analyses was the percentage of students meeting college eligibility requirements and the independent variable was the number of math or science credits required for graduation. These analyses also controlled for free or reduced lunch status. The overall results for both ANCOVAs were not statistically significant for the number of math or science credits required for graduation. However, both ANCOVAs were statistically significant for free or reduced lunch status $F = 19.6$, $p < .001$ for math and $F = 19.6$, $p < .001$ for science.

These analyses suggest that the number of math and science credits required for graduation does not have a significant impact on the percentage of students graduating eligible for admittance to a four-year Washington college. Of the districts requiring two credits in math, 48.5% were college eligible compared to 47.0% in the districts requiring more than two math credits. Similarly, in districts requiring two science credits, 47.0% were college eligible compared to 53.3% in districts requiring more than two credits. These results also confirm that socioeconomic status (i.e. free or reduced

lunch status) has a substantial influence on whether a student graduates from high school eligible to attend a Washington four-year college. Figures 4 and 5 display the mean number of math and science credits, respectively, taken by students based on the number of credits required for graduation. The number of credits taken by students in math and science was greater in districts with higher credit requirements, but as mentioned above this did not necessarily mean these students were college eligible. Oftentimes, the extra credits accumulated were lower level courses, algebra 1 taken for two credits over two years rather than in one year, and repeated classes.

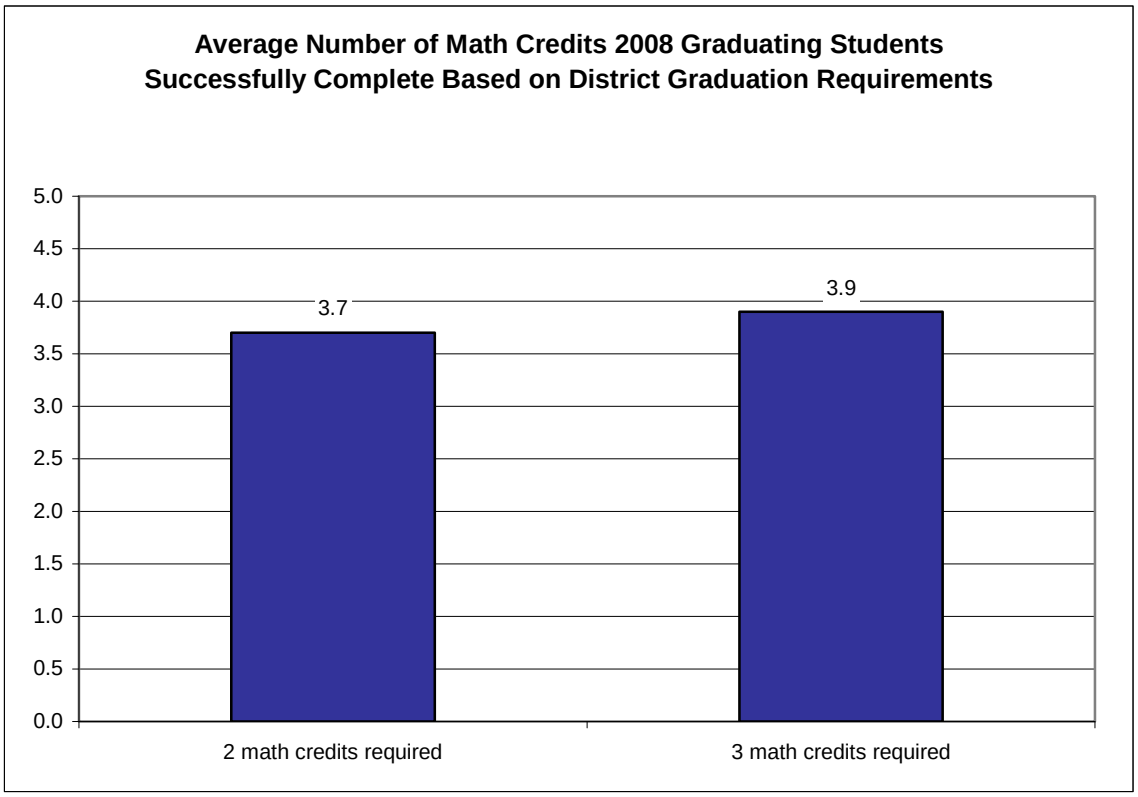

Figure 4. **Average Number of Math Credits 2008 Graduating Students Successfully Complete Based on District Graduation Requirements**

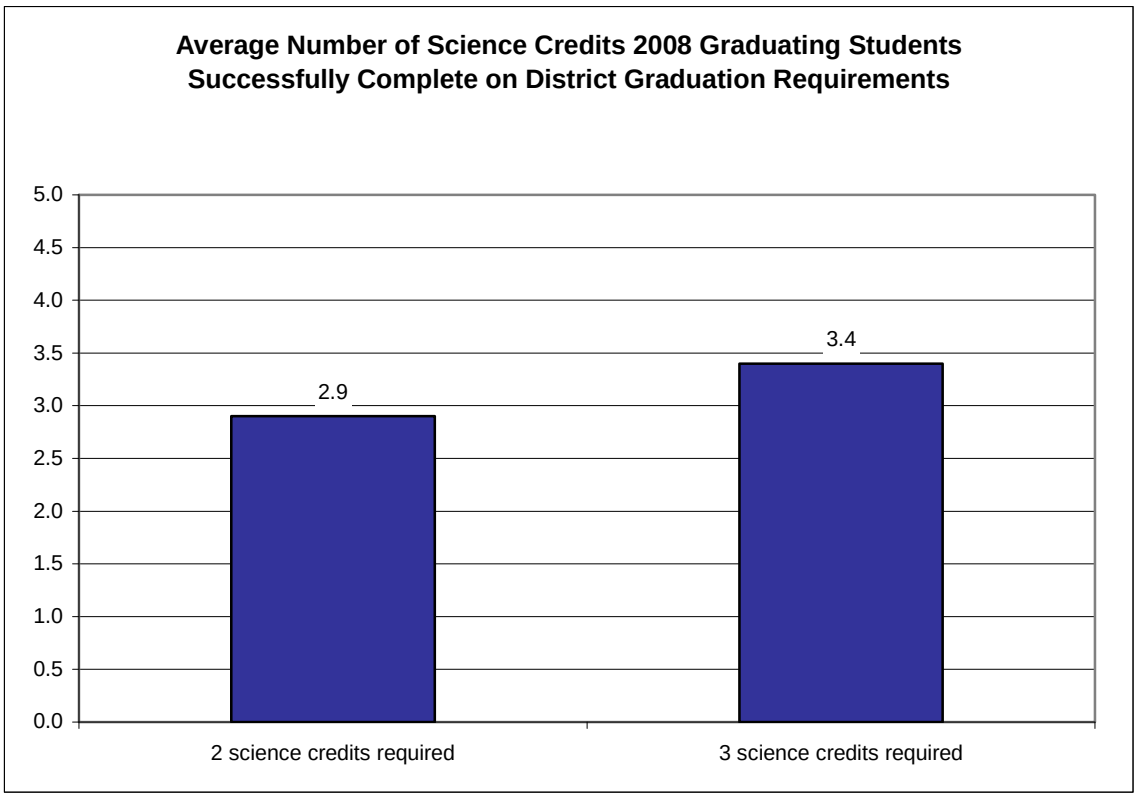

Figure 5. **Average Number of Science Credits 2008 Graduating Students Successfully Complete Based on District Graduation Requirements**

Research Question #1C: What required college admissions courses are most frequently not taken?

Approximately half of all graduates failed to meet college entrance requirements when aggregated across all requirements (see Figure 3). Disaggregating the results by individual subject area, approximately one-third of all students failed to meet the requisite college preparation requirements in math (34.5%) and world language (30.5%), and 21.2% of students failed to meet the requisite college preparation requirements in English (see Figure 6). These are the three subject areas where state graduation requirements are lower than the minimum, public four-year college admission standard identified by the HEC Board by at least one credit.

These results show the importance of aligning credit requirements for college admission in all areas. For example, in total, 34.5% did of the graduates did not meet the math requirements. That means 65.5% of students did complete the advanced math requirements, but only 48.5% completed all college admission requirements. This indicates that 17% of the students completed the advanced math requirements, but failed to meet admission requirements in another area (e.g. world language or perhaps English).

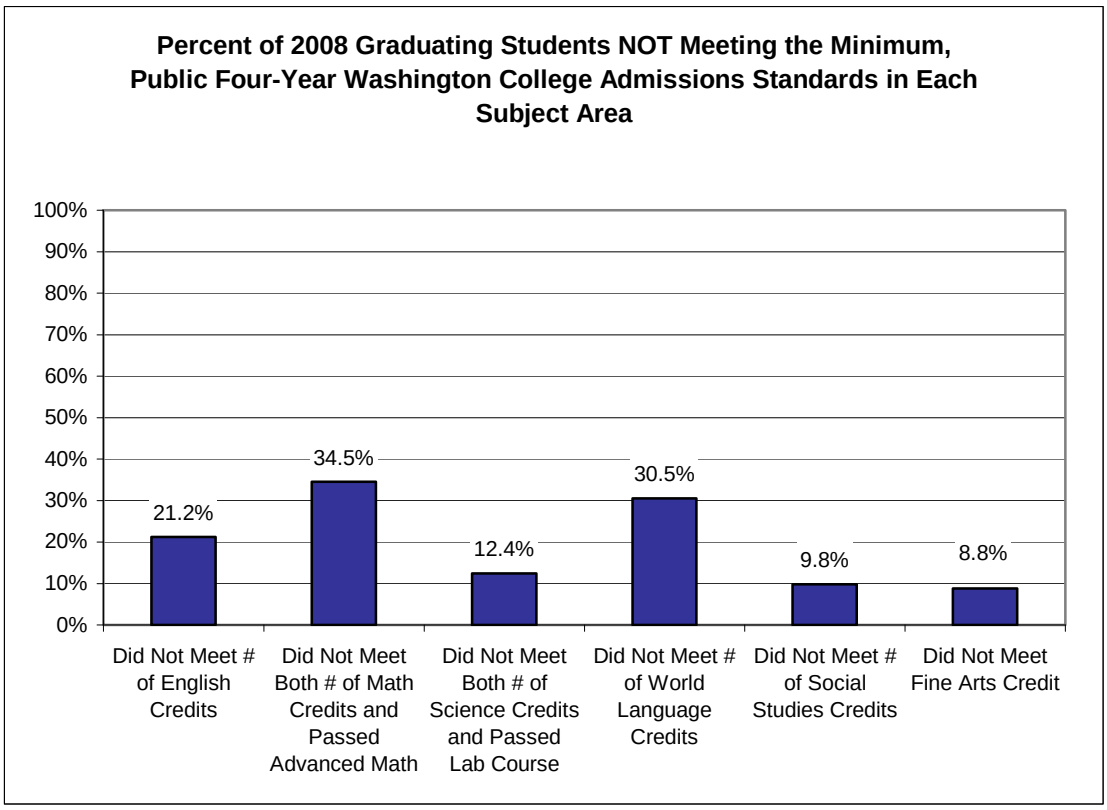

Figure 6. **Percent of 2008 Graduating Students NOT Meeting the Minimum, Public Four-Year Washington College Admissions Standards in Each Subject Area**

Research Question #2: What does a typical senior schedule look like—how many credits are seniors taking, and what types of courses?

Senior students take a mean of 6.5 credits (median = 6, mode = 6). Approximately 35.0% of seniors take less than a full load of credits, 35.5% take a full load, and 29.5% take more than a full load (see Figure 7).[8] Of those students who take more than a full load, 23.2% are enrolled in Running Start. The remaining students are recovering credits for previously failed classes or appear to be taking additional elective credits, particularly in fine arts (usually music), career or technical education, or physical education.

Further analysis reveals that the majority of seniors take social studies (95.3%) and English (93.5%) in their senior year (see Figure 8). This finding is consistent with district graduation policies and requirements. For example, the majority of districts schedule students into Current World Problems in the senior year. Furthermore, although the state minimum requirement in English is three credits, 92% of the districts in Washington State require a minimum of four credits (Taylor, 2007). Therefore, the majority of seniors take classes in these subject areas.

[8] The number of credits required for a full load is based upon the student's schedule. For example, students usually earn 8 credits in schools with a block schedule, and students usually earn 6 credits in schools with a standard schedule.

Conversely, only 40% of the districts require more than the state minimum requirements in math (two credits), 19% in science (two credits), and 2% in world language (zero credits). Consequently, the majority of students have already met these credit requirements by the end of their junior year, and many students do not take these classes in their senior year.

It is noteworthy that the percentage of students taking math in their senior year is likely higher than in previous years. Students graduating in 2008 who do not pass the math WASL are required to take math credits in their senior year. For example, while 68.7% of students were taking math in the senior year, only 55.3% were taking higher-level math that would lead to college admission. Approximately 13.4% were taking a math course to meet this graduation requirement, including Segmented math and PAS math. The remaining 31.3% of seniors were not taking math in their senior.

Generally, students fill their schedules in their senior year with English, social studies, and electives. Approximately, 24.3% of seniors earn credits as a Teacher's Assistant. Only 5.9% of graduates take credits in work experience.

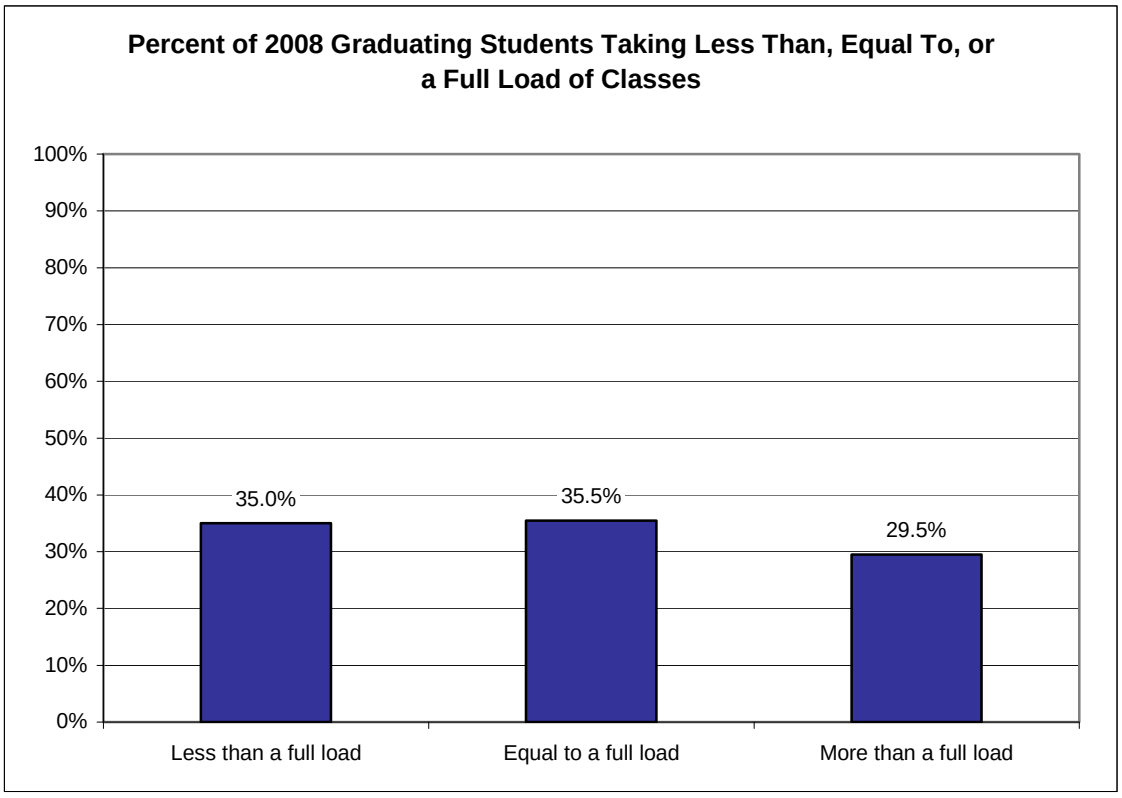

Figure 7. **Percent of 2008 Graduating Students Taking Less Than, Equal To, or a Full Load of Classes**

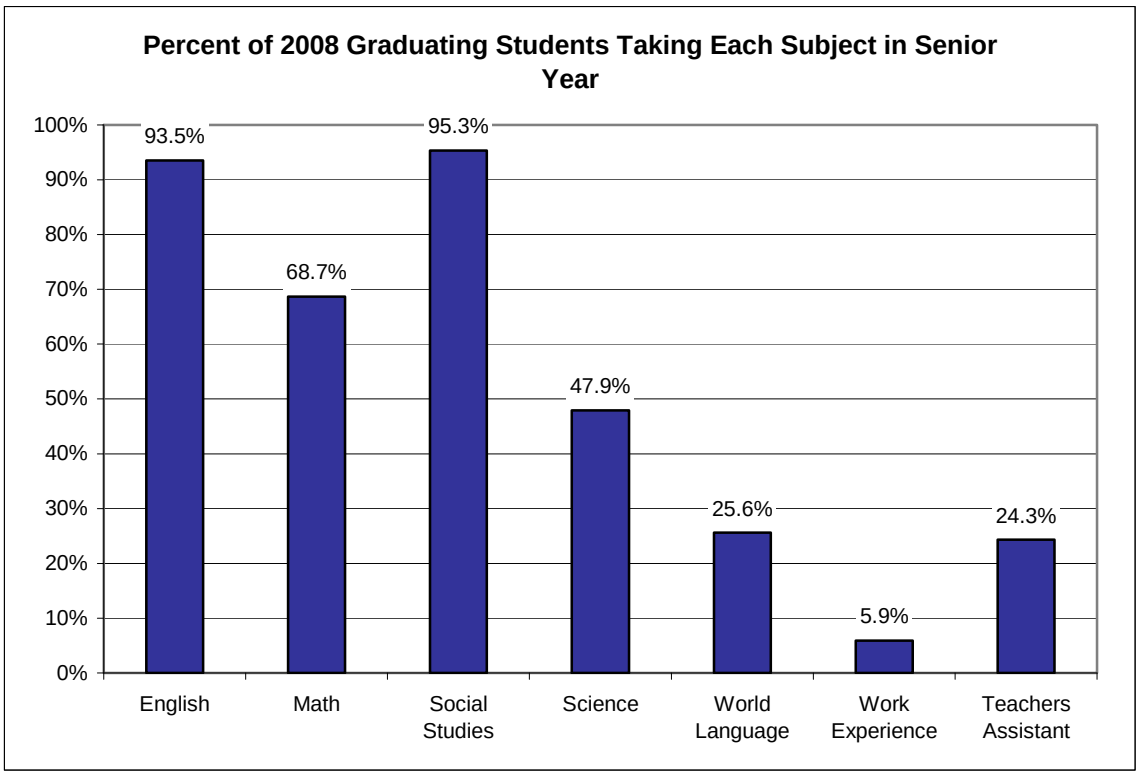

Figure 8. **Percent of 2008 Graduating Students Taking Each Subject in Senior Year**

Research Question #3: How do course-taking patterns differ for students who meet standard on the math, reading, writing, and science Washington Assessment of Student Learning (WASL) and those who don't?

The difference in course taking patterns for students who met standard on the math and science WASL were examined by grouping students based on their math and science course-taking patterns by their second year of high school.[9] Students were grouped into three levels based on their math and science course-taking patterns (see Table 8). Table 9 shows the percentage of graduates who attained each level by their sophomore year. Figures 9 and 10 show the percentage of students at each level meeting WASL standards for math and science.

Table 8.
Levels of Course Taking Patterns by Sophomore Year

Level	Math Course-Taking Patterns	Science Course-Taking Patterns
1	Algebra or below	Less than one credit lab science
2	Geometry	One credit lab science and less than two credits in science
3	Algebra 2 or above	Two credits of science, including one lab credit

[9] Analyses for the reading and writing WASL are not included because all students graduating in 2008 were required to pass these sections.

Table 9.

Percent of Students Attaining each Level by Sophomore Year

Level	Math Course Taking Patterns	Science Course Taking Patterns
1	26.1%	11.9%
2	43.6%	15.8%
3	30.4%	72.3%

Two analyses of variance (ANOVA) were run with Level (Level 1, Level 2, and Level 3) as the independent variable and meeting standard on the math or science WASL as the dependent variable, respectively. Both ANOVAs were statistically significant for level ($F = 1077$, $p < .001$ for math and $F = 304$, $p < .001$ for science) suggesting that students who reach a higher level of math or science by their second year are more likely to pass that subject area in the WASL.

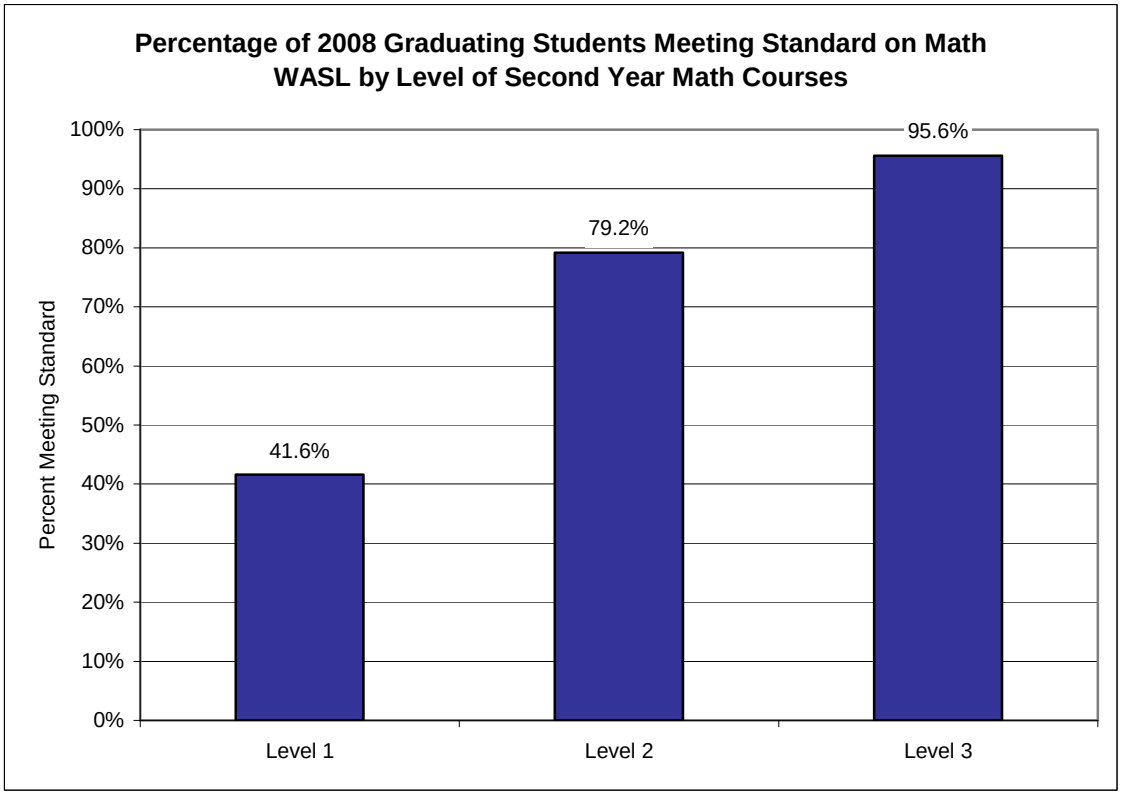

Figure 9. **Percentage of 2008 Graduating Students Meeting Standard on Math WASL by Level of Second Year Math Courses**[10]

[10] Level 1 refers to completing Algebra or Below, Level 2 refers to completing Geometry, and Level 3 refers to completing Algebra or above by the end of the second year of high school.

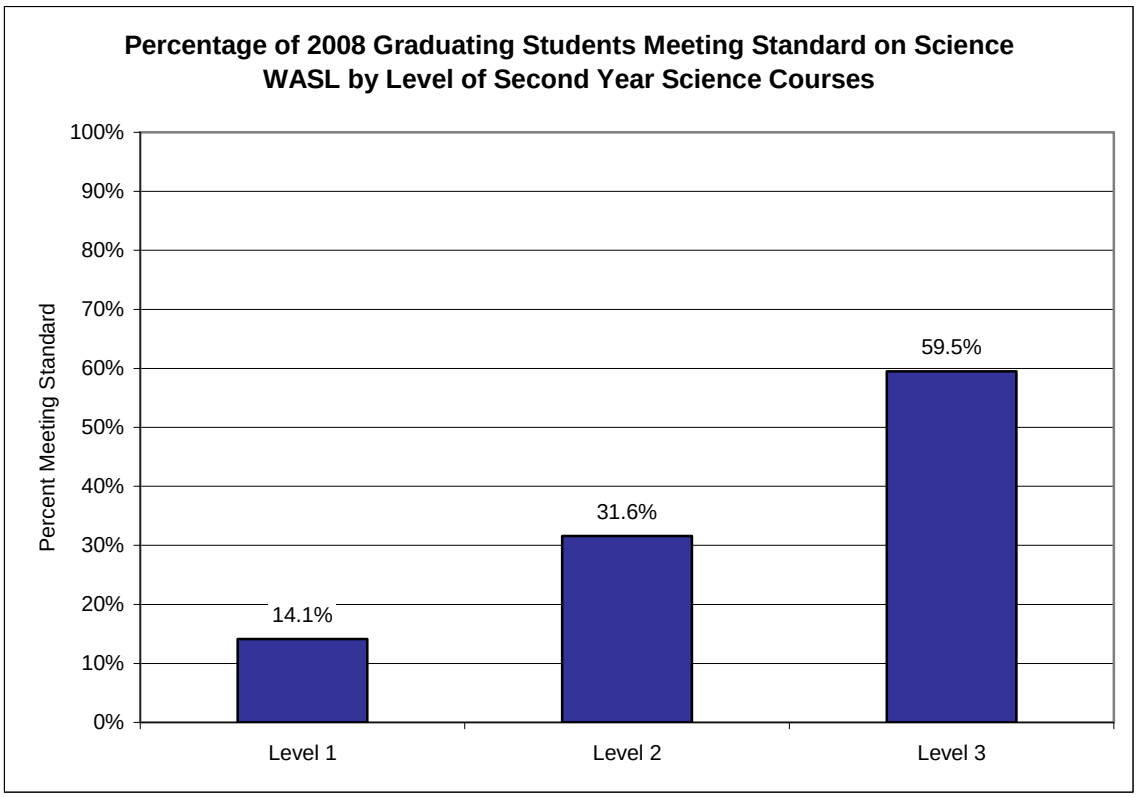

Figure 10. **Percentage of 2008 Graduating Students Meeting Standard on Science WASL by Level of Second Year Science Courses**[11]

Additional analyses show that students who reach a higher level of math or science by their second year of high school are more likely to meet the minimum, public four-year college admissions standards. For example, in math, only 8.2% of students who complete Algebra 1 by their second year in high school met the minimum, public four-year college admissions standards, whereas 80.6% of students completing through Algebra 2 or beyond by their second year met these standards (see Figure 11). Similarly, in science, only 6.6% who took less than one credit of lab science by their second year in high school met the minimum, public four-year college admissions standards, whereas 58.9% of students completing two credits of science, including one lab, by their second year met these college admission standards. These results suggest that course taking patterns in middle school and the first couple of years of high school are important for determining college eligibility.

[11] Level 1 refers to completing less than one credit of lab science, Level 2 refers to completing one credit of lab science and less than two credits of science, Level 3 refers to completing two credits of science, including one credit of lab science.

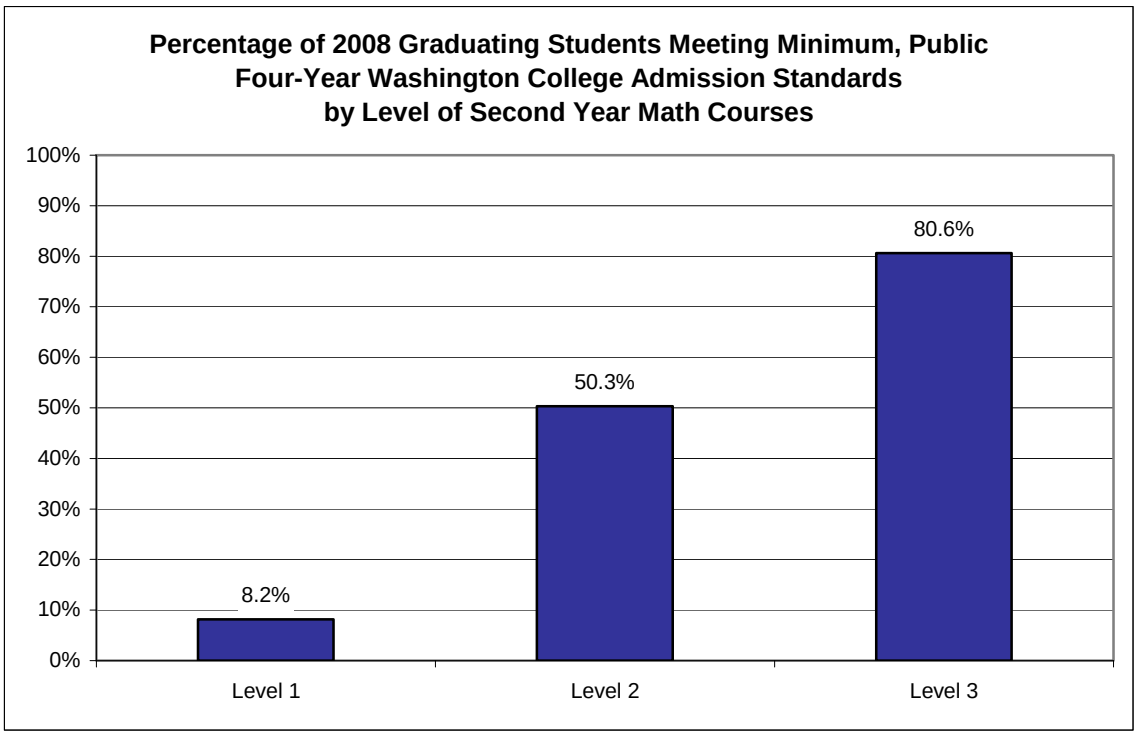

Figure 11. **Percentage of 2008 Graduating Students Meeting Minimum, Public Four-Year Washington College Admissions Standards by Level of Second Year Math Courses**

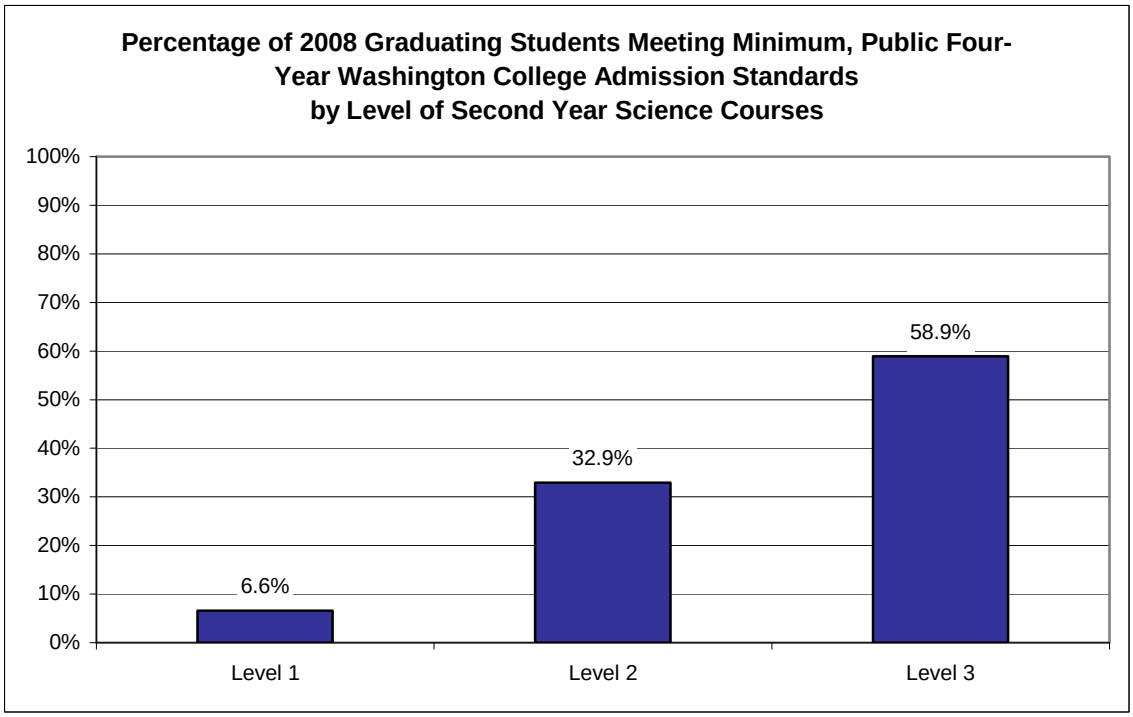

Figure 12. **Percentage of Students Meeting Minimum, Public Four-Year Washington College Admissions Standards by Level of Second Year Science Courses**

Research Question #4: How many students earn high school credits in math and world language prior to entering 9th grade?

This analysis focused on whether students earned high school credits in math or world language prior to entering 9th grade[12]. Results showed that 26.1% and 6.3% of high school graduates earned credits in math or foreign language, respectively, prior to entering 9th grade (see Figure 13). In addition, approximately 39.9% of students completed Washington State History prior to entering 9th grade. However, the majority of these students did not receive credit for the state history class; instead, there was documentation on the transcript that the requirement was met in middle school. There is no discernable pattern between schools where students met the Washington State History requirements in middle schools and in schools where students did not meet this requirement.[13]

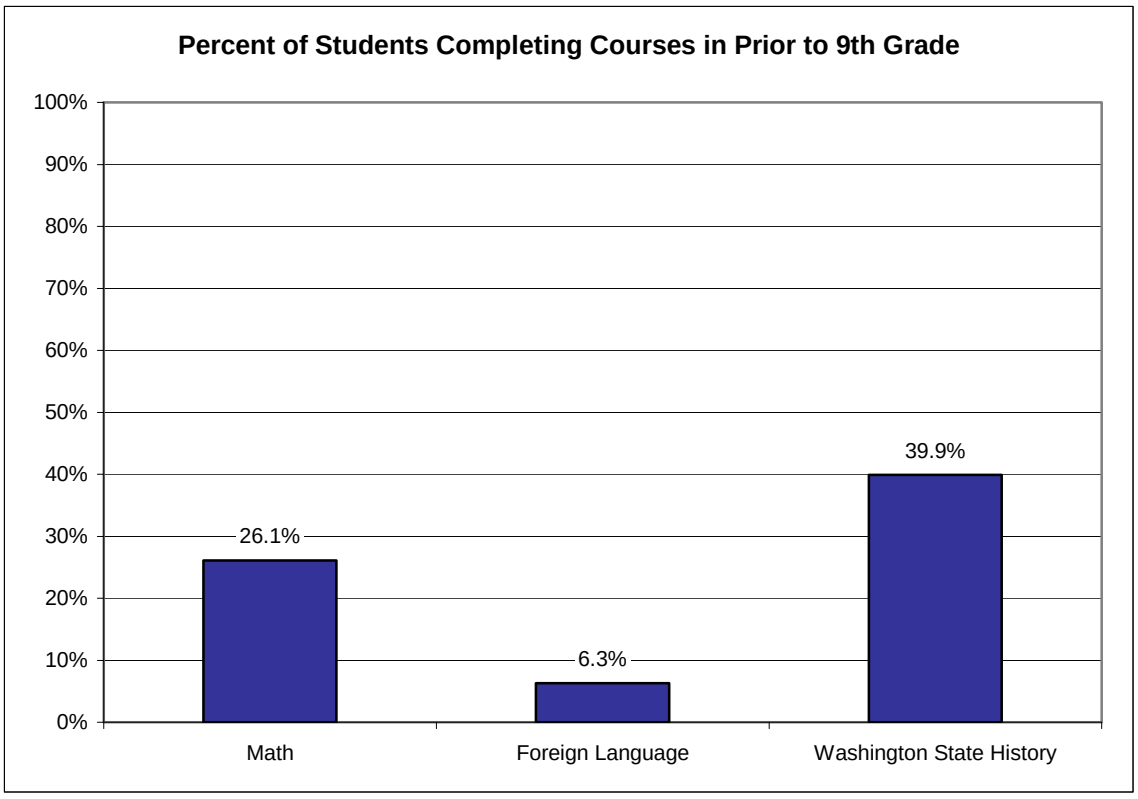

Figure 13. **Percent of Students Completing Key Courses Prior to 9th Grade**

[12] Students are eligible to start earning credits for graduation starting in the 7th grade in Washington State

[13] The analysis for Washington State History includes only 86.4% (n = 12,845) of the transcripts because this question was added after some transcripts had been analyzed and entered into the database.

Research Question #5: How many credits in each subject area required for high school graduation (e.g., English, mathematics, science, social studies, arts, occupational education) are students actually taking?

Figure 14 details the credits taken by subject area. The results show that students, on average, are taking more credits than are required for the current Washington State graduation requirements.

Additional analyses show that 47.3% of students failed some credits throughout high school. An analysis by year reveals that the percentage of students failing classes by year is roughly the same each year (see Figure 15).

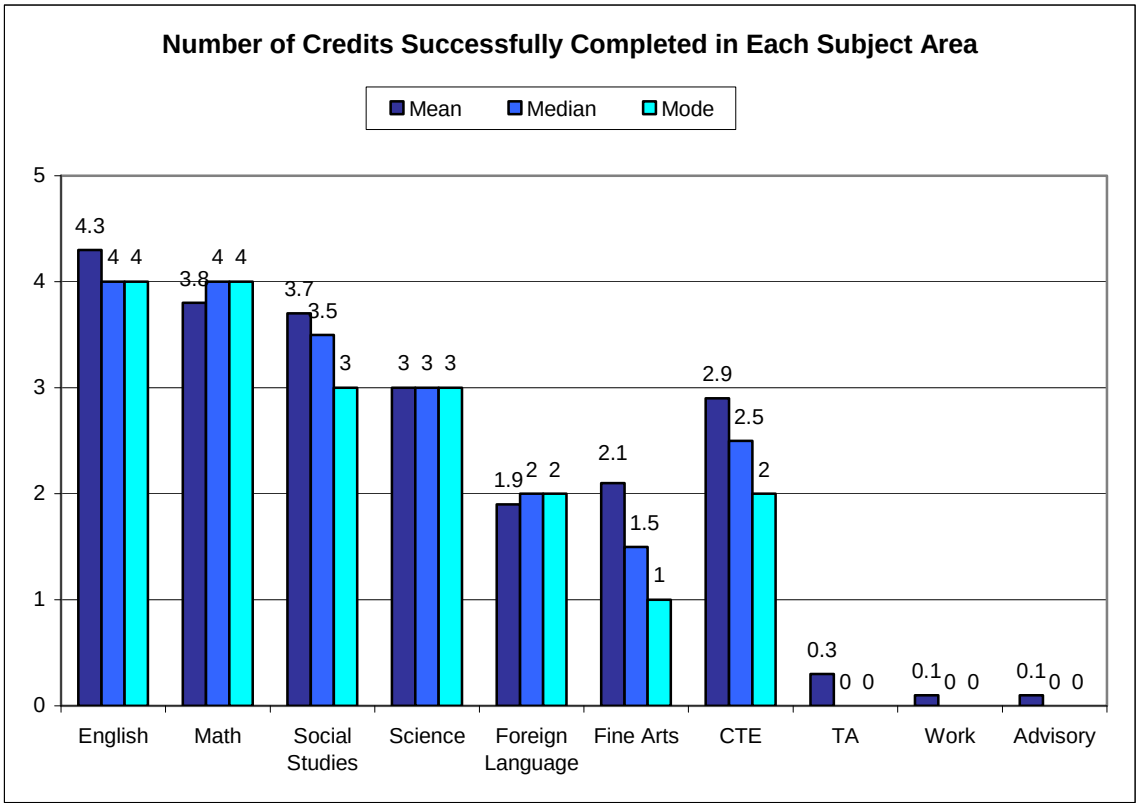

Figure 14. **Number of Credits Successfully Completed in Each Subject**

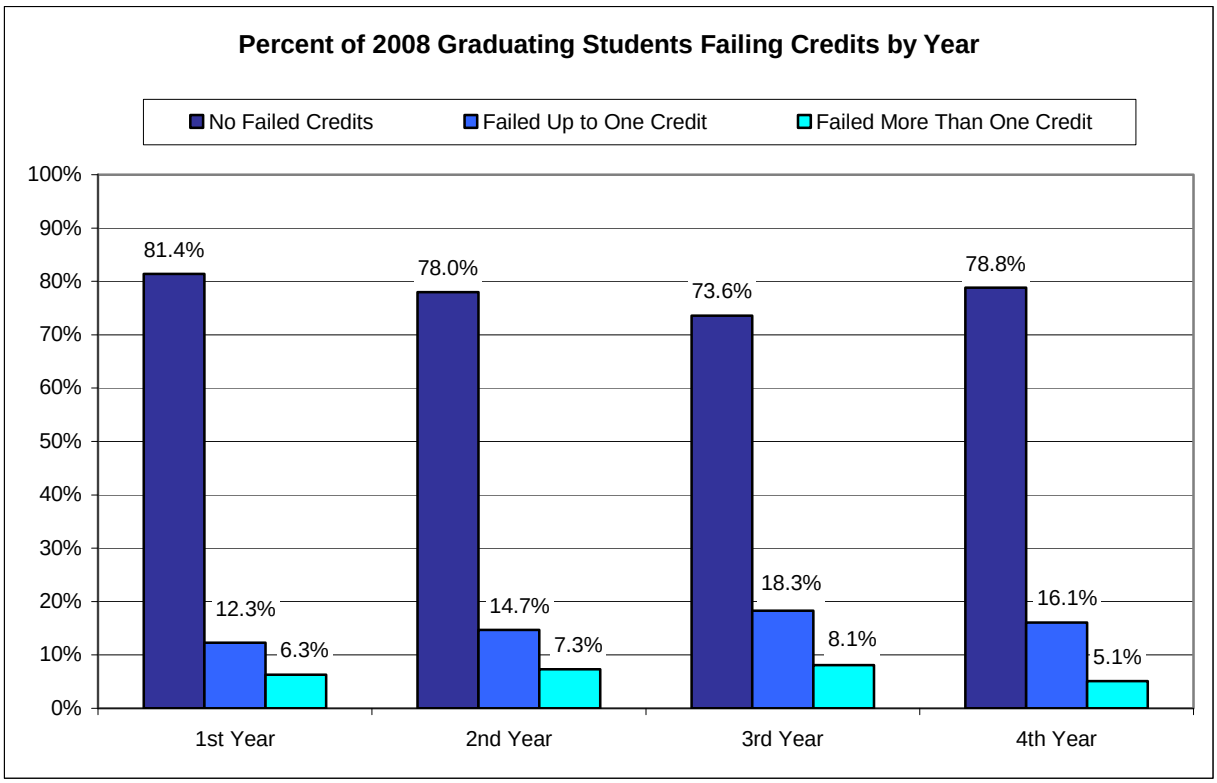

Figure 15. **Percent of 2008 Graduating Students Failing Credits by Year**

Research #6: What is the relationship between the number of credits required for graduation at the district level and the number of credits students actually take?

Table 10 shows the number of credits students attempt, the number of credits students earn, and the number of credits required for graduation at the district level. Using the mean, the results show that students attempt approximately 4.0 more credits than required and earn 2.9 more credits than required.

Table 10.
Number of Credits Taken, Earned, and Required

	Credits Attempted	Credits Earned	Credits Required
Mean	27.6	26.5	23.6
Median	26.5	25.5	23.0
Mode	24.0	24.0	22.0

Research Question #7: What courses are students taking in each subject area?

Figure 16 details the mean credits students take in English, math, social studies, and science that align with minimum, public four-year college admission standards as defined by the HEC Board compared to total credits. Generally, social studies and science courses are more aligned with college admission standards than English and math courses.

Current minimum college admissions standards in English require students to take a minimum of four credits in English, including a minimum of three literature courses. One additional elective credit, such as journalism, creative writing, or English as a second language, can be counted towards the minimum college admissions standards. The majority of English courses taken by students were standard level courses (e.g. English 9) or honors courses (e.g. Honors English 9), and these courses meet the minimum college admissions standards. Students also had opportunities to take other English courses such as Shakespeare, pop literature, drama as English, journalism, and English as a second language. A maximum of one English elective credit was included in the minimum, public four-year college admissions standards category, and the remaining credits were included in the Total Credits category. In the majority of cases, students completed the required credits. However, in some cases, students repeated courses, such as drama as English and journalism multiple times, receiving multiple credits for these courses. When this occurred, only one credit was included in the minimum college admissions standards category and the remaining credits were included in the Total Credits category. Similarly, some students took English as a second language courses throughout high school, but only one credit was included in the minimum, public four-year college admissions category. The additional credits accumulated for these courses were included in the Total Credits category. This resulted in an increase in credits accumulated in the Total Credits category.

In math, courses defined as Algebra 1 or above were included in the minimum, public four-year college admission standards category. Pre-algebra, math support labs, segmented math, and business math were included in the math Total Credits. This result shows that many students take additional support math courses.

There were fewer discrepancies in the social studies and science courses. Most courses were included in the minimum, public four-year college admission standards category, except basic courses taken by special education students. In addition, courses taken multiple times for credit were given only one credit in the minimum college admission standards category. Finally, in science, agriculture and horticulture courses were sometimes cross-credited as a science credit. These credits were identified as a non-lab general science credit and were included in the Total Credits category.

Finally, approximately 23.0% of the students received credit in one or more subject areas for passing a particular section of the WASL. When a school gave credit for passing this section, students usually received 0.25 or 0.50 credits in English, math, or science. However, at one school, the number of credits the students received appeared to be based upon what they needed to meet minimum district graduation requirements in that subject area.

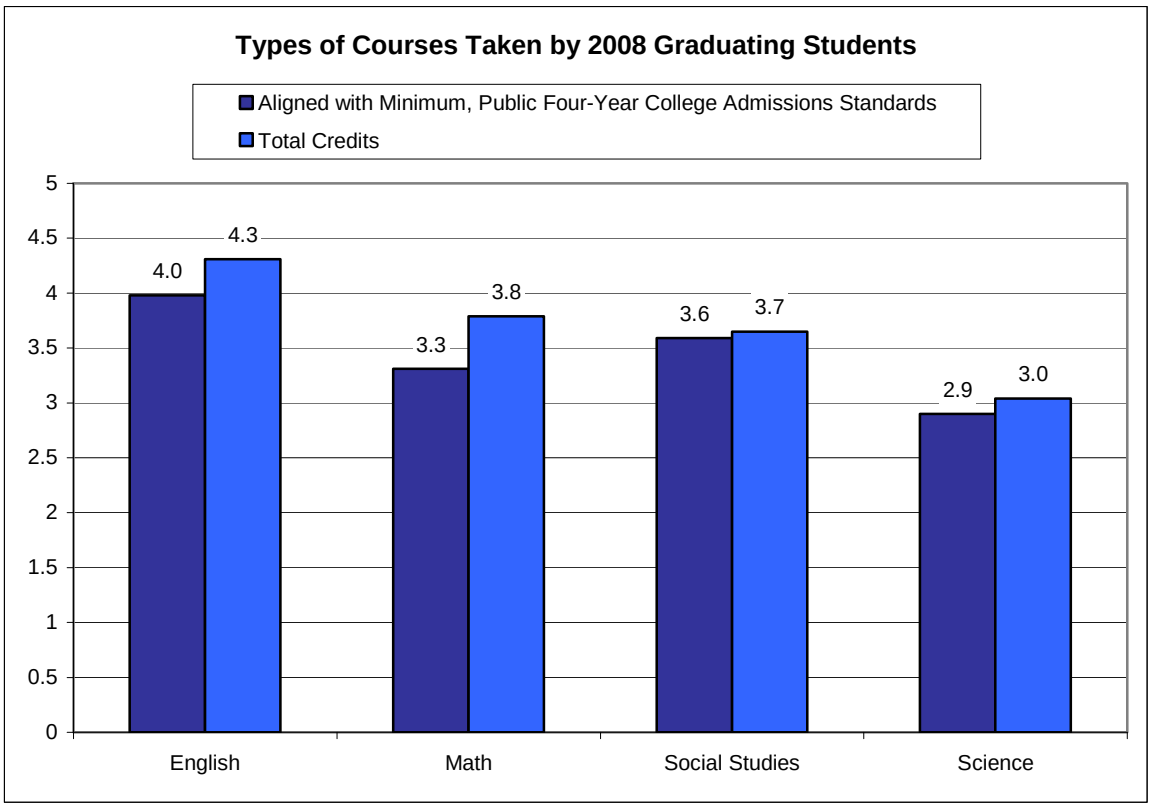

Figure 16. **Types of Courses Taken by 2008 Graduating Students**

Research Question #8: What percentage of honors courses (Advanced Placement, IB) are students taking, and in what types of districts are these courses likely to be available?

Approximately 35.1% and 13.3% of students take Advanced Placement/International Baccalaureate (AP/IB) or Running Start courses, respectively (see Figure 17). Of the students who take these courses, they take approximately 3.5 (2.0 median, 2.0 mode) Advanced Placement/International Baccalaureate courses and 8.4 (7.0 median, 1.0 mode) Running Start Courses (see Figure 18).

Advanced Placement/International Baccalaureate and Running Start attendance results were disaggregated by district size (see Figure 19). Small districts had less than 700 students in the district, medium districts enrolled 700 to 3000 students, and large districts enrolled more than 3000 students. The results show that the percentage of students taking AP/IB courses increases as district size increases (see Figure 19). This finding may be related to the number and variety of AP/IB courses that larger districts are able to offer with more students opting to take at least one of these courses. There is less difference in the number of courses that students take. In small districts, students take a mean of 2.1 courses (2.0 median, 2.0 mode); in medium districts, students take a mean of 3.4 courses (2.0 median, 2.0 mode); and in large districts, students take a mean of 3.5 courses (3.0 median, 2.0 mode). This results shows that a greater proportion of students in large districts take AP/IB courses; however, the number of courses that students take is similar.

The results also show that a greater proportion of students in medium (14.4%) and large (13.2%) districts enroll in Running Start compared to small (6.0%) districts (see Figure 19). This is likely because many of the small districts are located in rural areas, where it may be more difficult to access a community college. However, there is less difference in the number of Running Start courses that students take. In small districts, students take a mean of 7.9 Running Start courses (6 median, 2 mode); in medium districts, students take a mean of 8.8 Running Start courses (7 median, 2 mode); and in large districts, students take a mean of 8.3 Running Start courses (7 median, 1 mode). These results indicate that although a greater proportion of students attending medium and large districts enroll in Running Start, all students take approximately the same number of courses.

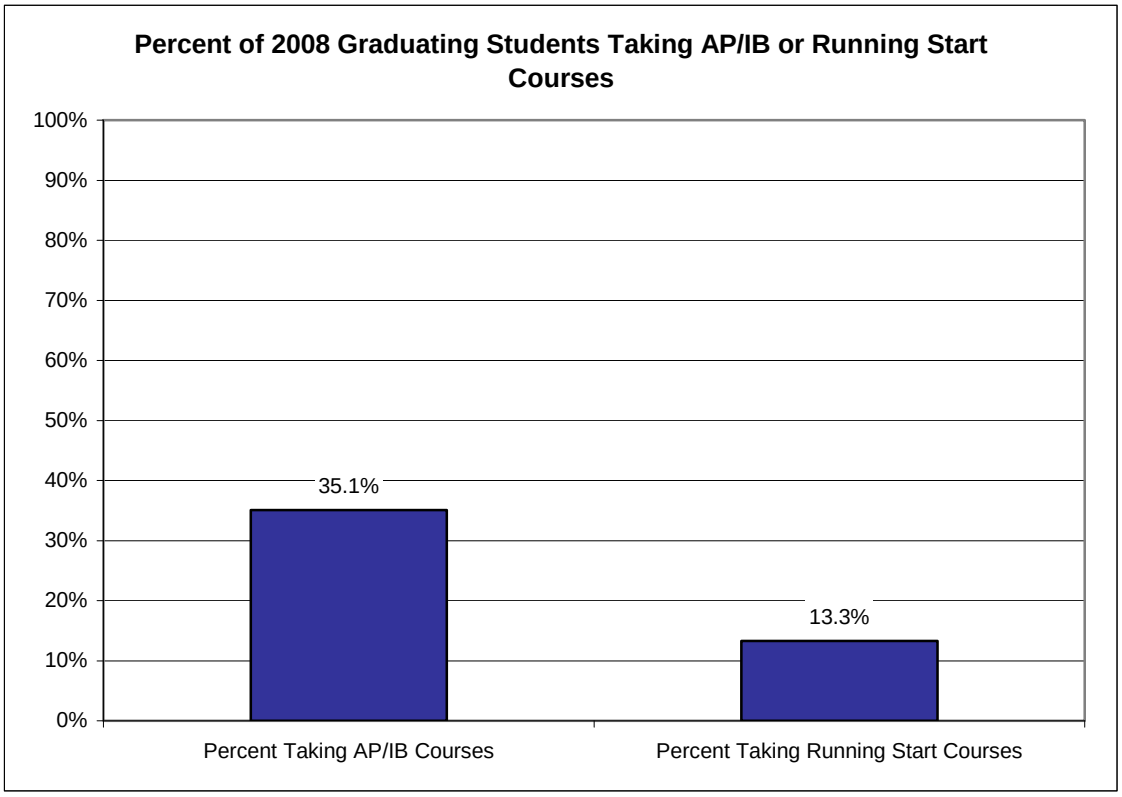

Figure 17. **Percent of 2008 Graduating Students Taking AP/IB or Running Start Courses**

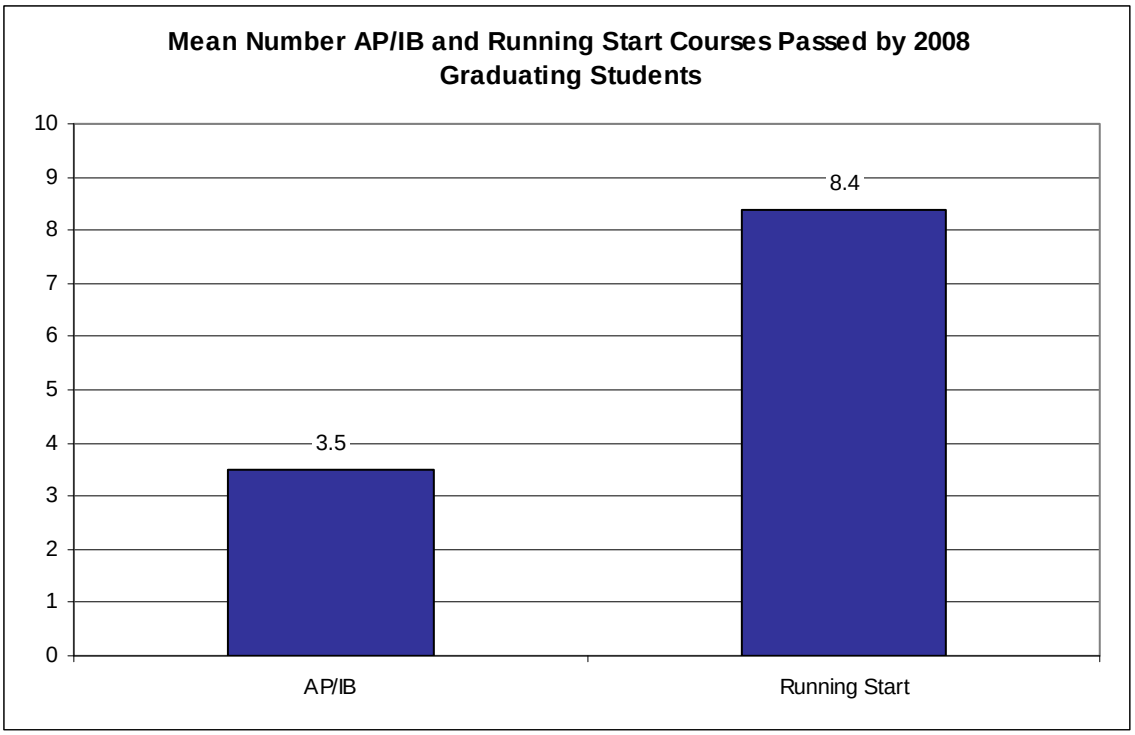

Figure 18. **Mean Number of AP/IB or Running Start Courses Passed by 2008 Graduating Students**

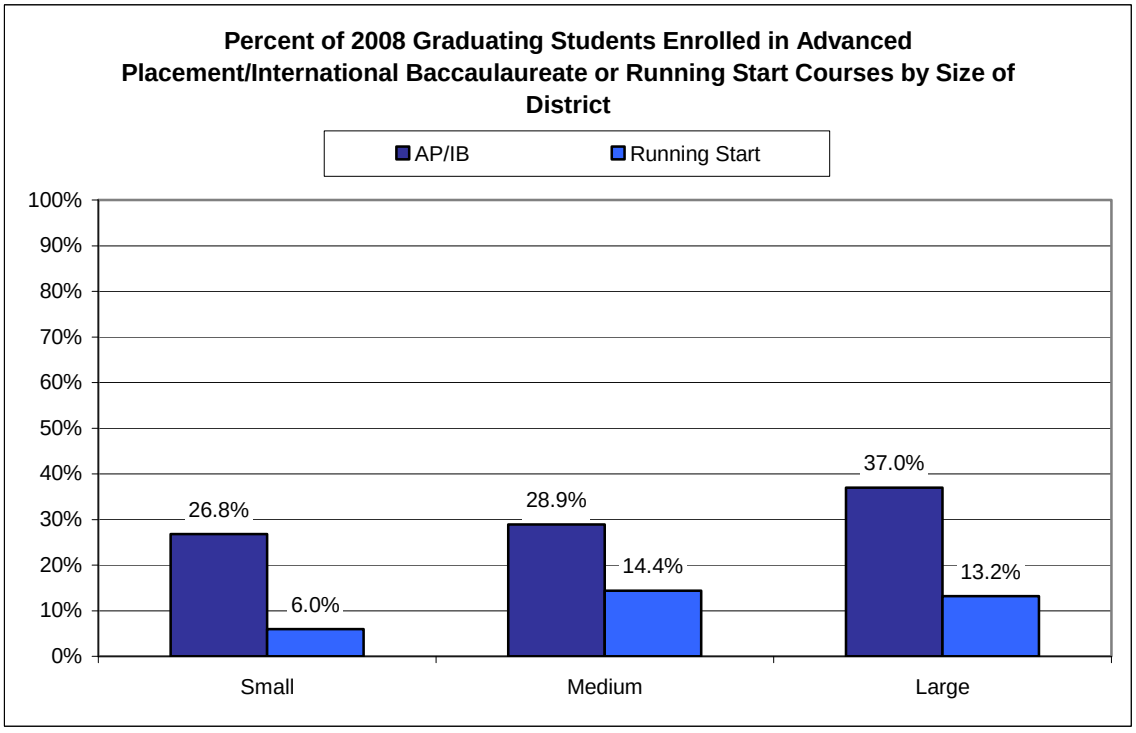

Figure 19. **Percent of 2008 Graduating Students Enrolled in Advanced Placement/International Baccalaureate Courses by Size of District**

Research Question #9: What differences emerge if the responses to each of these questions are cross-referenced by gender and ethnicity?

The findings in this study showed substantial differences by gender and ethnicity. Fewer males (44.8%) met course requirements for admission to a four-year college compared to females (51.9%) (see Figure 20). Similarly, fewer Black, American Indian/Alaskan Native, and Hispanic students met the course requirements compared to Asian and White students (see Figure 21).

Figures 22 and 23 show disaggregated results by subject area by gender and ethnicity. Figure 22 shows that course-taking patterns disaggregated by gender follow the same general pattern in most areas. However the largest difference is in world language, where approximately 11.5% more females meet requirements in world language compared to males. The results by ethnicity demonstrate that the largest differences are in math (29.6% maximum gap) and world language (24.8% maximum gap) (see Figure 23).

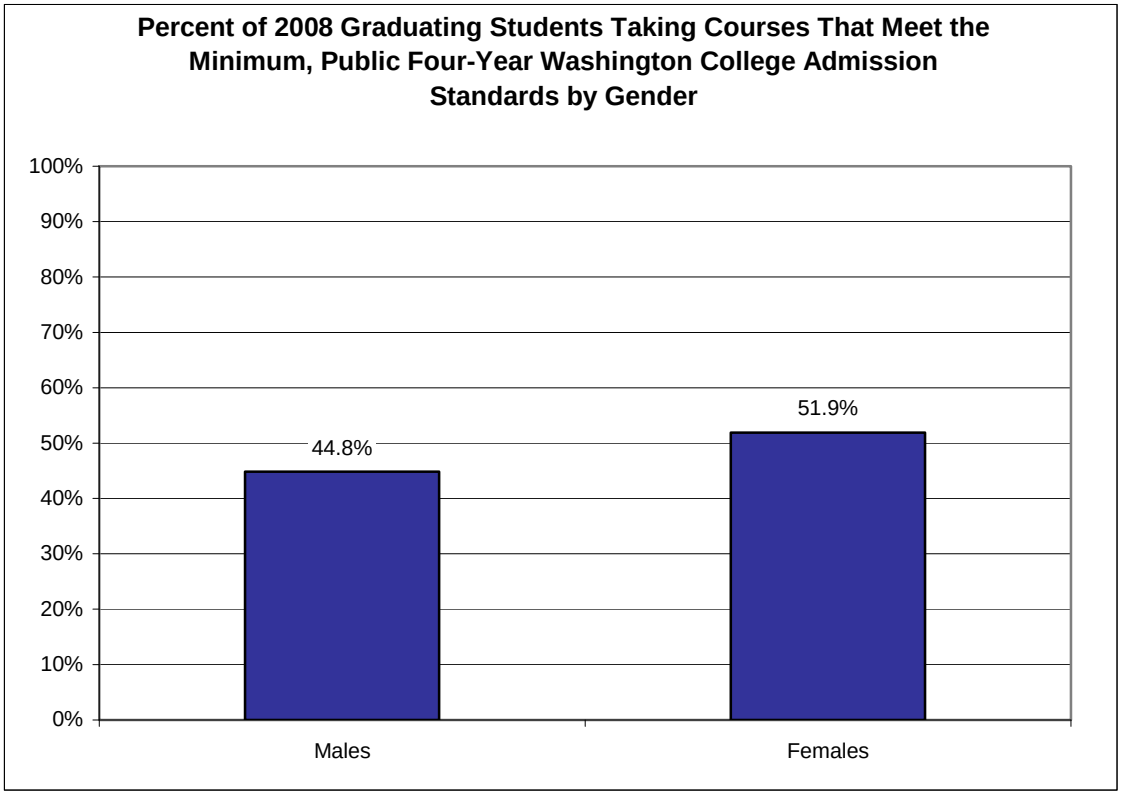

Figure 20. **Percent of 2008 Graduating Students Taking Courses That Meet the Minimum, Public Four-Year Washington College Admission Standards by Gender**

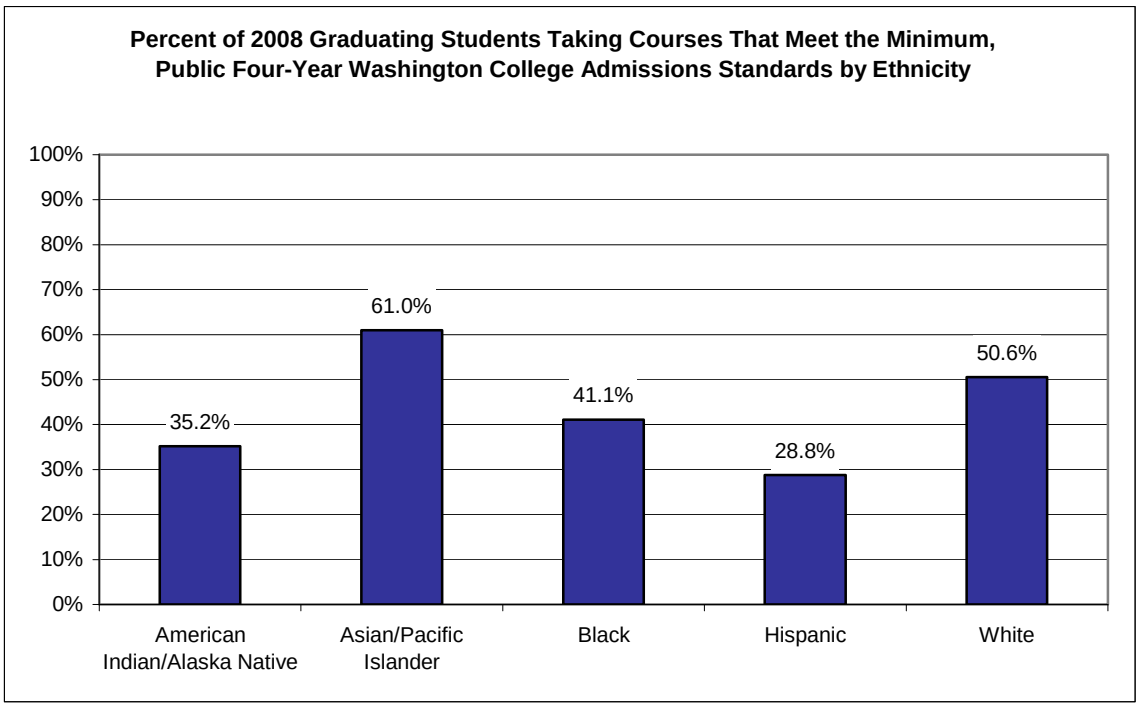

Figure 21. **Percent of 2008 Graduating Students Taking Courses That Meet the Minimum, Public Four-Year Washington College Admissions Standards by Ethnicity**

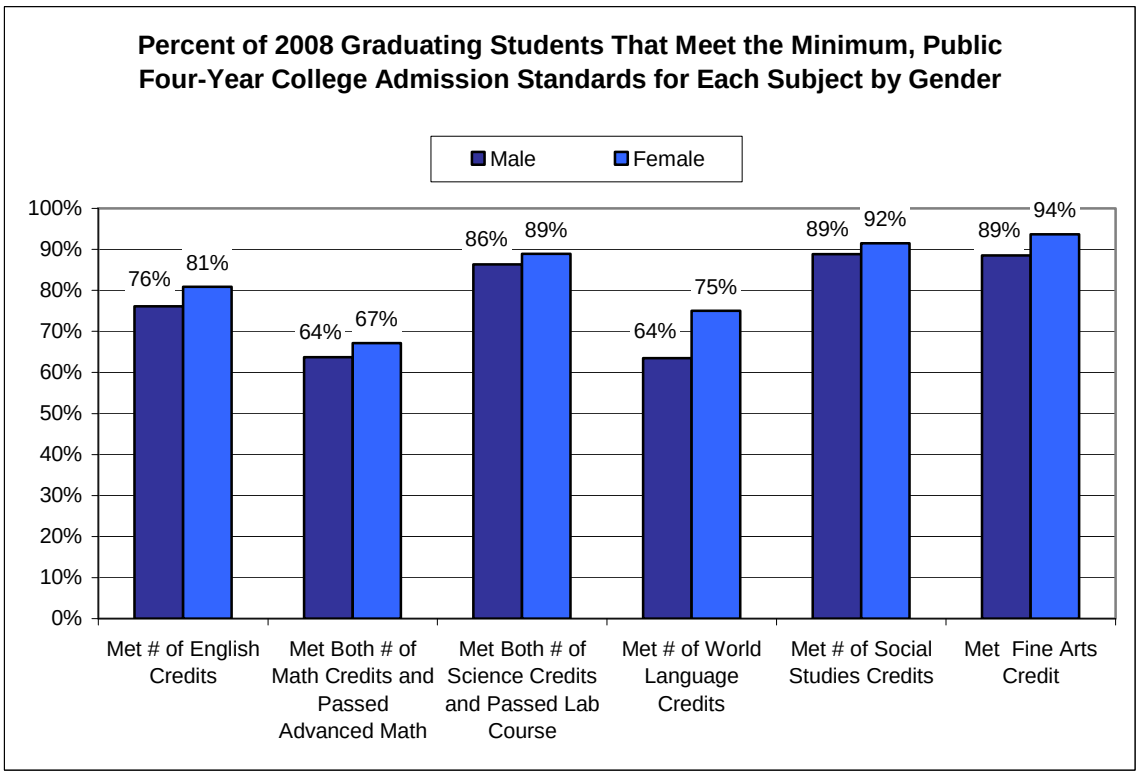

Figure 22. **Percent of 2008 Graduating Students That Meet the Minimum, Public Four-Year HEC Board Course Requirements for Each Subject by Gender**

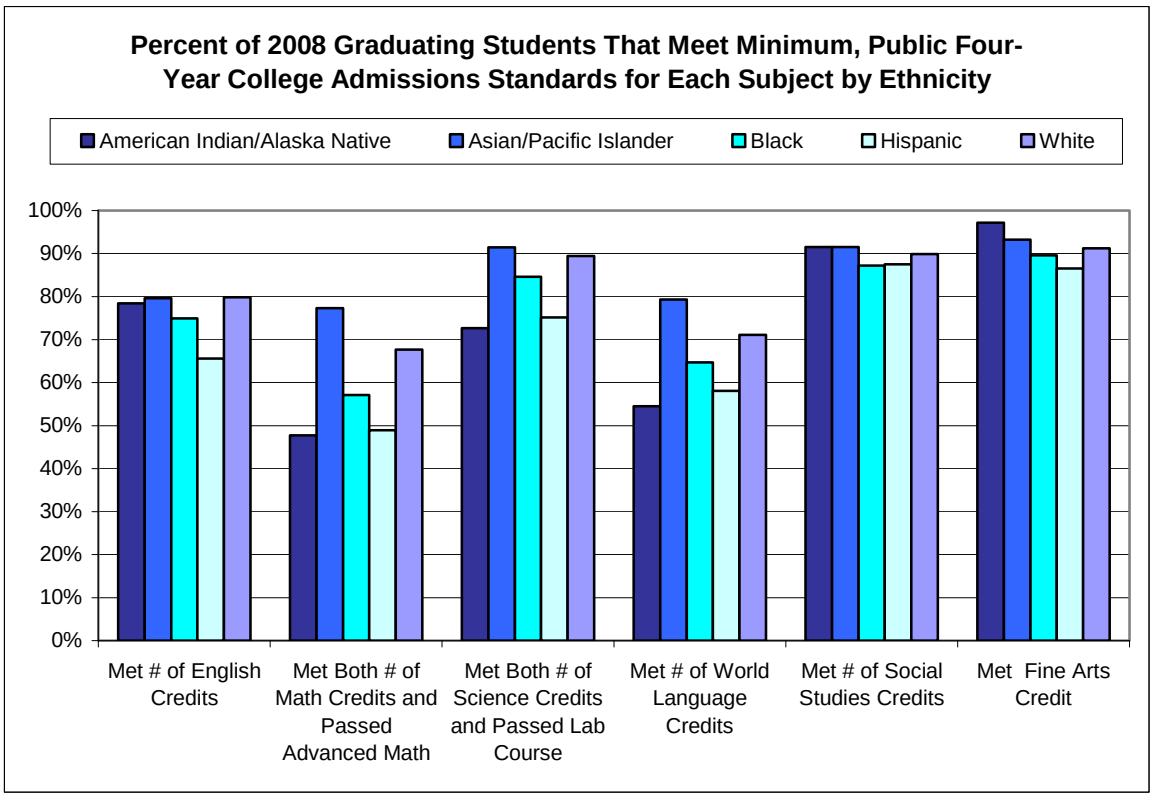

Figure 23. **Percent of 2008 Graduating Students That Meet the Minimum, Public Four-Year HEC Board Course Requirements for Each Subject by Ethnicity**

CORE 24 Results

The CORE 24 requirements are more stringent than current HEC Board Requirements in science and fine arts and are more stringent than current state requirements in English, math, and world language. An analysis of the 2008 graduates reveals that 16.8% of graduates met the CORE 24 requirements (see Figure 24). Additional analyses by subject area reveal that fewer graduates met the CORE 24 requirements in Fine Arts, Science, and Foreign Language (see Figure 25). If CORE 24 is implemented as adopted, these subject areas may warrant more support to help all students meet these requirements.

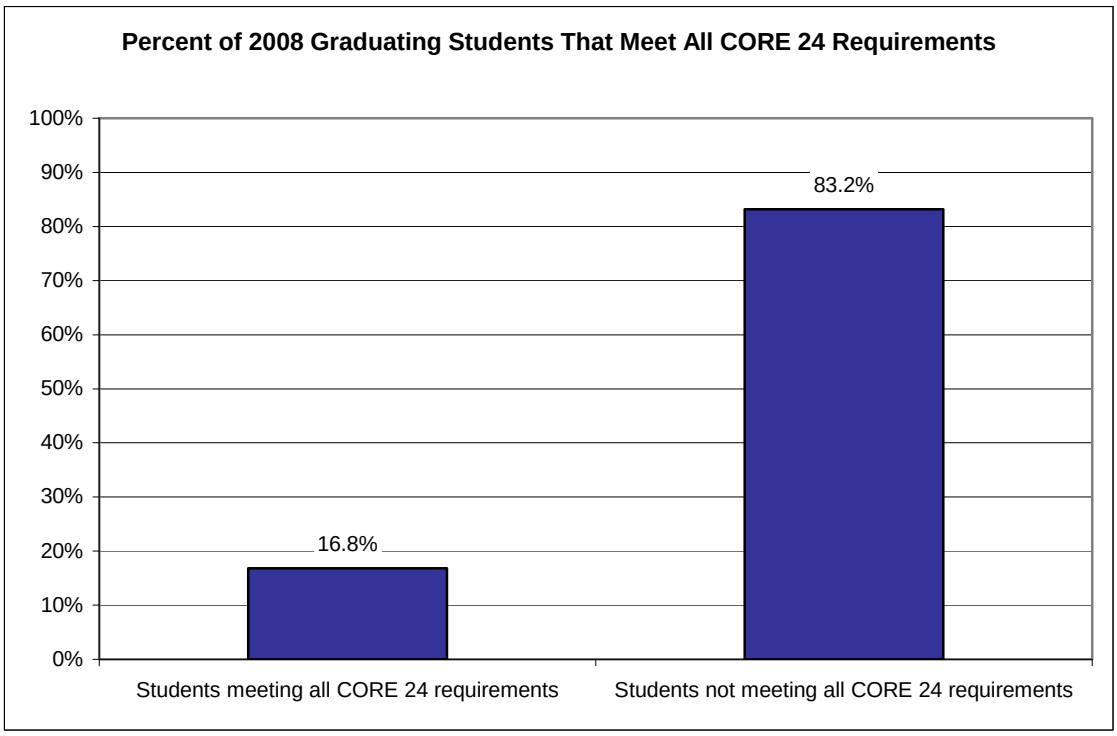

Figure 24. **Percent of 2008 Graduating Students That Meet ALL CORE 24 Requirements**

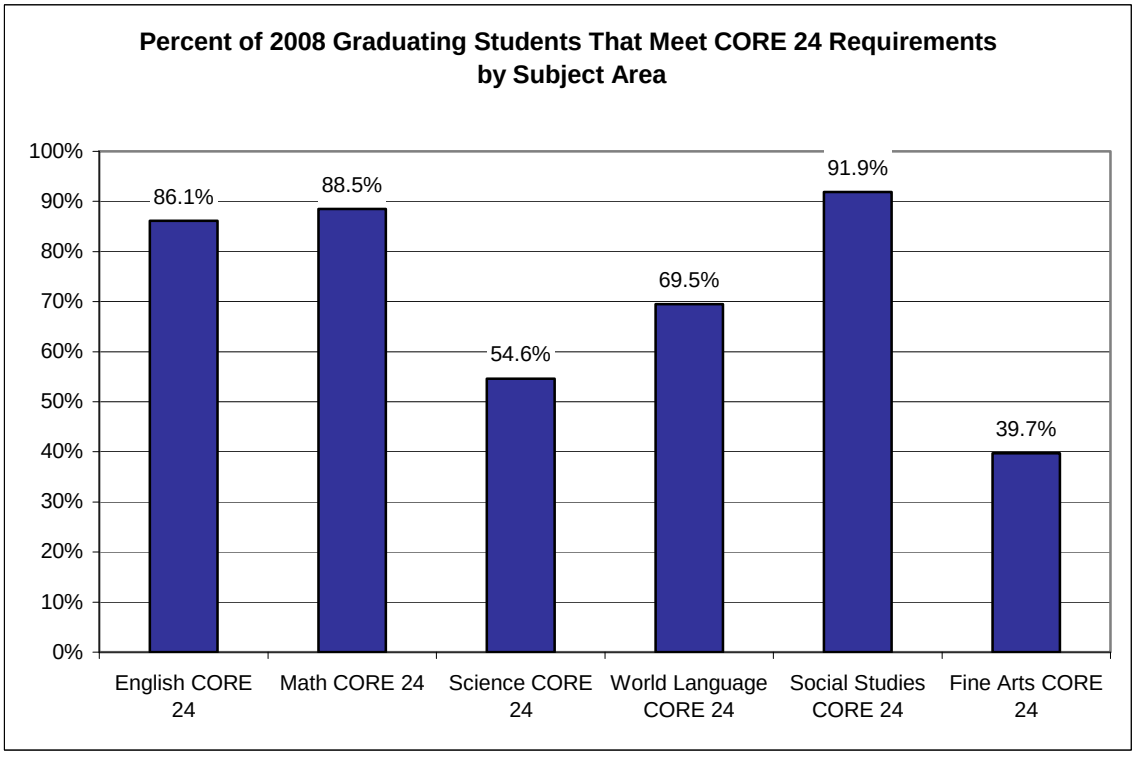

Figure 25. **Percent of 2008 Graduating Students That Meet CORE 24 Requirements by Subject Area**

CONCLUSION/DISCUSSION

Education prepares students for the future in the society in which they live. Upon graduation from high school, our nation's students should have the opportunity to transition smoothly into college and careers. For that to occur, schools must provide students with the skills and background necessary to make that transition. Research and forecasts pertaining to labor, industry, and the economy indicate that college is a prerequisite for the majority of jobs and for financial independence. Thus, it could be argued that all high schools need to prepare students to attend college if they are to earn a living wage and if our nation is to maintain a central role in the global economy. This includes the requisite coursework for college admittance, as well as skills associated with college readiness.

Questions about the preparedness of Washington State high school graduates for college and career prompted this study. The Washington State Board of Education commissioned this research to determine the extent to which the state's high schools are currently providing students the academic background necessary for admittance to and success in college. The study also investigated the relationship between the numbers of credits required and the level of courses taken by students. This information is critical as the State Board of Education considers revisions to state regulations around graduation requirements.

This study examined the course-taking patterns for students of the graduating class of 2008 across Washington. The sample consisted of the high school seniors from 100 schools in 100 districts and was representative of the state's student population. Of the 14,875 high school graduates from 2008 accounted for in this study, 48.5% took the requisite courses for admission to a Washington four-year college. This pattern emerged in spite of the fact that students frequently take more credits than needed for graduation. This suggests that the majority of students graduating from Washington State high schools are not eligible for college admittance by Washington State HEC Board standards because of specific course-taking deficiencies. Overall results indicate that while high school graduation requirements meet the state's minimum for a high school diploma, they do not align with college admission requirements.

A closer examination of the course-taking patterns of those graduates who failed to meet college entrance requirements revealed some important themes. Disaggregating the results by individual subject area, students most frequently failed to meet college preparation requirements in math (35%), world language (31%), and English (21%). In these three subject areas, state graduation requirements are lower than the Higher Education Coordinating Board graduation requirements by at least one credit. In addition, course-taking patterns show a lack of overall alignment between students' courses and a college preparatory curriculum. Specifically, students complete college entrance requirements in some subject areas but not in others.

These findings also call into question the relationship between the number of credits required and the types of course students take. Indeed, in this study, higher credit requirements did not ensure students completed specific course sequences necessary for college admittance. The number of math and science credits required for graduation did not have a significant impact on the percentage of

students graduating college eligible. Some students filled higher credit requirements with lower level courses rather than advanced courses. Conversely, in districts with lower credit requirements, some students took college preparatory course sequences that exceeded district requirements. Thus, specifying a higher *number* of math or science credits without specifying the *levels* of classes does not ensure that students are prepared for college. Similarly, students took on average 4.3 credits in English, yet 21% did not take the combination of English courses necessary for college admission. Math is particularly interesting because of the various ways students are granted credit: two math classes at once, math study lab, credit for passing WASL, etc.

This study also found that there is room in students' schedules for more stringent requirements, including higher numbers of credits and more advanced courses. In fact, 34% of the graduating seniors took less than a full load of credits. With appropriate planning and sequencing of courses throughout secondary school, students can advance through college preparatory course requirements. The results for math, in particular, reflected difficulties in planning and executing appropriate course sequences: although a high percentage of seniors took math, one-third did not meet math college eligibility requirements. It is noteworthy that students graduating in 2008 who do not pass the math WASL are required to take math credits in their senior year, which likely resulted in more students taking math in their senior. These numbers are striking, given that one-quarter of the students entered 9th grade high school having previously taken high school math. Taken together, these results suggest requirements, schedules, and/or advising do not provide the structure necessary for guiding students through college preparatory course sequences.

Disparities in college readiness across ethnic and gender groupings also emerged. Disaggregated data showed the percentage of students meeting college entrance requirements across ethnic groups varied from 29% to 61%, with Asian and White students most prepared and Black, American Indian/Alaskan Native, and Hispanic students least prepared. These findings suggest that current approaches to academic preparation may limit access to college along ethnic lines. A smaller discrepancy was evident in gender, with somewhat fewer males meeting course requirements for admission to a four-year college compared to females.

This study also shows a relationship between college eligibility and student achievement, as measured by performance on the Washington Assessment of Student Learning. Not surprisingly, students who met college entrance requirements in math and science by 10th grade were more likely to meet standard on the WASL in those subject areas. This suggests that participating in a college-ready curriculum from the 9th grade forward raises student achievement. This is an important finding when considering steps for closing the achievement gap.

Finally, this study examined the extent that students are already meeting CORE 24 requirements. Findings reveal that on 17% of 2008 graduating students met the CORE 24 requirements. Students were least likely to meet the requirements in fine arts, science, and world languages. These are the areas where the credit requirements are more rigorous than current Washington State and HEC Board graduation requirements. This suggests that if CORE 24 is implemented as adopted, these are the subject areas that warrant the most support, particularly in staffing and materials.

If the state is truly determined to establish a world-class education system, college and work readiness must take center stage in education policy development. College and career readiness *must* be a priority. The State Board of Education's intention to revise high school graduation requirements is an essential step toward improving outcomes for students. The current study and existing research provide critical guideposts for improving college and career preparation for Washington students.

- Raising the number of credits alone does not ensure students will complete the courses necessary for admittance to college. However, it does ensure there is room in students' schedules to complete the necessary course sequences, including additional coursework for students who need extra support.
- Requiring specific course levels is necessary to ensure students complete the college preparatory course sequences.
- High school graduation requirements must be considered in their totality if they are to be aligned with college entrance requirements across all subjects. In other words, aligning individual subject areas does not ensure students graduate prepared for college in all areas.
- As revisions to graduation requirements are implemented, it will be important to provide support to schools and students that will enable students to meet the requirements of more rigorous courses. This includes effective advising for planning course sequences in advance.
- If CORE 24 requirements are implemented as adopted, schools will need more support to offer all students additional courses in science, fine arts, and world languages, as these are the subject areas where the fewest students meet the requirements. Schools may require additional resources for staffing and materials.
- While high school graduation requirements focus on credits earned in the 9th through 12th grades, preparing for college and career must be a focus throughout all secondary education. Junior highs and middle schools must prepare students for high school, and vertical articulation is necessary for this to occur.
- Education pertaining to the evolving requirements for entering the workforce may be helpful for schools and their communities as they implement more rigorous expectations for students.

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