



## Business, Finance and Planning

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TO: School Committee

FROM: Katy Hogue, Director of Data Analysis and Enrollment Planning

DATE: May 8, 2023

RE: Advanced Placement Enrollment, Participation, and Exam Performance

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Attached please find the Advanced Placement (AP) Enrollment, Participation, and Exam Performance analysis. I would like to thank the department heads, schedulers, vice principals, and principals of Newton North and Newton South for their assistance and feedback in the development of this analysis.

# Newton Public Schools Advanced Placement (AP) Enrollment, Participation, and Exam Performance

May 8, 2023

## Introduction

The Newton Public Schools offer a wide range of Advanced Placement (AP) courses as a part of our honors course offerings in the high schools. AP courses are considered college level courses and are a formal program operated by the College Board, a national non-profit working in the college access field. These rigorous courses are based on specific content and curriculum defined by the College Board and are designed to offer high school students the opportunity to experience college level coursework while in high school, while also potentially earning college credits.

Each AP course is associated with a formal examination that is offered each May to assess students' mastery of the content in the course. AP exams are scored from one to five (1-5). The College Board provides the following interpretation of AP exam scores<sup>1</sup>:

<b>AP Score</b>	<b>Recommendation</b>	<b>College Course Grade Equivalent</b>
5	Extremely well qualified	A+ or A
4	Very well qualified	A-, B+, or B
3	Qualified	B-, C+, or C
2	Possibly qualified	----
1	No recommendation	----

In NPS high schools in the 2022-23 school year, the following AP courses are offered (please note that some courses that typically run were not offered in 2022-23 due to low enrollment:

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<sup>1</sup> <https://apstudents.collegeboard.org/about-ap-scores/ap-score-scale-table>

<b>Newton North</b>	<b>Newton South</b>
Biology	3D Design
Calculus AB	Biology
Calculus BC	Calculus AB
Chemistry	Calculus BC
Chinese Language & Culture	Chemistry
Comparative Government and Politics	Comparative Government & Politics
English Language & Composition	English Language & Composition
English Literature & Composition	English Literature & Composition
European History	Environmental Science
French Language & Culture	French Language & Culture
History of Art	History of Art
Italian Language & Culture	Physics C: Mechanics
Music Theory	Physics C: Electricity & Magnetism
Physics C: Mechanics	Psychology
Psychology	Spanish Language & Culture
Spanish Language & Culture	Statistics
Statistics	Studio Art
US History	US History
	US Government and Politics

Some students in Newton may also take an AP exam at the end of the school year for additional courses they have studied for independently (known as “self-study”), as Newton schools are College Board testing sites; scores from students who self-study are then associated with Newton schools.

In NPS, the high schools have had an ongoing focus on expanding equitable access to AP courses for over 10 years. Based on data that indicated disproportionate enrollment of different student groups in AP courses, including race, gender, disability, and other demographic subgroups, various systemic interventions have been developed to ensure that enrollment in AP and other advanced courses<sup>2</sup> are more representative of Newton’s student community. Examples of these systemic interventions include the Calculus

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<sup>2</sup> Honors classes in NPS are equal in status and weight to AP classes. Honors level courses may be offered in earlier grades in subject areas that culminate in AP courses or in subject areas that do not have an available AP exam. AP courses are required to use College Board approved curriculum and give students the opportunity to take a College Board AP exam in May, while honors courses utilize rigorous curriculum designed locally and have end of course assessments designed by NPS educators.

Project, AP US History summer supports, and work to counter the impact of stereotype-threat through Newton's clustering program<sup>3</sup>.

Over the past three years, our schools have worked to reduce the unnecessary requirements for specific assessments, grades, and recommendations that limit who can enroll in most AP courses, as these prerequisites can perpetuate the underrepresentation of many student groups in AP courses<sup>4</sup>. In addition, research has shown that enrollment in an AP course, regardless of the AP exam score received, improves postsecondary outcomes for students who take an AP course and exam<sup>5</sup> and this research is crucial in understanding the priority placed on access. A key finding of this research indicates that students who score a 1 or a 2 on an AP exam experience significantly stronger college outcomes than their peers who did not take an AP course and exam. As a result of this work to expand access, Newton North was recognized by the College Board with an AP Access Award in 2023.

The ongoing focus on equitable access to AP courses in NPS and the removal of unnecessary prerequisites for these courses has resulted in changes to the student enrollment process in these courses in NPS. The current process for enrolling in most AP courses in Newton consists of students in appropriate courses expressing an interest in pursuing the advanced subject matter and receiving a teacher recommendation. While AP enrollment is encouraged, school counselors and deans in Newton focus on encouraging students to enroll in AP courses in subjects that they are genuinely interested in studying in depth, as Newton has seen an increase in students feeling they need to enroll only because they must keep up with other students. In general, Newton recommends that students take no more than three courses at the AP/honors level in one year, while also considering their emotional health/wellness and the impact of their selected course load on healthy sleep habits, engagement in social and extracurricular activities, and the flexibility of their schedule to allow for some unstructured time.

Students enrolled in an AP course in a Newton high school are not required to take the accompanying AP exam in that subject at the end of the school year, as this exam may or may not benefit them based on their college admissions status, college plans, or other related factors. In recent years, fewer colleges are accepting AP coursework and

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<sup>3</sup> Clustering involves cohorting students of color into specific sections of a course to ensure that they will not be the only student from their demographic group in a particular advanced class. This work is based on the research and writing of Claude Steele.

<sup>4</sup>

<https://edtrust.org/resource/inequities-in-advanced-coursework/?emci=ed0b9936-4232-ea11-a1cc-2818784d084f&emdi=ea000000-0000-0000-0000-000000000001&ceid=%7B%7BContactsEmailID%7D%7D>

<sup>5</sup> <https://onlinelibrary.wiley.com/doi/abs/10.1111/emip.12295>,  
<https://apcentral.collegeboard.org/media/pdf/new-analyses-ap-scores-1-and-2.pdf>

exam scores for credit. Many colleges are also limiting their practices of accepting AP coursework and exams to place out of introductory coursework at the college level<sup>6</sup>. In Newton, students who do not take the AP exam still receive high school credit for the AP course and the designation of the AP course on their transcripts (this is not the case in some comparison districts around Newton). Important to note, a number of highly competitive independent high schools have abandoned AP courses in favor of Advanced Independent Curriculum courses. NPS high schools do offer some unique advanced coursework, including Organic Chemistry, Engineering, Neurobiology, Biotechnology, and Linear Algebra.

Newton is unique in comparison to similar districts in both AP enrollment practices and AP exam test requirements. Utilizing the list of comparison districts in the Enrollment Analysis Report from the current year, the table below lists enrollment requirements and test taking requirements for each comparison district. This data was obtained from each district's high school 2023-2024 Program of Studies document, available online.

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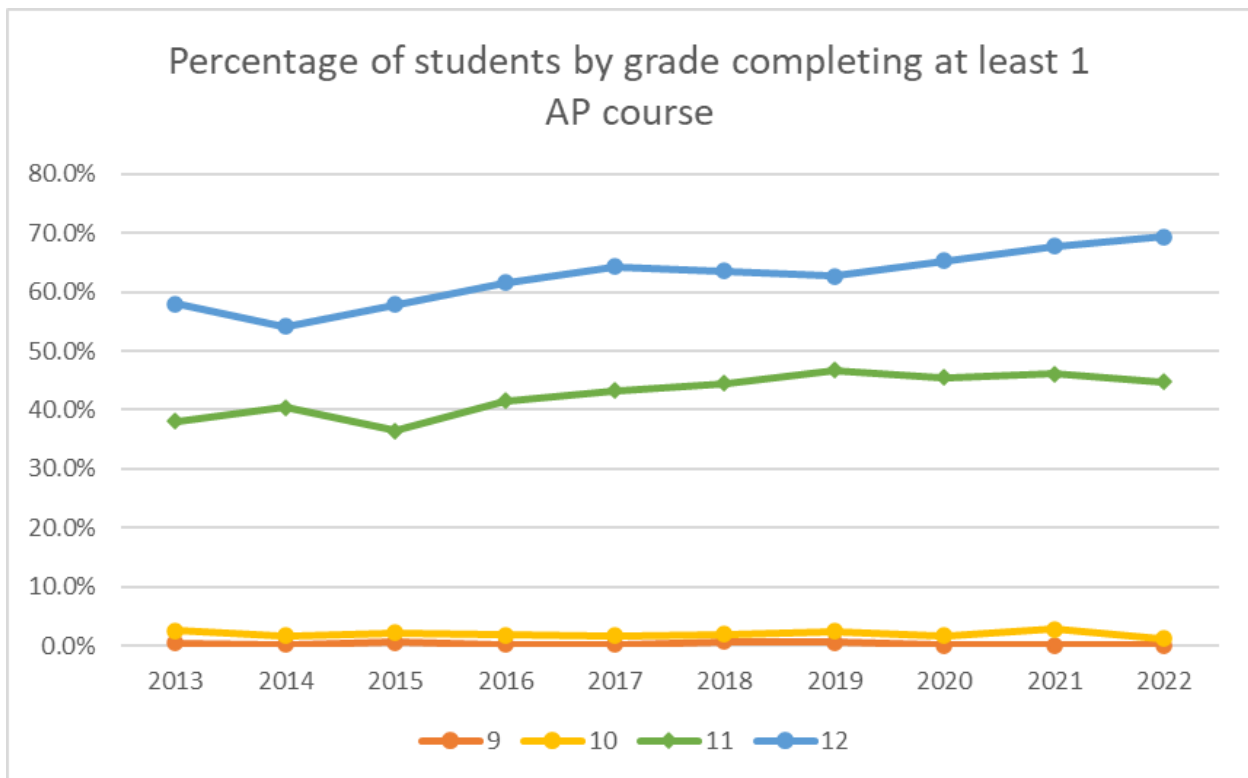
<sup>6</sup> <https://thehighschooler.net/colleges-that-dont-accept-ap-credits/>,  
<https://www.progressivepolicy.org/wp-content/uploads/2016/09/MEMO-Weinstein-AP.pdf>

<b>District</b>	<b>AP course enrollment requirements?</b>	<b>AP Test Required for students in AP courses?</b>
Arlington	Previous courses only	Required
Belmont	Teacher recommendation; course review process available to student/caregiver	Expected. In English, must participate to receive AP designation on transcript.
Brookline	Previous courses only	Expected
Burlington	Previous courses only	Required/Strongly Encouraged (both terms are used)
Cambridge	Prior course grades or teacher recommendation	Required/Strongly Encouraged (depends on the course)
Dedham	Prior course grades and teacher recommendation	Required to receive AP designation/GPA weight on transcript
Lexington	Teacher recommendation; placement review process available to student/caregiver	Expected/Encouraged (depends on course)
Natick	Prior course grades and teacher recommendation	Expected
Needham	Teacher recommendation; override process available to student/caregiver	Expected/Optional (depends on the course)
Newton	Previous courses and/or teacher recommendation for some; none for others	Expected/Encouraged/Optional (depends on the course)
Waltham	Previous courses and teacher recommendation; can appeal to guidance counselor	Expected
Watertown	Teacher recommendation	Encouraged
Wayland	Previous courses and teacher recommendation; can appeal	Required to receive AP credit
Wellesley	Teacher recommendation; course level change process available to student/caregiver	Encouraged
Weston	Teacher recommendation	Not required

## Access and Opportunity

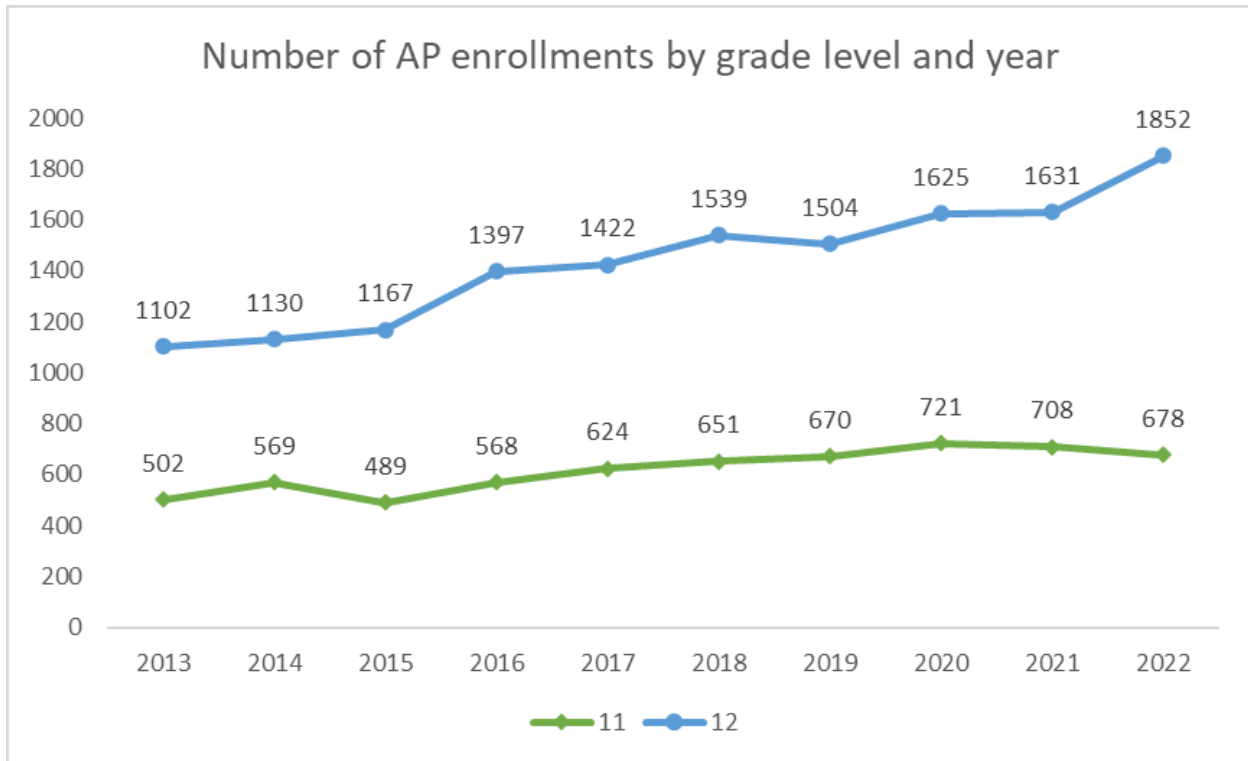
As previously described, the Newton Public Schools has focused on increasing access and opportunity to AP courses for all students by both removing many of the unnecessary barriers to entry that existed in prior years and supporting students in many ways in their progression to AP courses. The bulk of the barriers were removed in the 2020-2021 school year. All graphs in this analysis show the year in which the exams were administered, which is in May of each school year. A year of 2016 indicates the 2015-2016 school year.

The graph below displays the percentage of students completing at least 1 AP course by grade level over the past 10 years. The majority of students completing at least 1 AP course are enrolled in grades 11 and 12 in each school year. The percentage of 11th graders enrolled in at least 1 AP course has remained relatively constant over the past 10 years, while the percentage of 12th graders enrolled in at least 1 AP course has increased since 2019, with nearly 70% of all 12th graders in the 2021-2022 school year completing at least 1 AP course while in 12th grade.



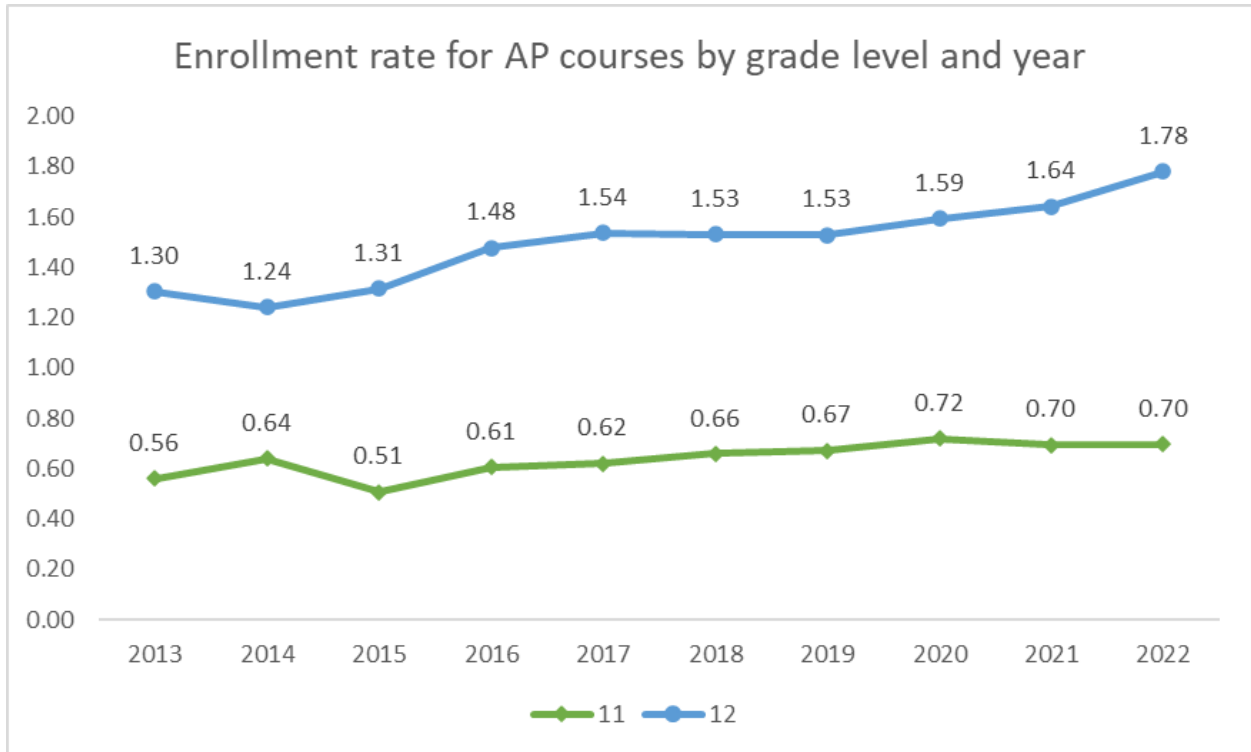
The graph below shows the total number of AP enrollments in NPS by grade level and school year over the past ten years (as the majority of students taking AP courses are in grades 11 and 12, the following graphs include only 11th and 12th graders). Please note that because students may take more than 1 AP course in a particular year, these

graphs display the total number of enrollments, not the total number of students. Based on raw numbers, the number of AP course enrollments in 12th grade has increased in the past 10 years, beginning in the 2015-2016 school year, with a larger acceleration in the 2021-2022 school year. The increase in enrollments in the 2019-2020 and 2020-2021 school year is mainly due to the addition of the Environmental Science and 3-D Design courses. The increase in enrollments in the 2021-2022 school year in 12th grade is mainly due to increased access to courses. The number of AP course enrollments in 11th grade has remained relatively constant.



The next graph displays total number of AP enrollments by grade level compared to total enrollment in the high schools. This graph provides information on grade level enrollment rates for AP courses, which incorporates the total population. The enrollment rate is calculated by dividing the number of students completing AP courses by the total enrollment in that grade level. Similar to the total number of AP course enrollments by grade level, enrollment rates in AP courses increased for 12<sup>th</sup> graders beginning in the 2015-2016 school year, remained steady until the 2019-2020 school year, and have been increasing since. Enrollment rates for 11<sup>th</sup> graders have remained relatively steady. This graph also indicates that on average, 12<sup>th</sup> grade students are taking more AP courses than 11<sup>th</sup> grade students. In the 2021-2022 school year, on average, 12<sup>th</sup> grade students completed 1.78 AP courses, while on average, 11<sup>th</sup> grade students completed 0.7 AP courses.



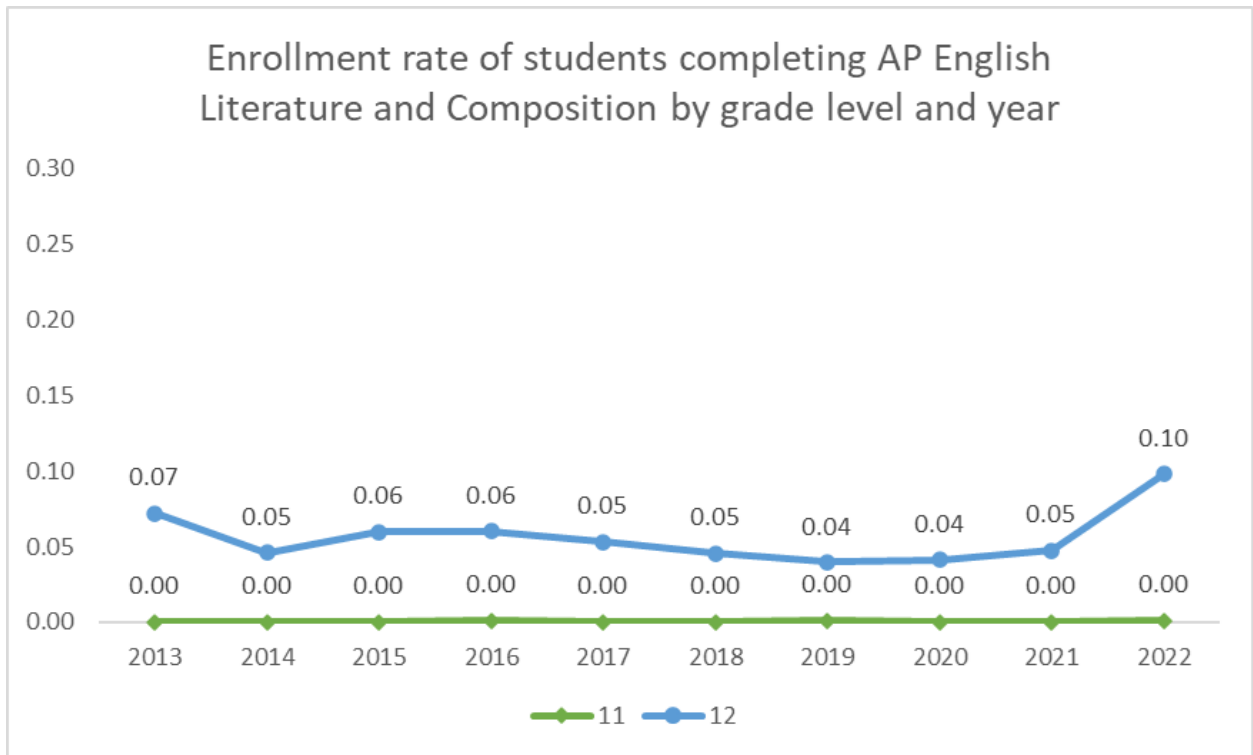
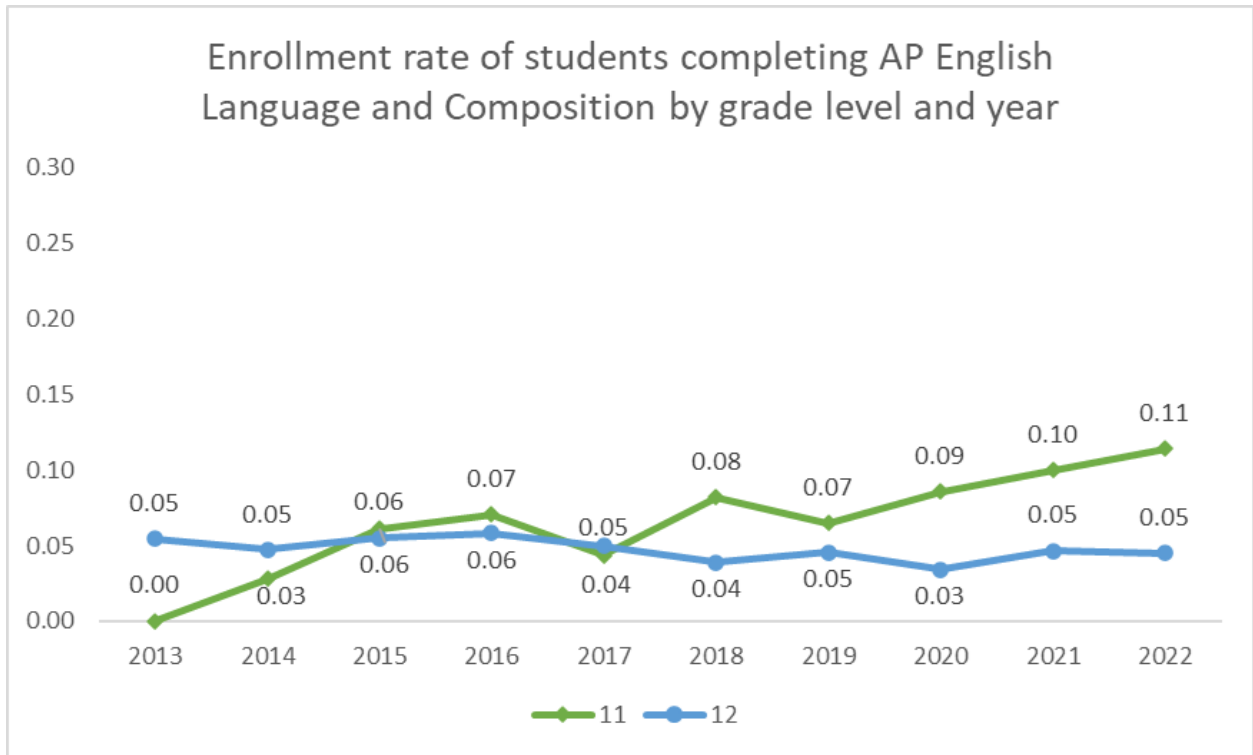


The following graphs look at enrollment rates for AP courses by individual course and grade level, organized by subject. Some courses are omitted from this analysis, given the small number of students (less than 10) enrolled in these courses in particular years of the ten year analysis (Art History, Environmental Science (began in 2019-2020), Latin, Music Theory, Studio Art: 3-D Design, and Studio Art: Drawing).

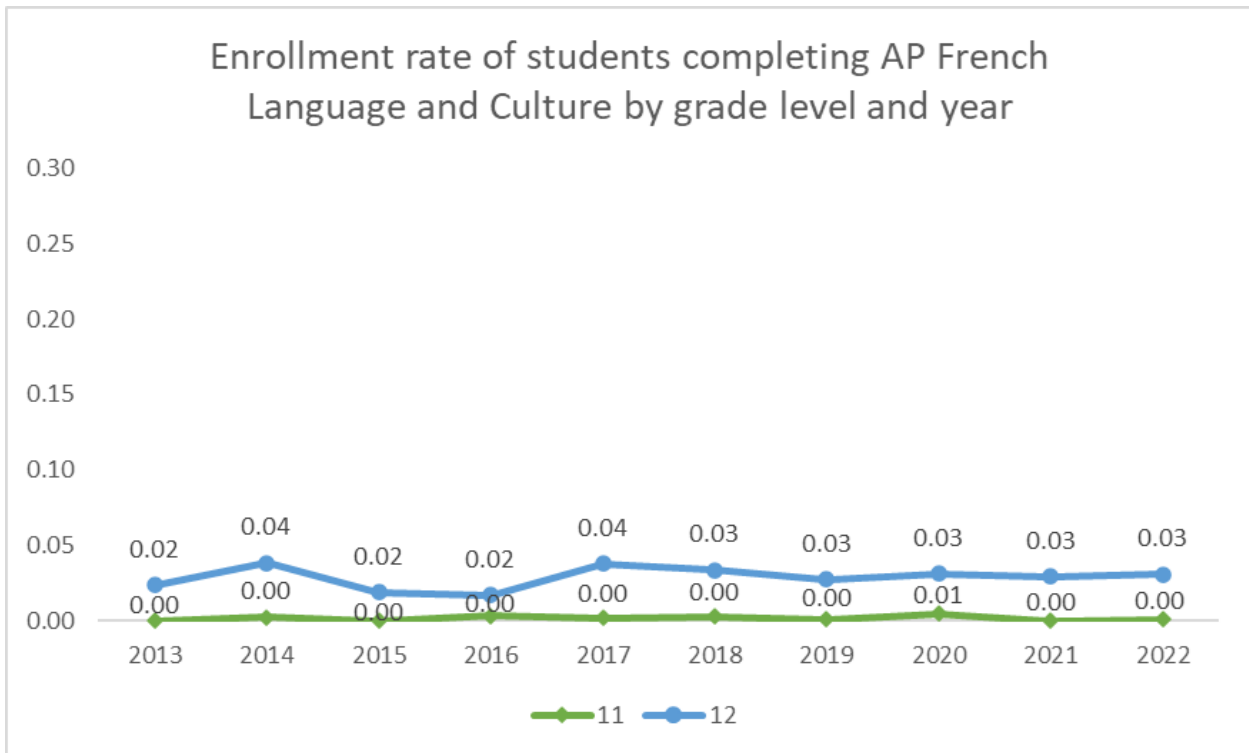
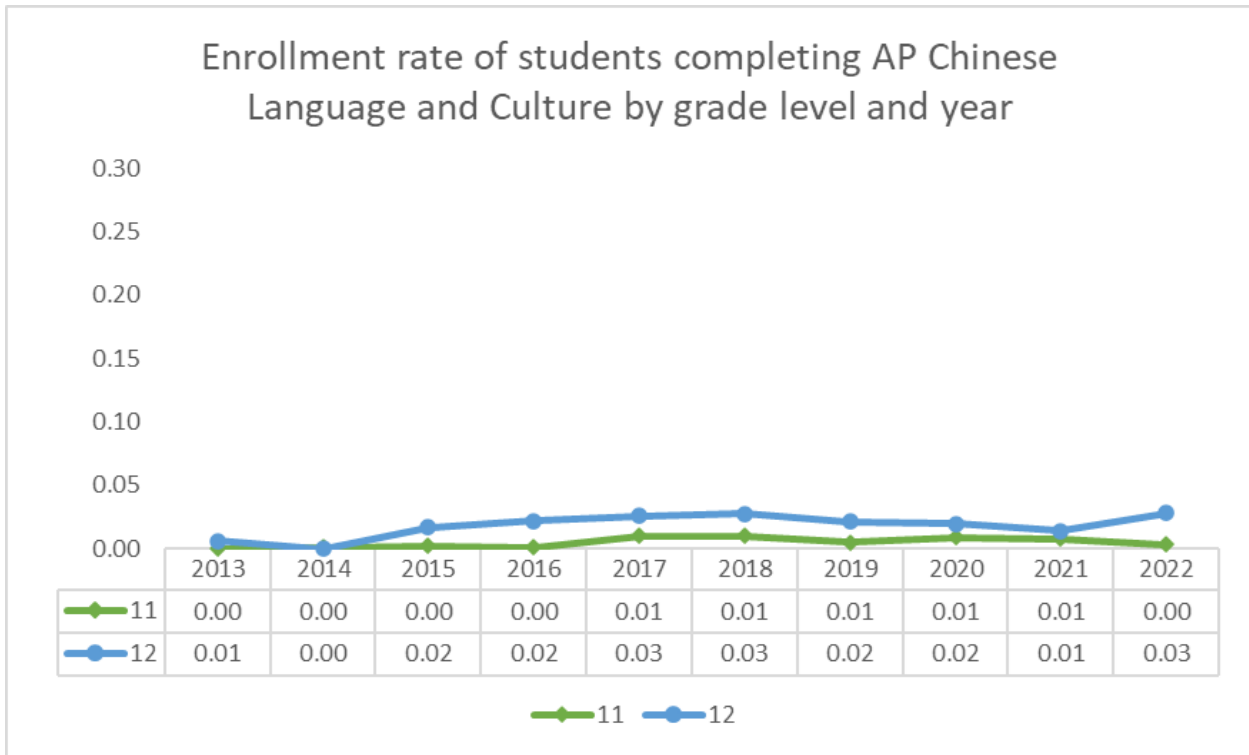
As noted in the previous graph, 11<sup>th</sup> graders typically complete a smaller number of AP courses than 12<sup>th</sup> graders. For 11<sup>th</sup> graders enrolled in AP courses, they typically complete AP Chemistry, AP Chinese, AP English Language and Composition, AP Statistics, and AP US History in grade 11. Students in grade 12 are more likely to complete a larger range of AP courses; students in grade 12 typically do not complete AP US History (although they may have completed it when they were in grade 11). There is also some variability in offerings by high school as noted in the introduction.

Particular courses have seen an increase in enrollment rates in recent years. These include: English Language and Composition (grade 11); English Literature and Composition (grade 12); Psychology (grade 12); Calculus AB (grade 12); Statistics (grade 11); and Biology (grade 12).

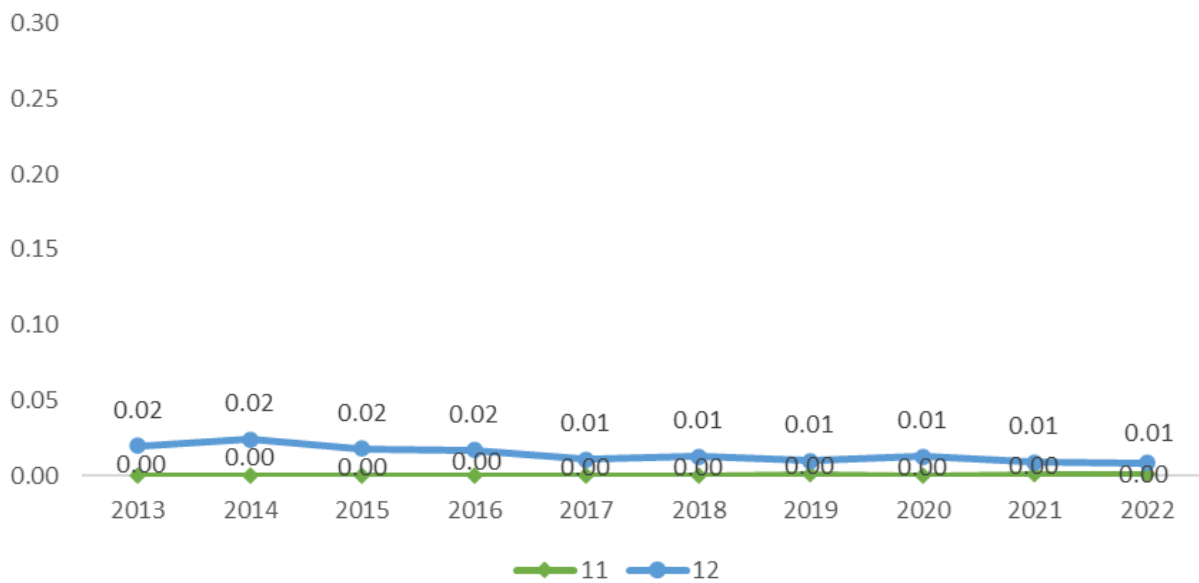
English Language Arts



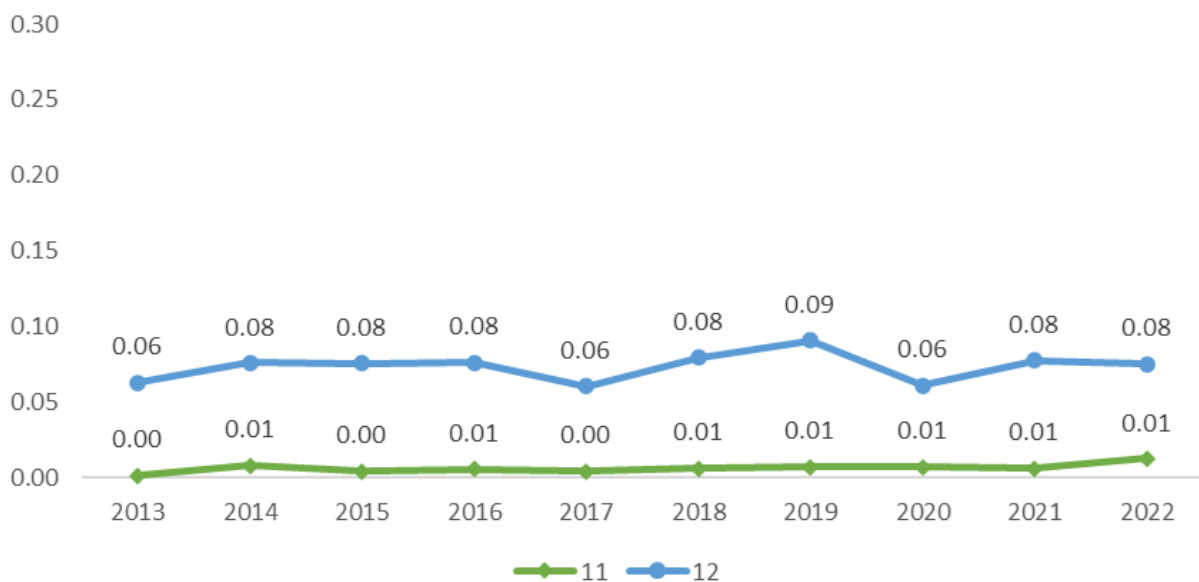
Foreign Languages



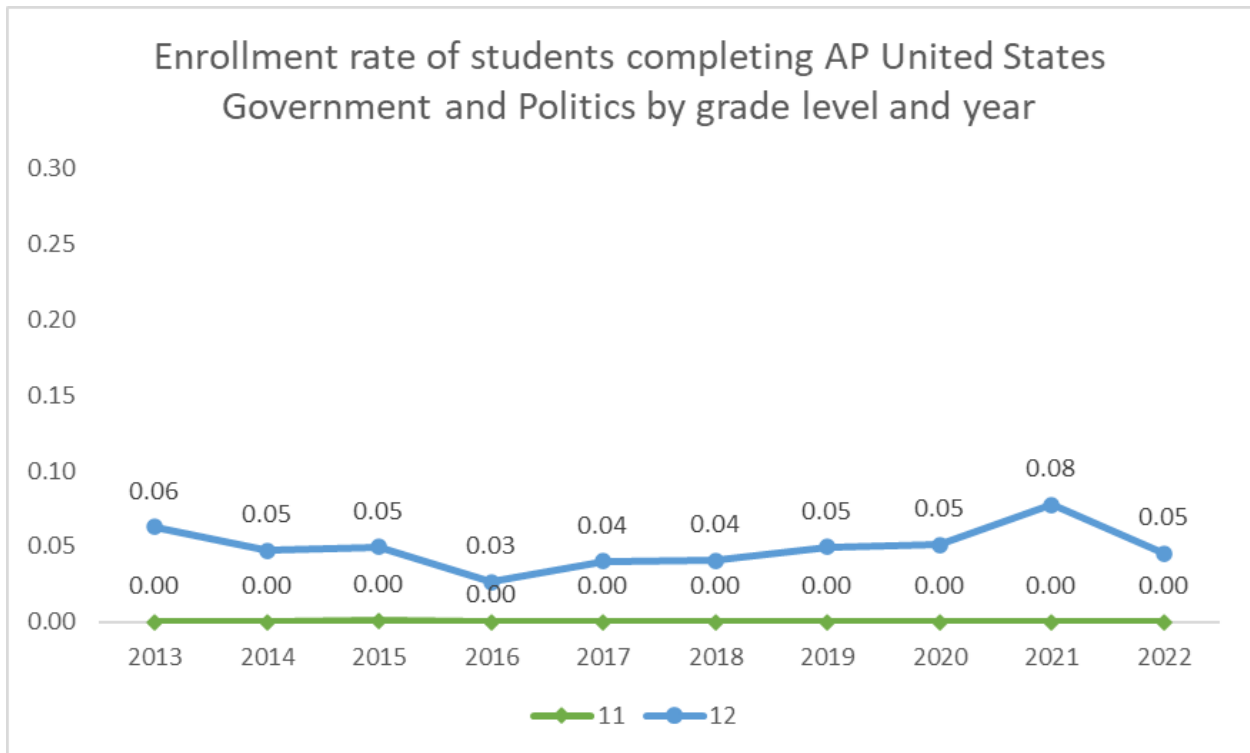
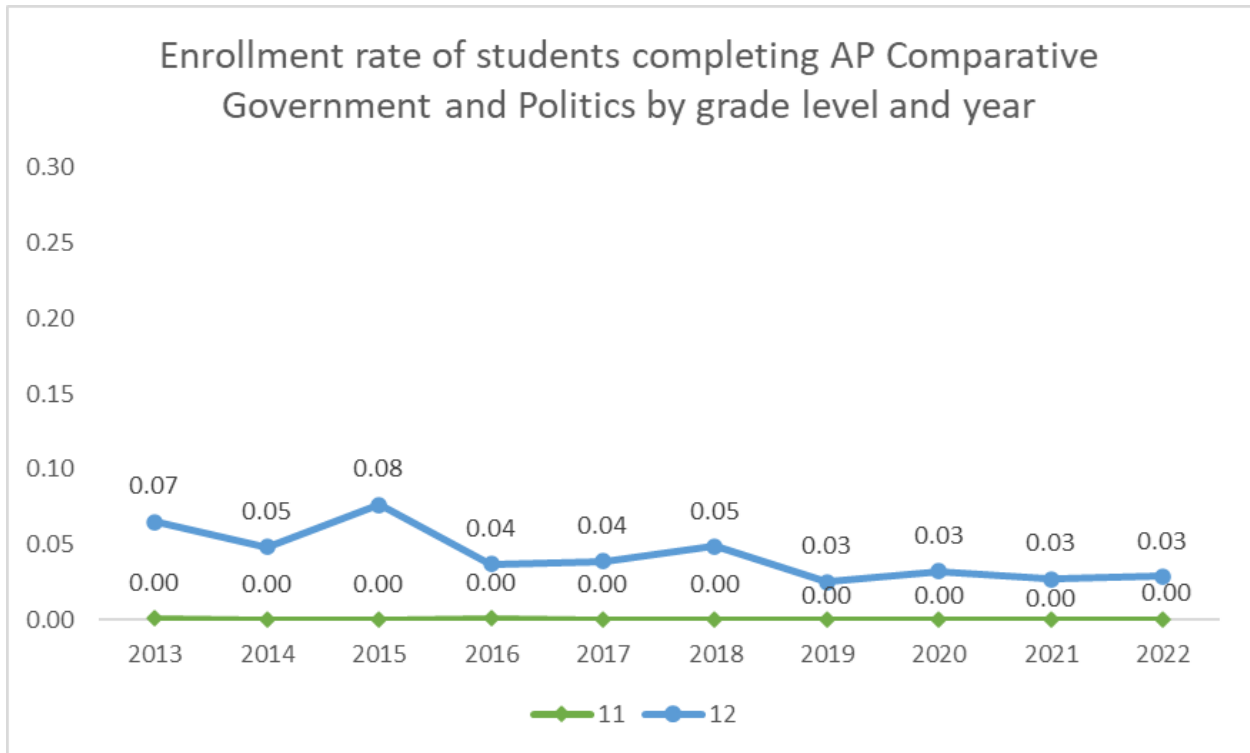
Enrollment rate of students completing AP Italian Language and Culture by grade level and year



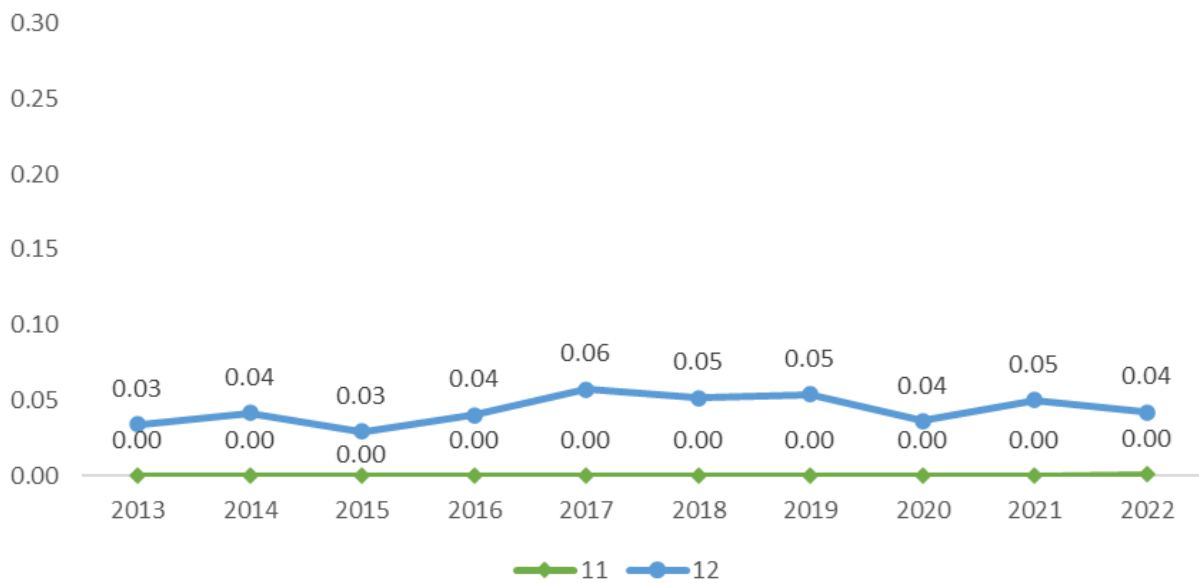
Enrollment rate of students completing AP Spanish Language and Culture by grade level and year



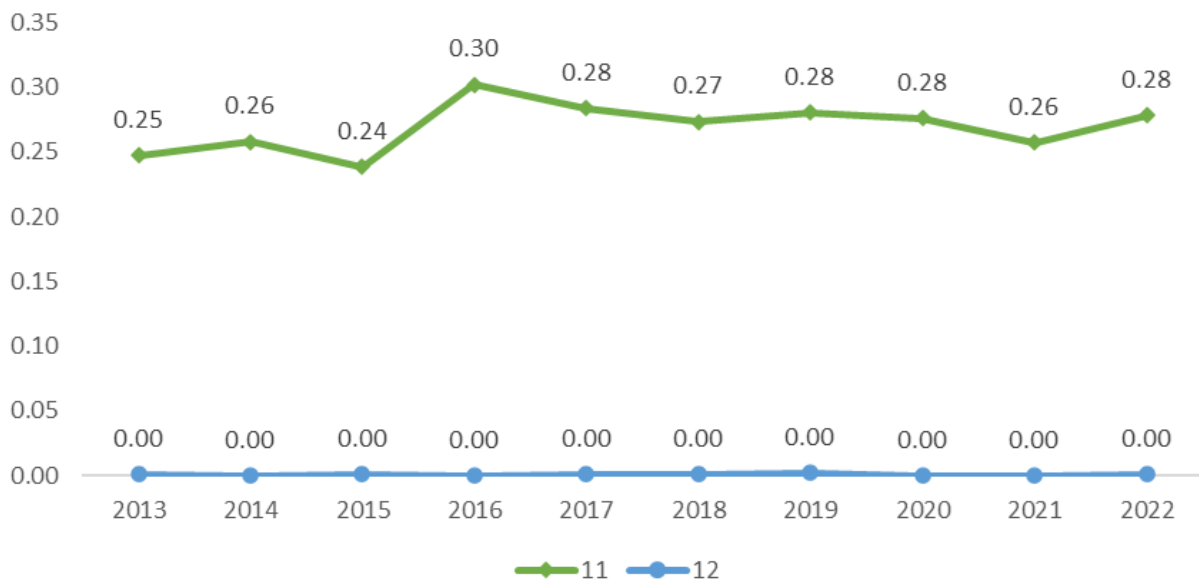
History and Social Science

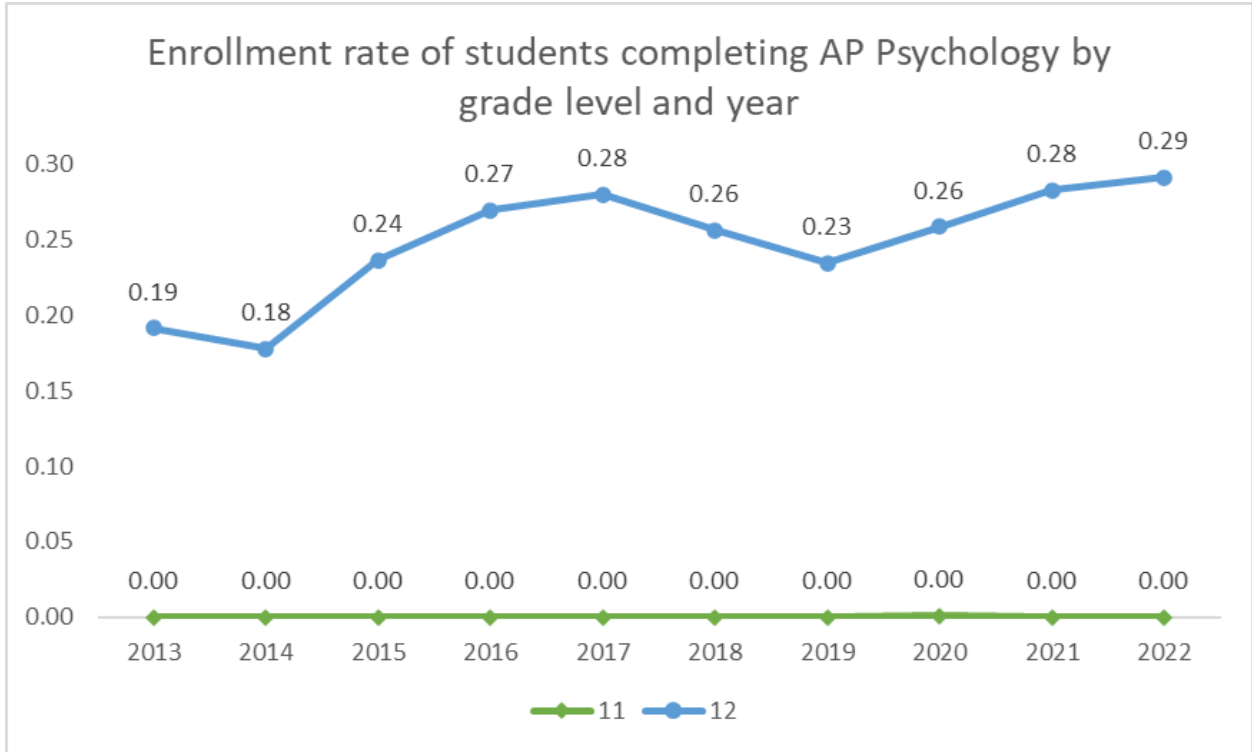


Enrollment rate of students completing AP European History by grade level and year

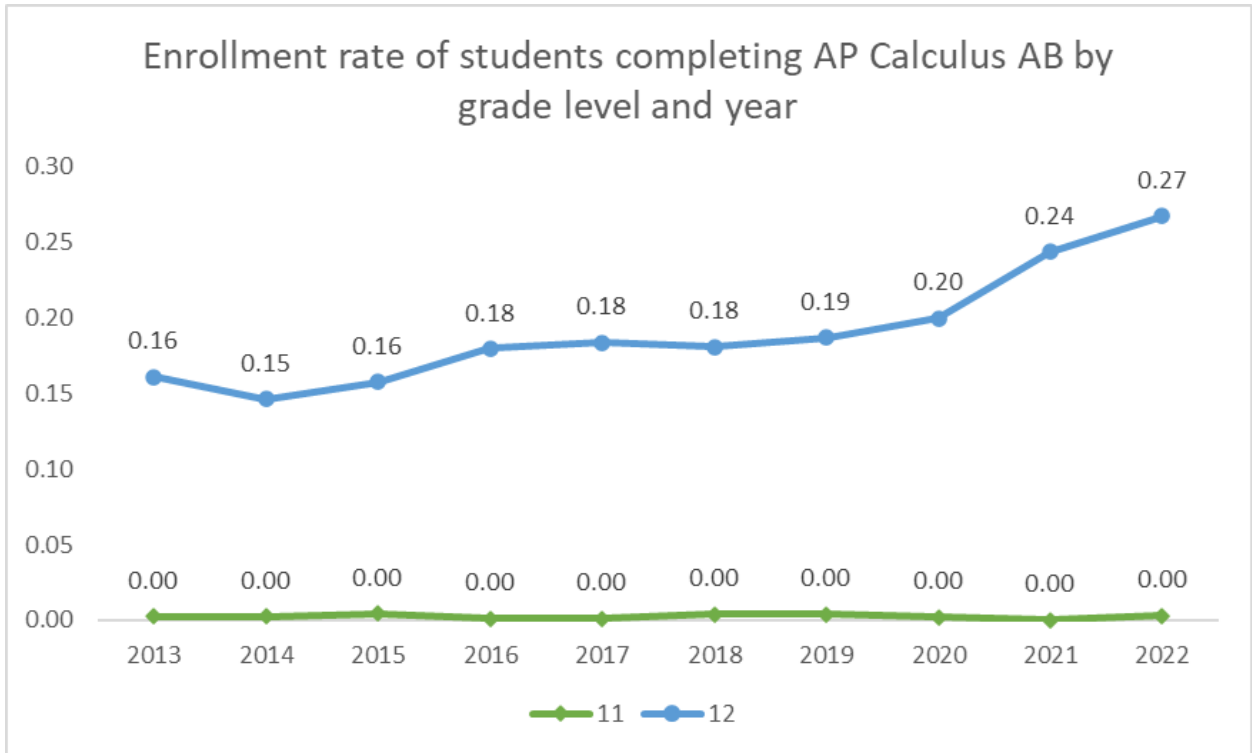


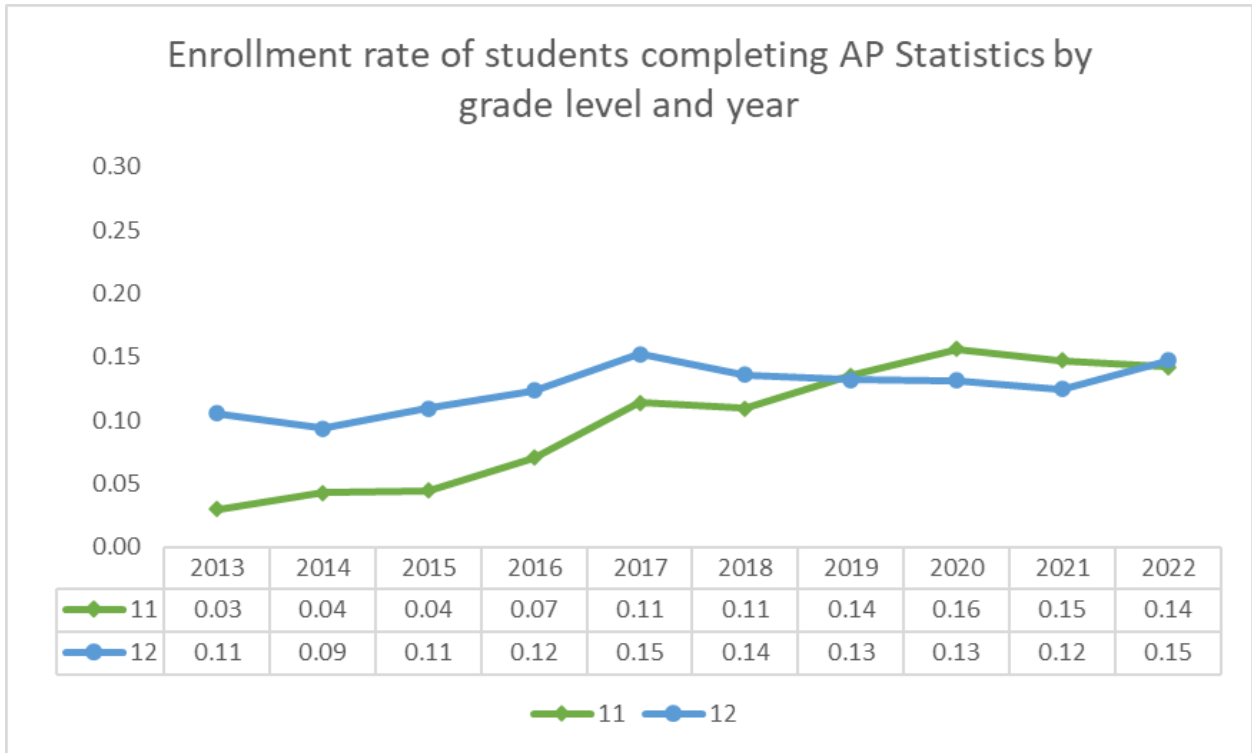
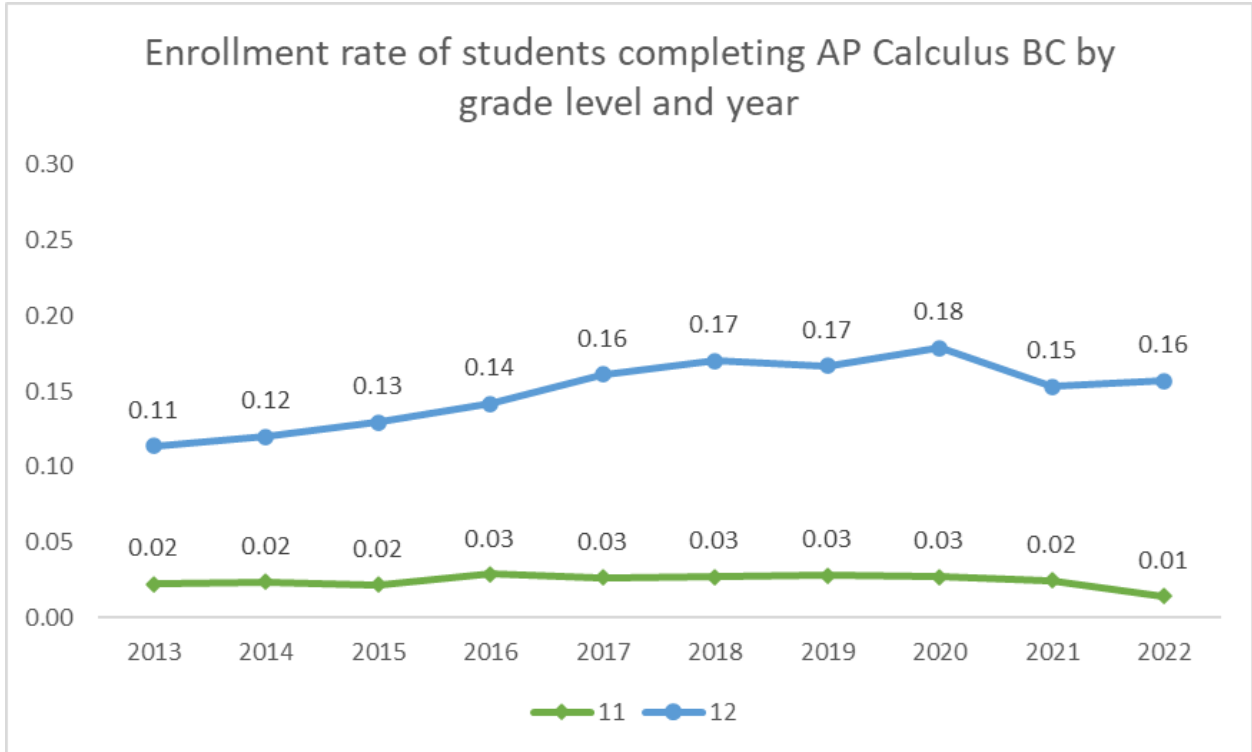
Enrollment rate of students completing AP United States History by grade level and year





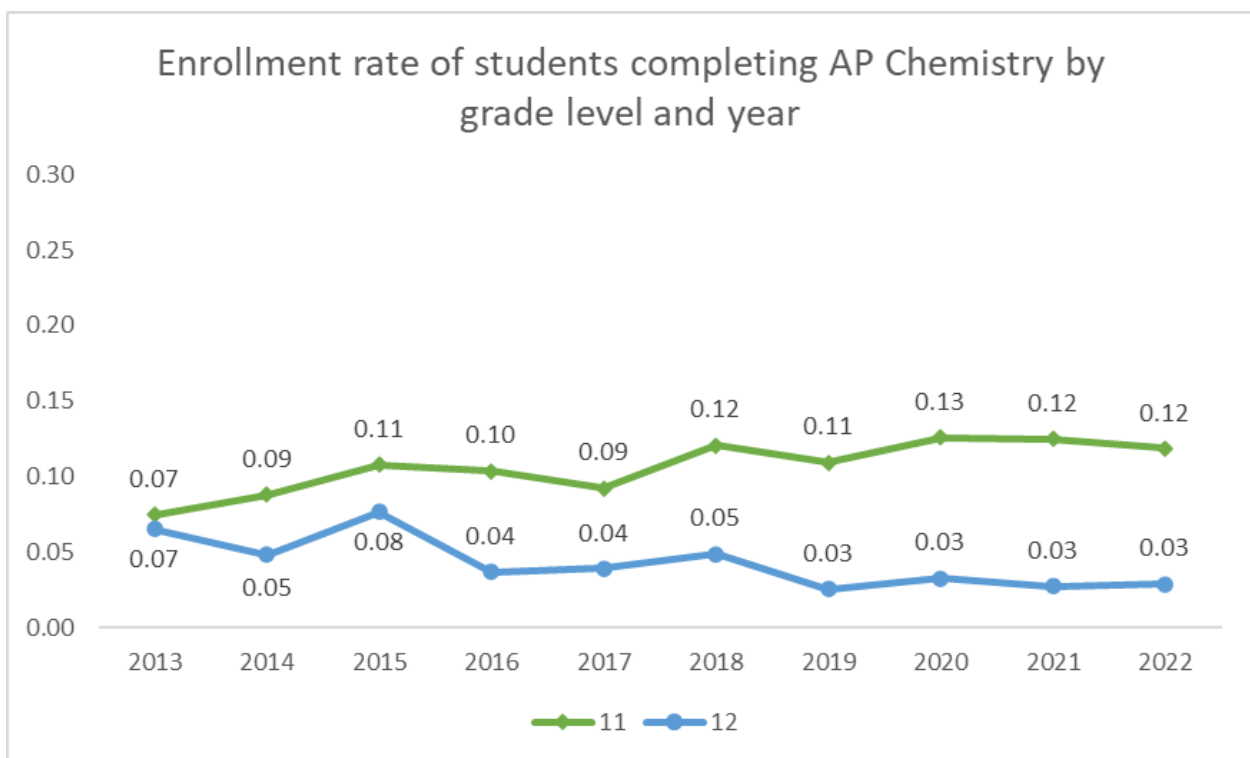
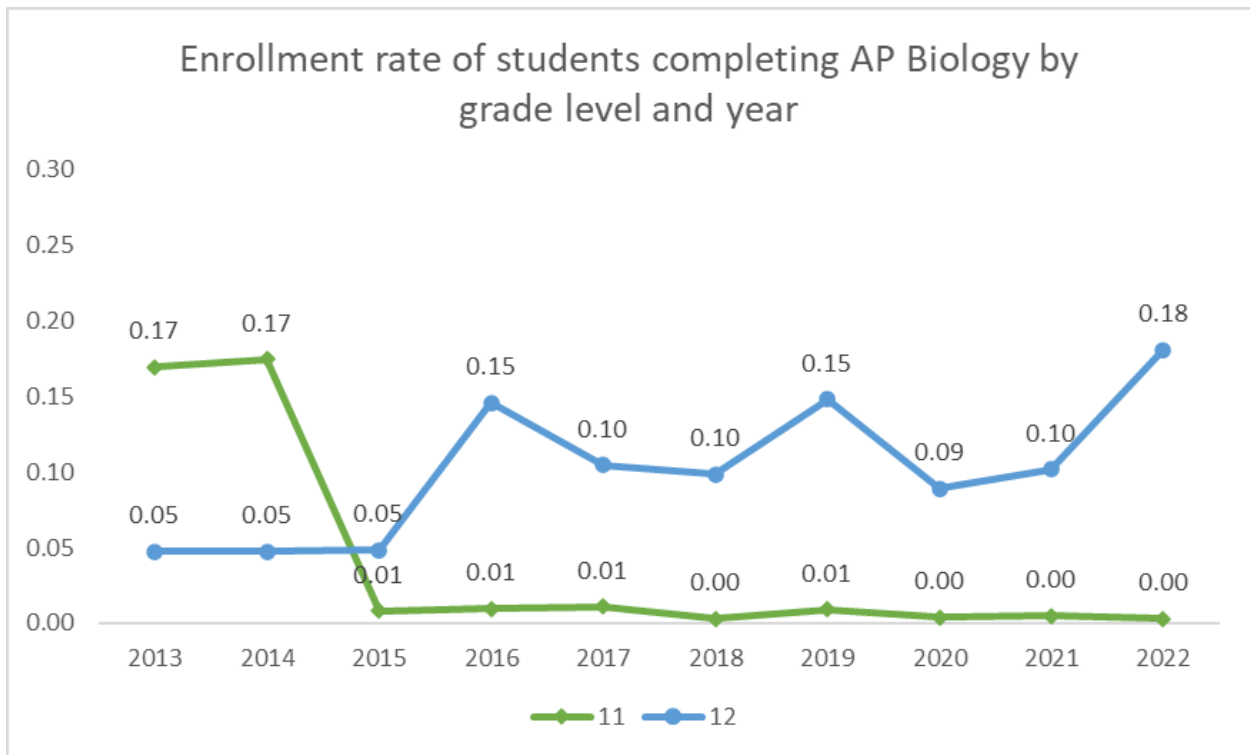
**Math**



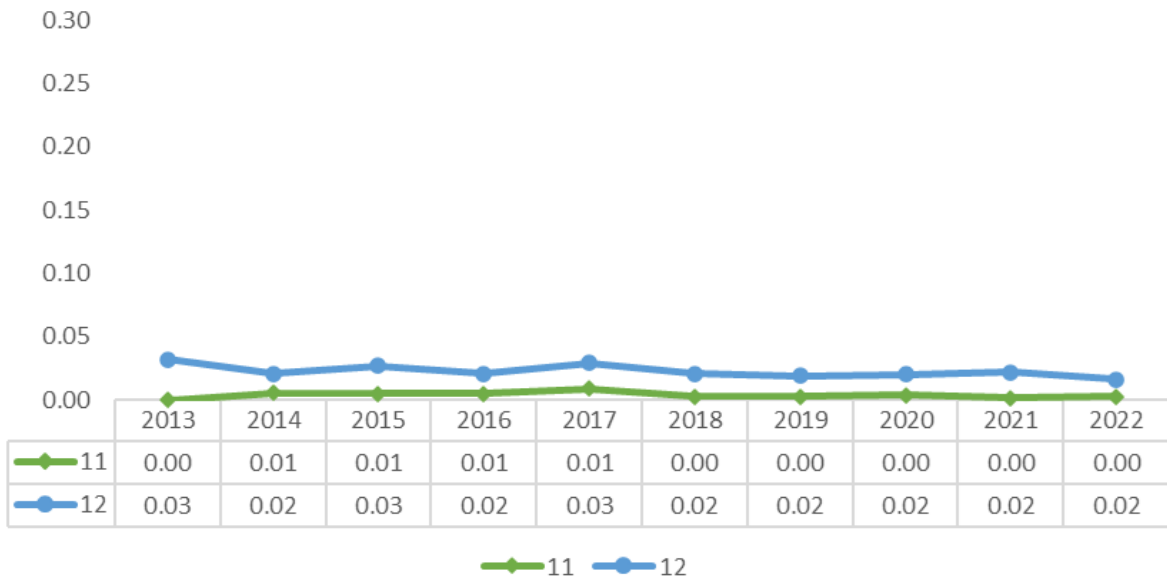




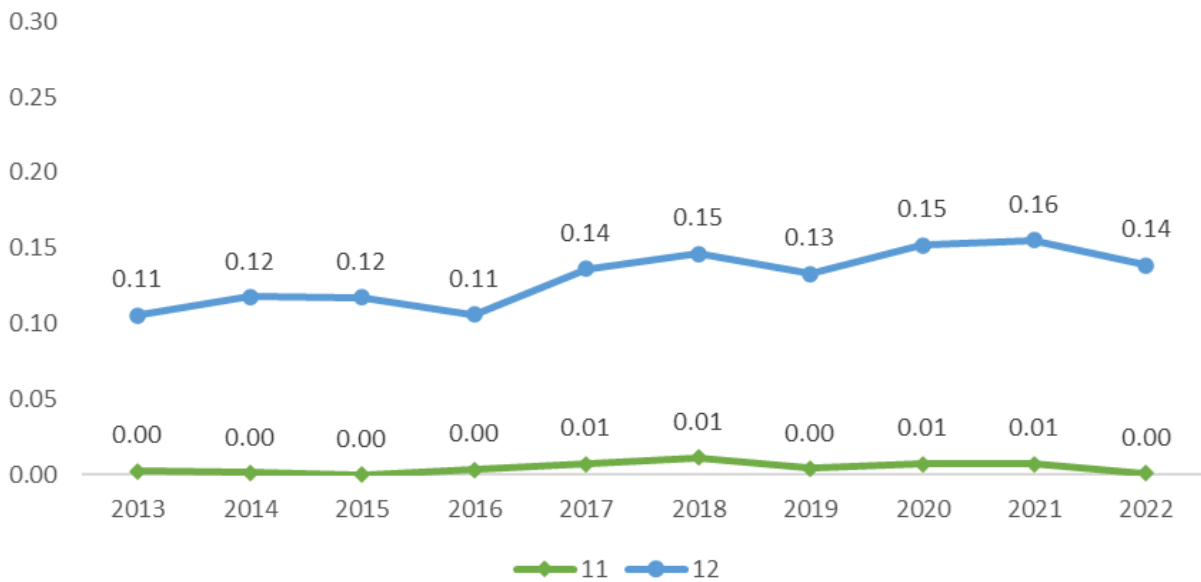
Science and Technology



Enrollment rate of students completing AP Physics C: Electricity and Magnetism by grade level and year

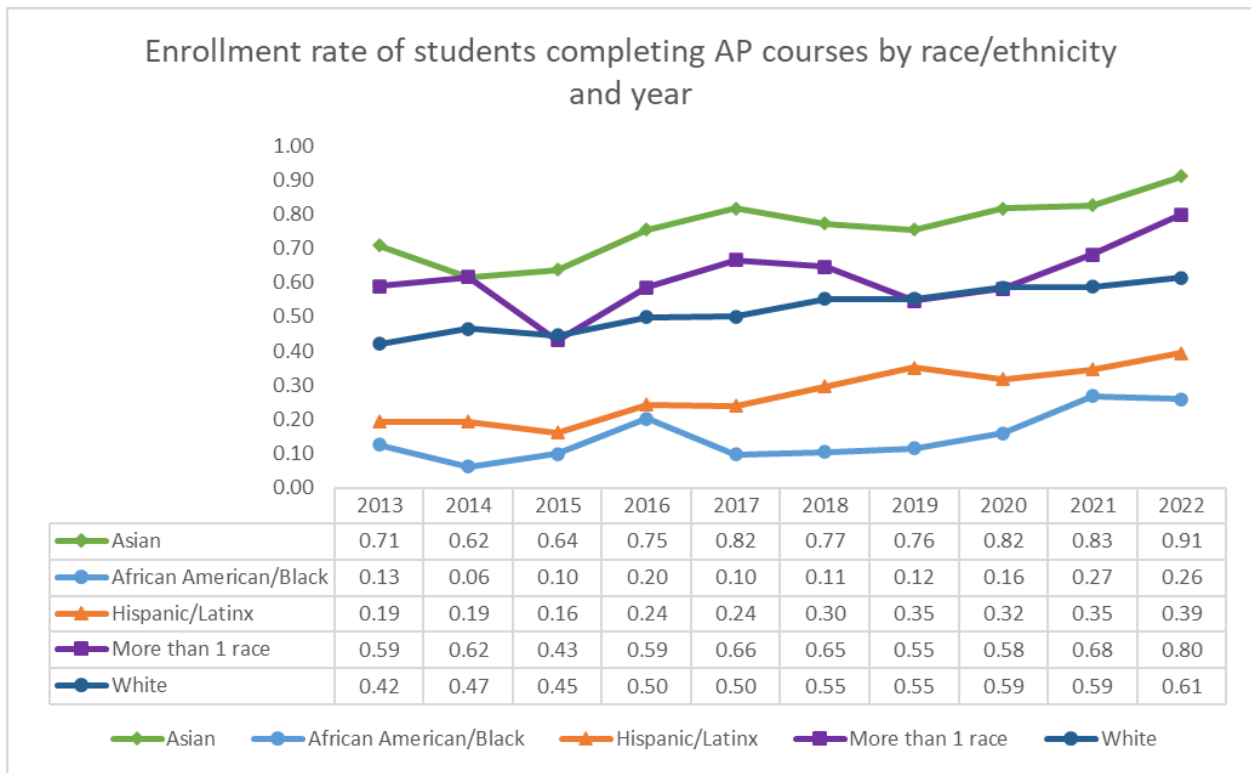


Enrollment rate of students completing AP Physics C: Mechanics by grade level and year

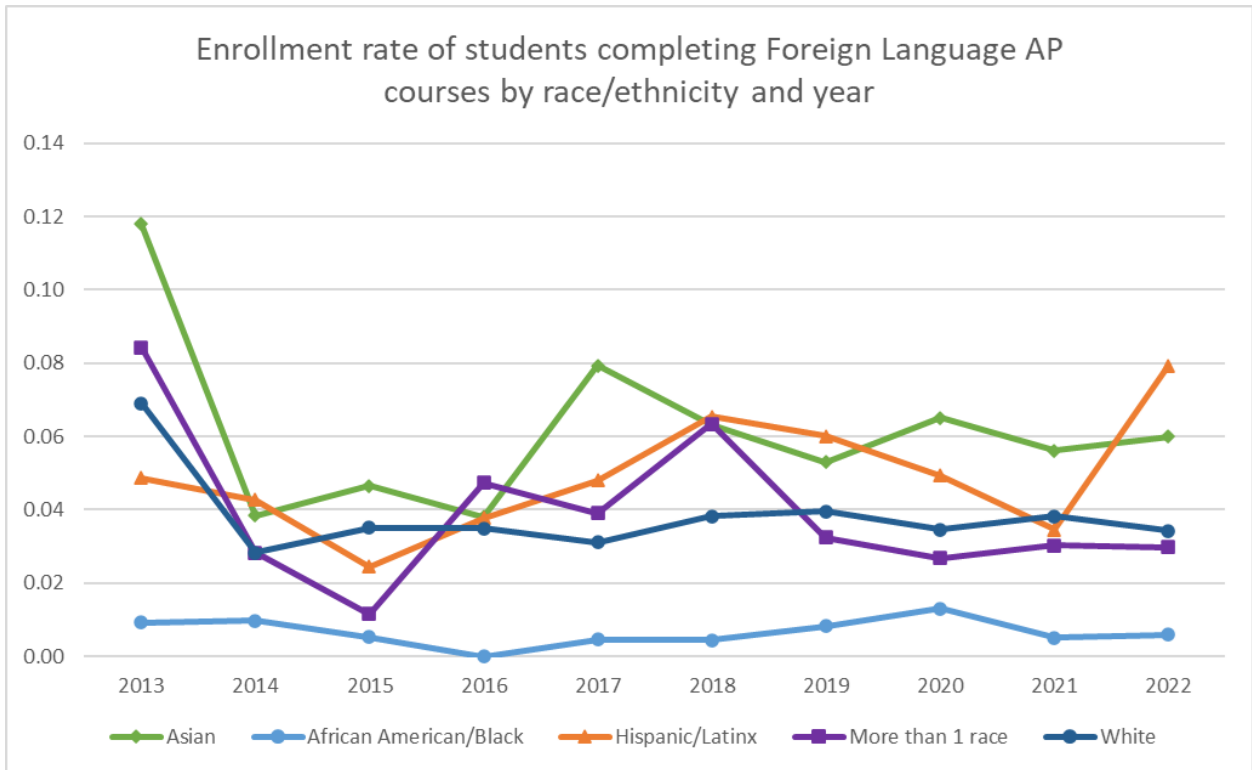
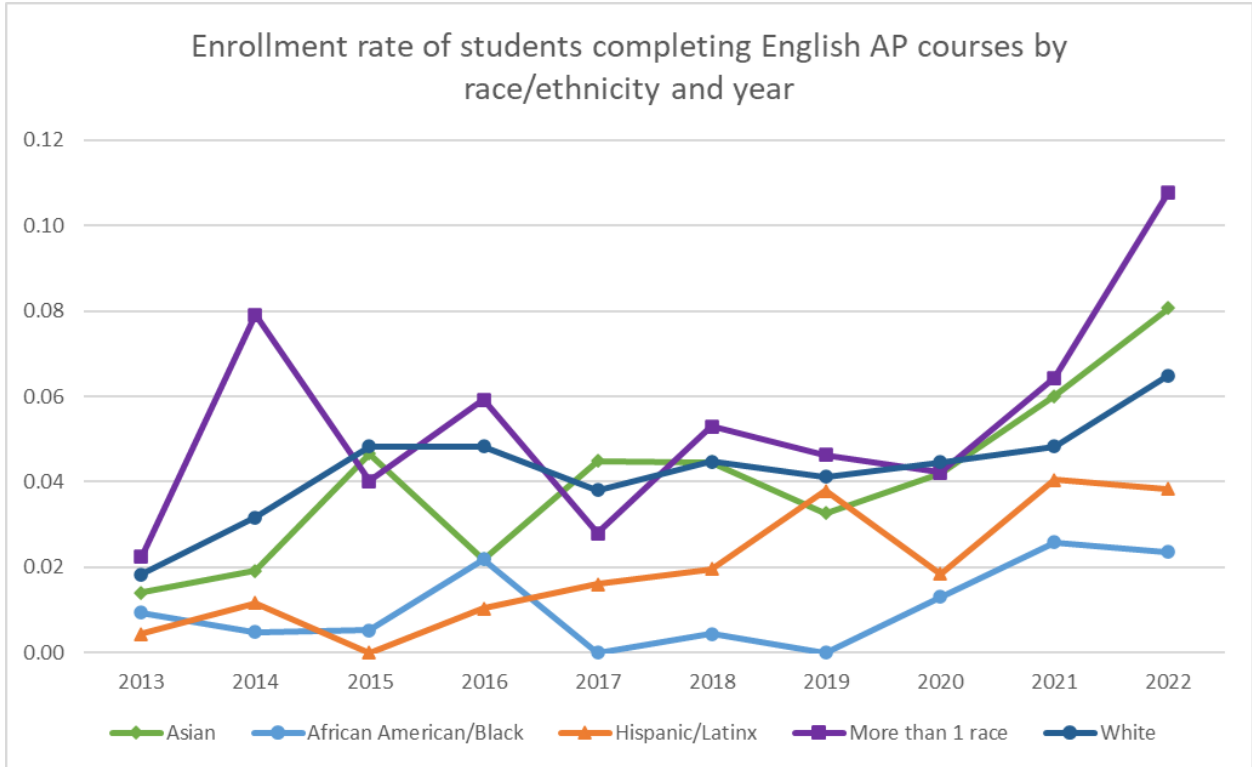


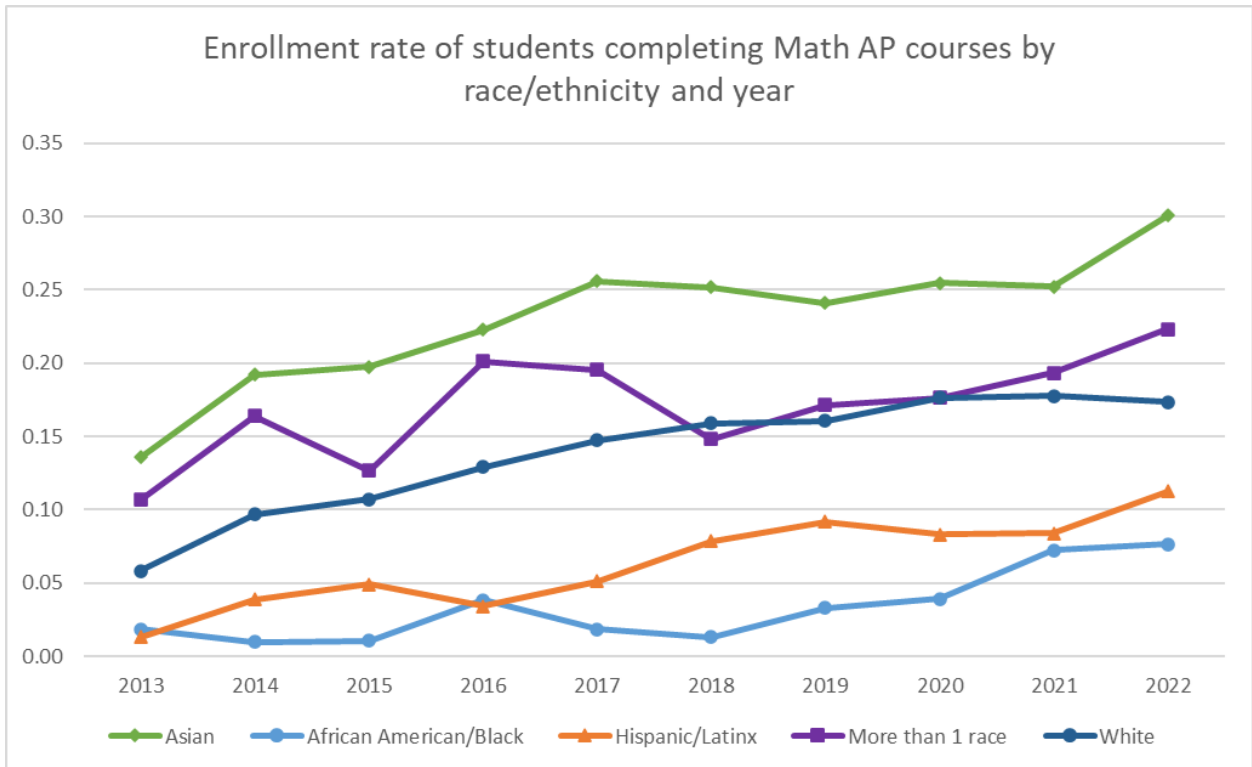
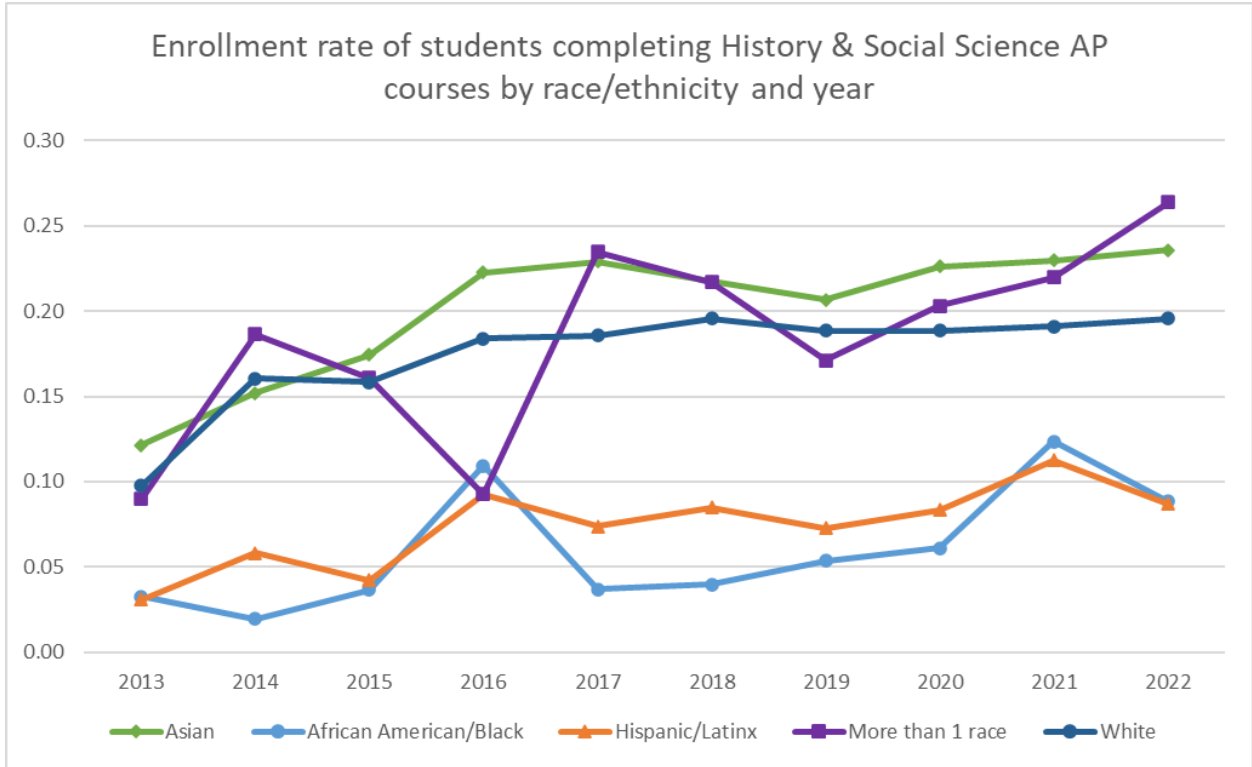
The graph below shows the total number of AP enrollments by race/ethnicity and school year over the past ten years. This graph shows that enrollment rates in AP courses have increased over the past 10 years for all racial/ethnic subgroups, although an

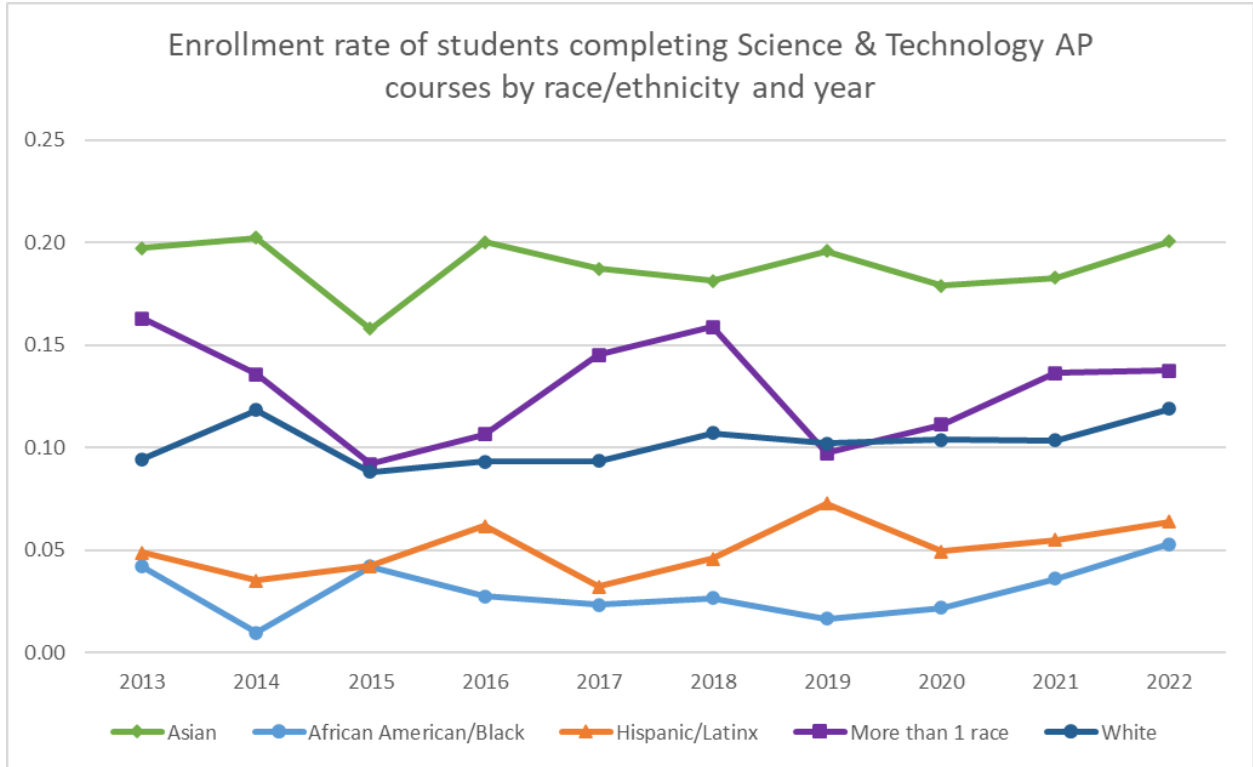
enrollment gap remains for students who identify as African American/Black or Hispanic/Latinx.



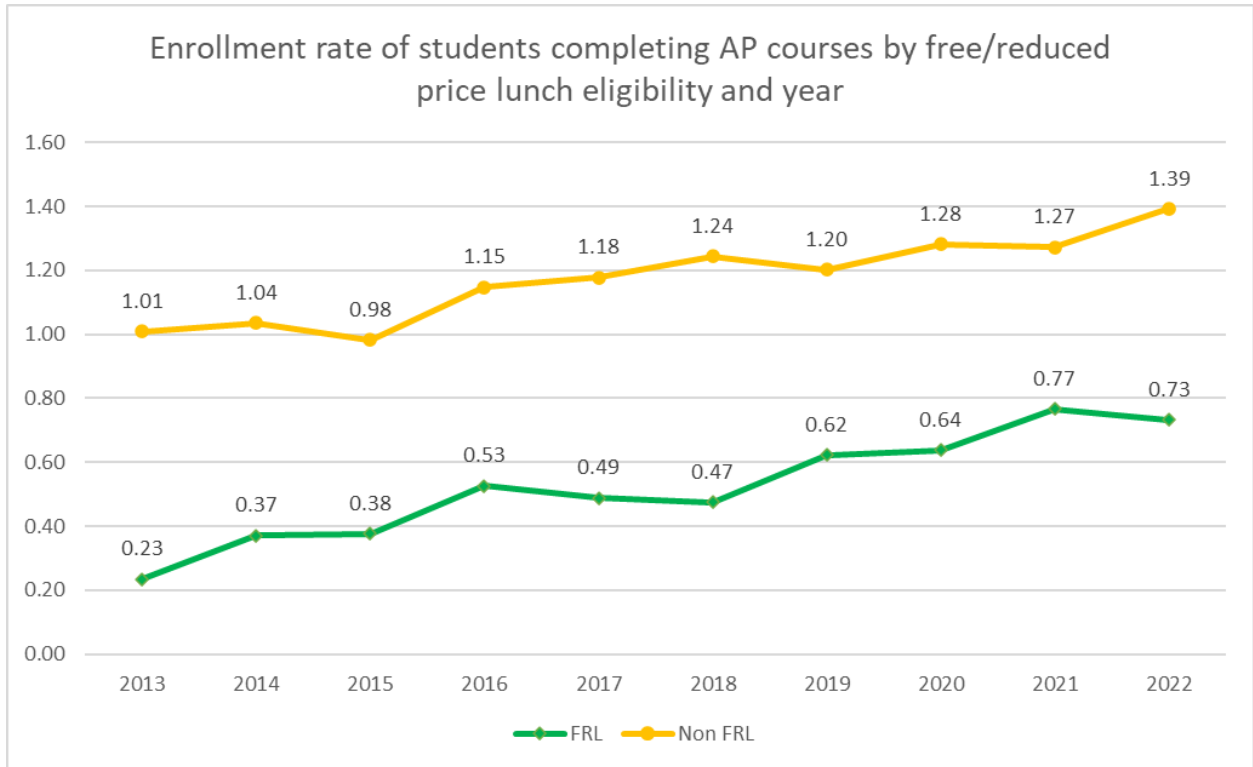
Because the number of students completing specific AP courses and identifying as African American/Black or Hispanic/Latinx is less than 10 in multiple years of this analysis, the next graphs display enrollment rates over the past 10 years for AP courses by subject rather than individual courses.



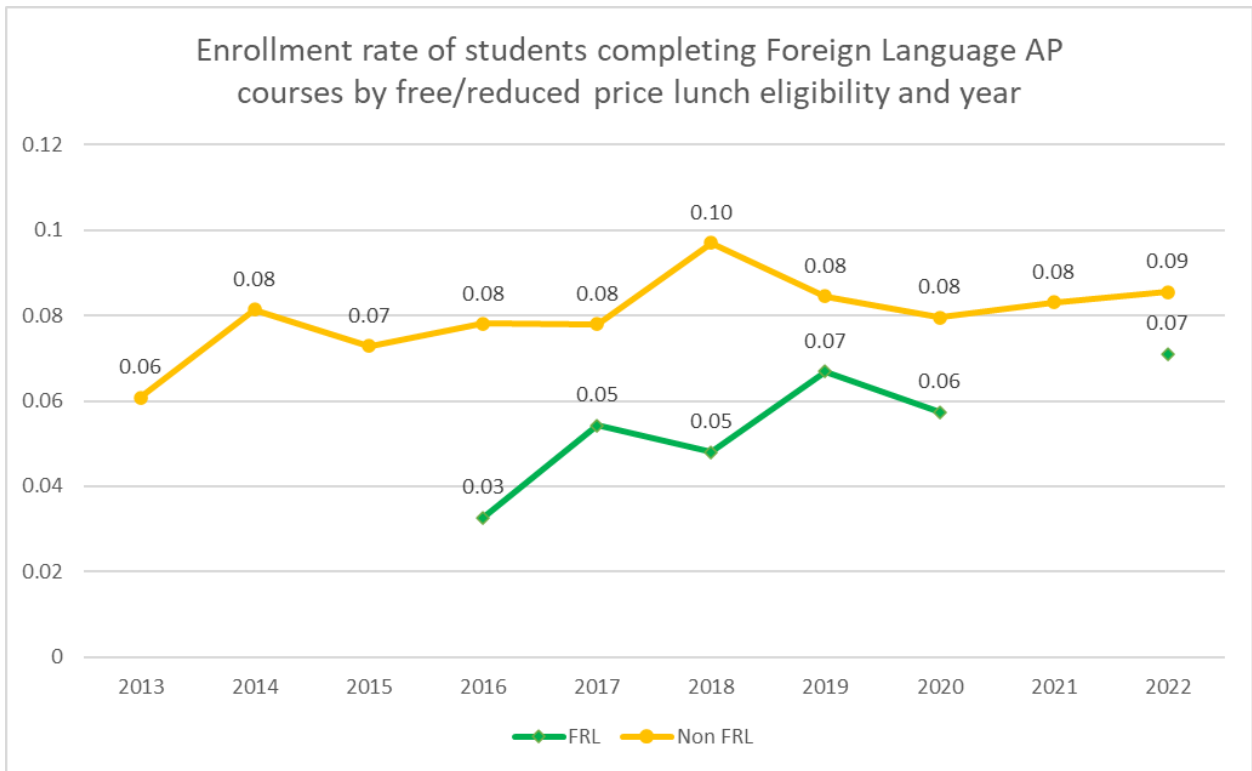
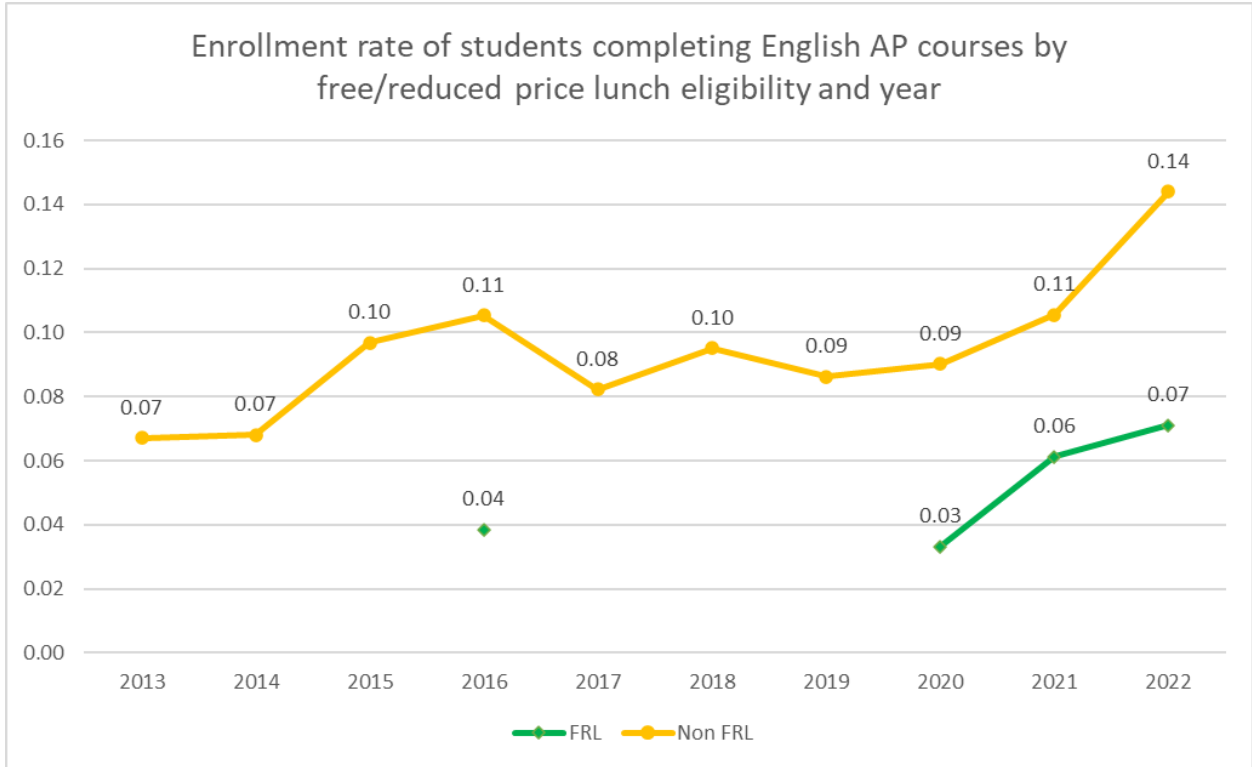




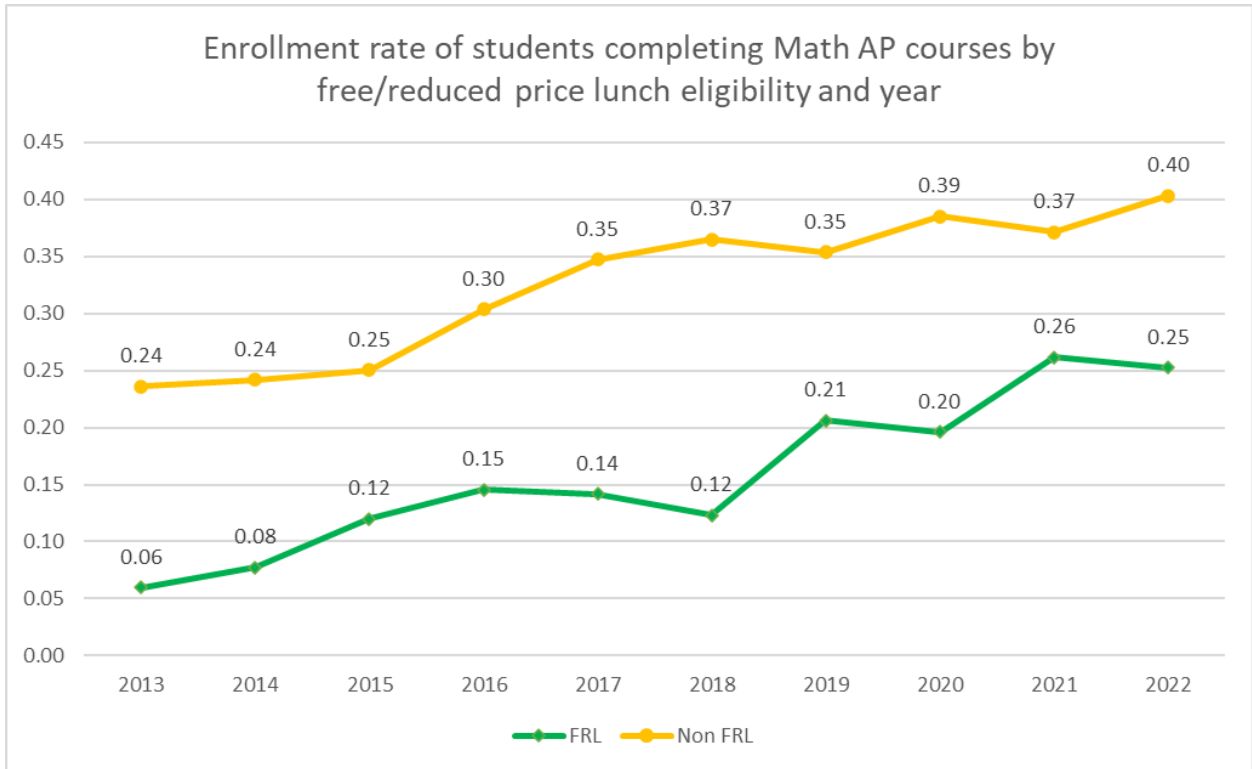
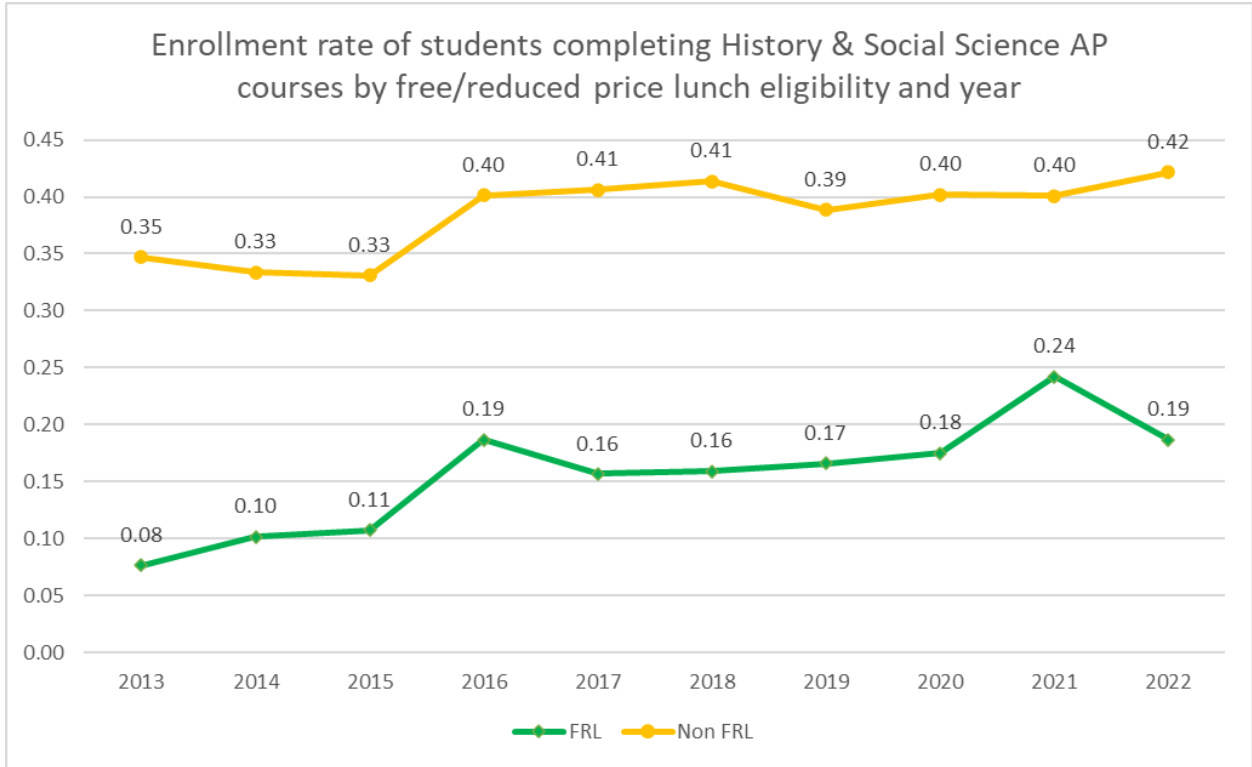
The graph below shows the total number of AP enrollments by free/reduced price lunch status and school year over the past ten years. This graph shows that enrollment rates in AP courses have increased over the past 10 years for students eligible for free/reduced price lunch and for students who are not eligible, although an enrollment gap remains for students who are eligible.

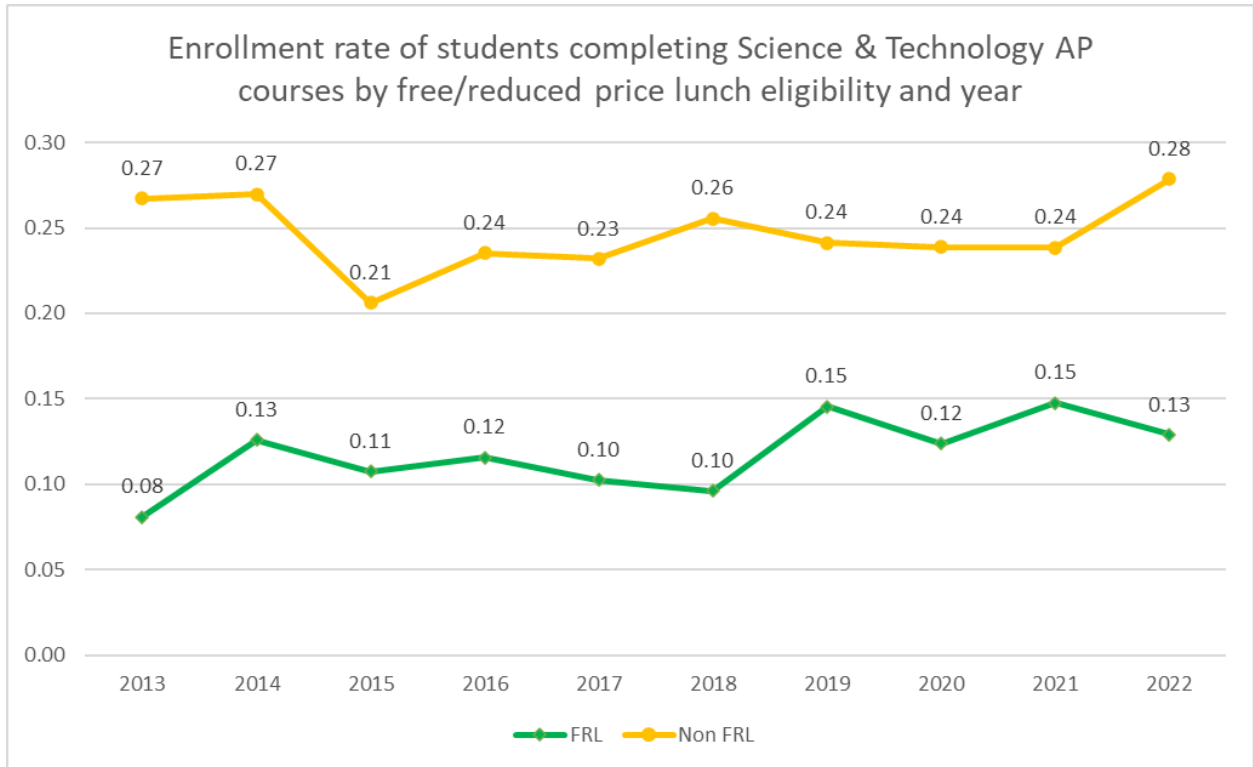


Because the number of students completing specific AP courses and eligible for free/reduced price lunch is less than 10 in multiple years of this analysis, the next graphs display enrollment rates over the past 10 years for AP courses by subject rather than individual courses.







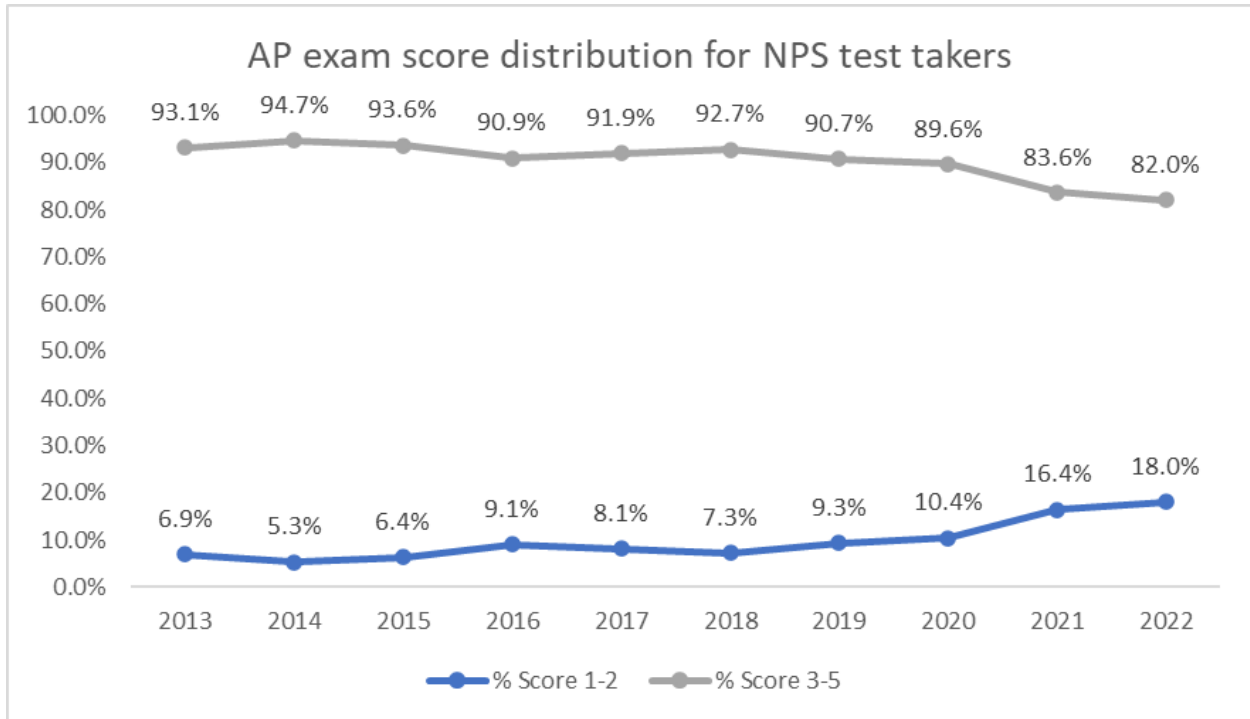


Enrollments in AP courses for students with disabilities and English Learners are less than ten for most of the years of this analysis and are therefore not included here.

## Outcomes

### *Exam participation and scores*

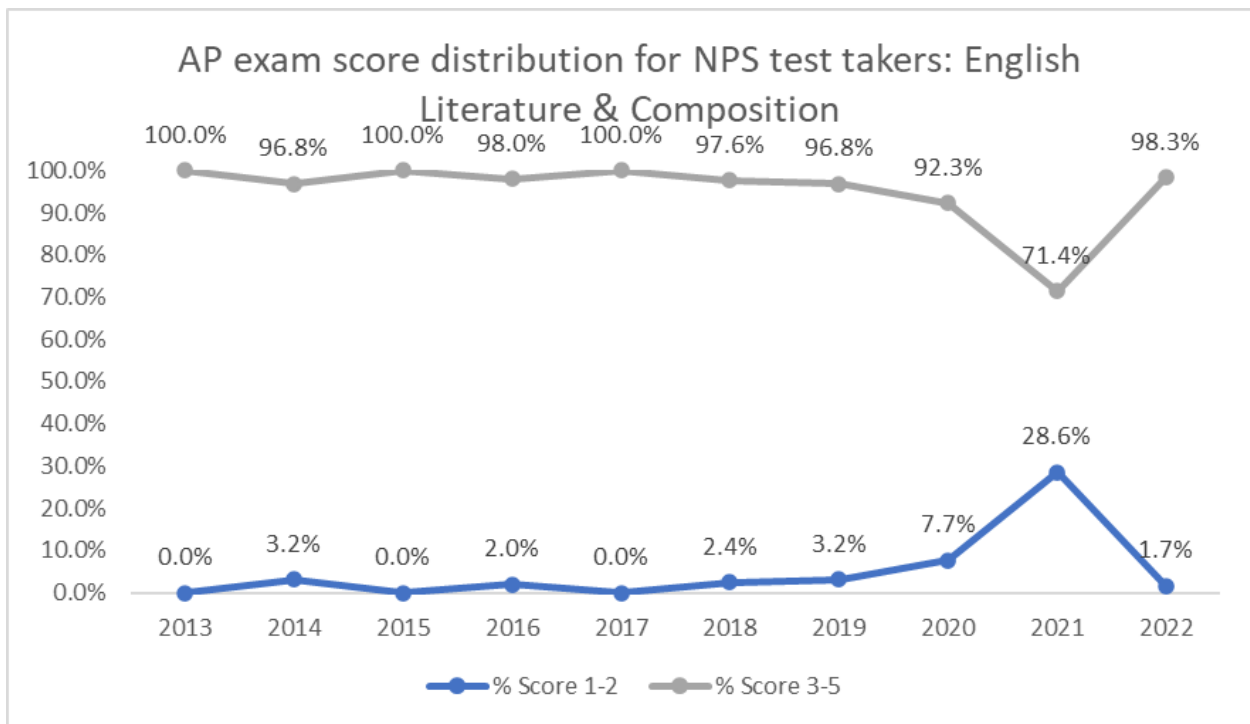
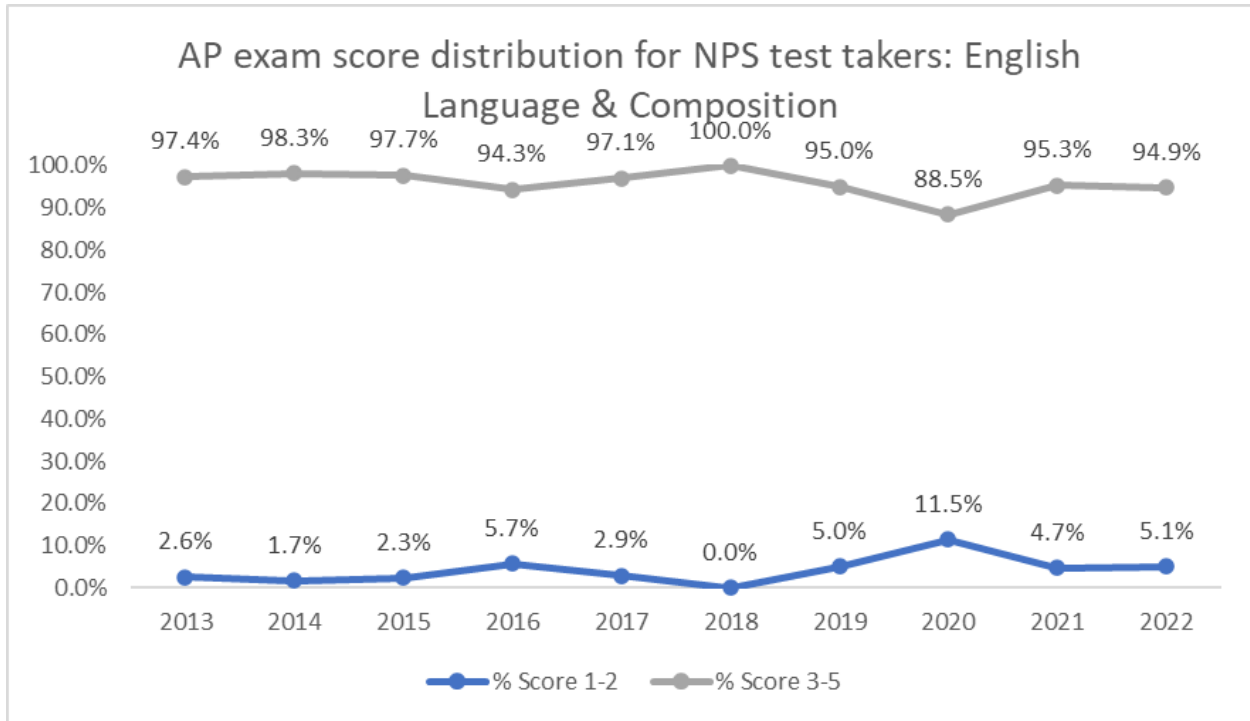
The following graph displays the AP exam score distribution for all test takers over the past ten years (2013-2022). Overall, the pattern in exam scores is relatively constant until the 2019-2020 school year, when the pattern begins to shift to one where a higher percentage of students scored a 1 or a 2 on the AP exams than in prior years and, conversely, the percentage of students scoring a 3, 4, or 5 on the AP exams decreased.



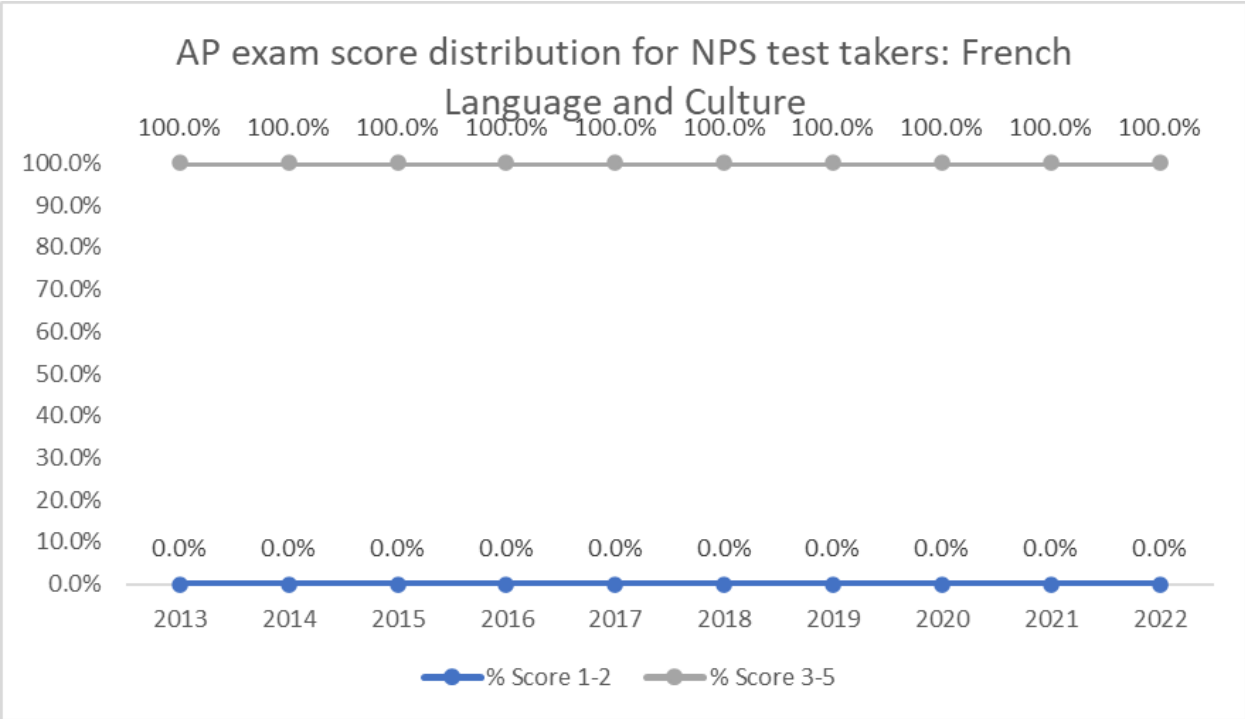
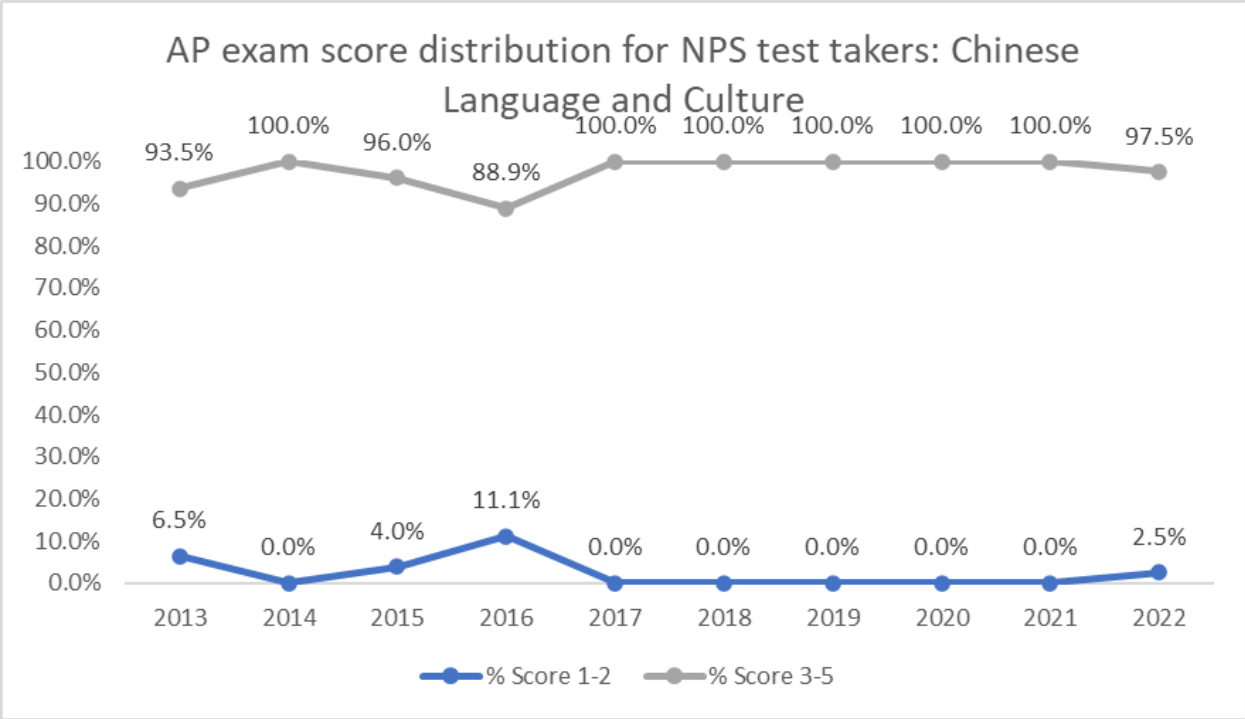
The following graphs display the AP exam score distribution by subject over the past 10 years. The following subjects have seen a change in test scores similar to the pattern seen for all subjects beginning in 2019-2020: Calculus AB (although the change in the distribution in scores is more varied), Calculus BC, Statistics, Chemistry, Physics Mechanics, Physics E&M, Comparative Government and Politics, US Government and Politics (although more varied), European History, United States History, and Psychology.

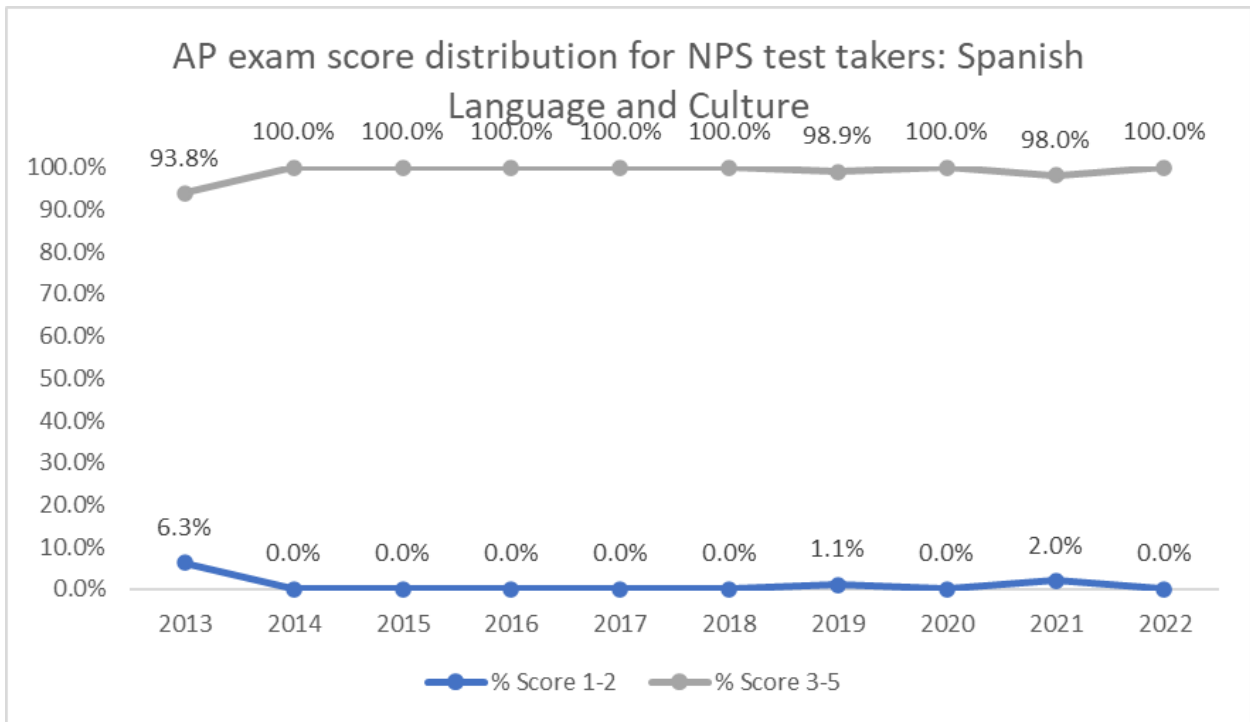
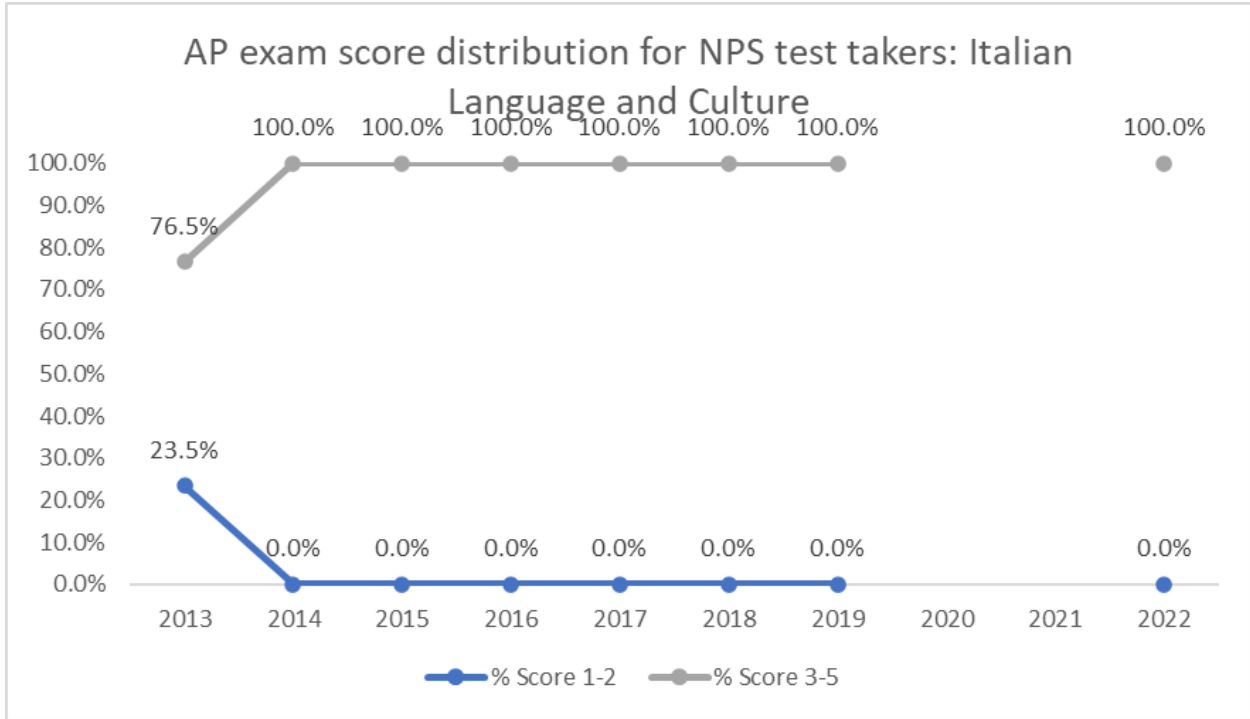
The following subjects have not seen a change in the distribution of test scores over time: English (both subjects, with the exception of a single year in both), Biology, Chinese, French, Italian, and Spanish.

English Language Arts

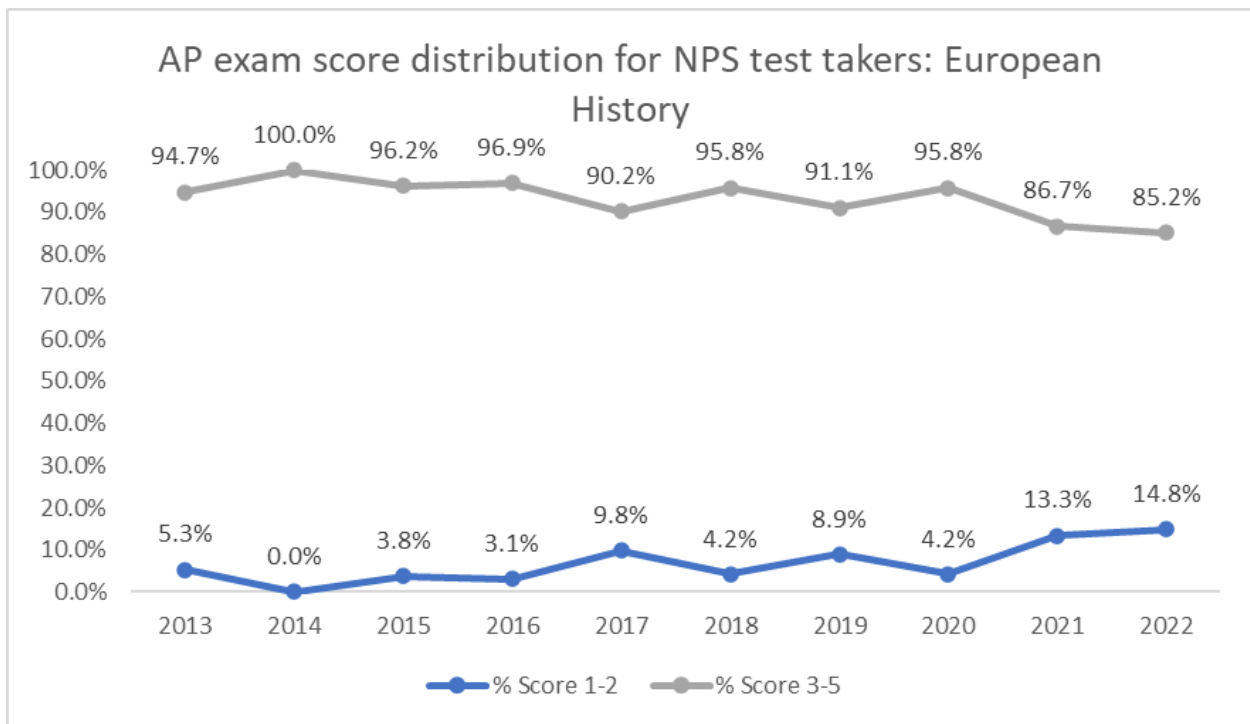
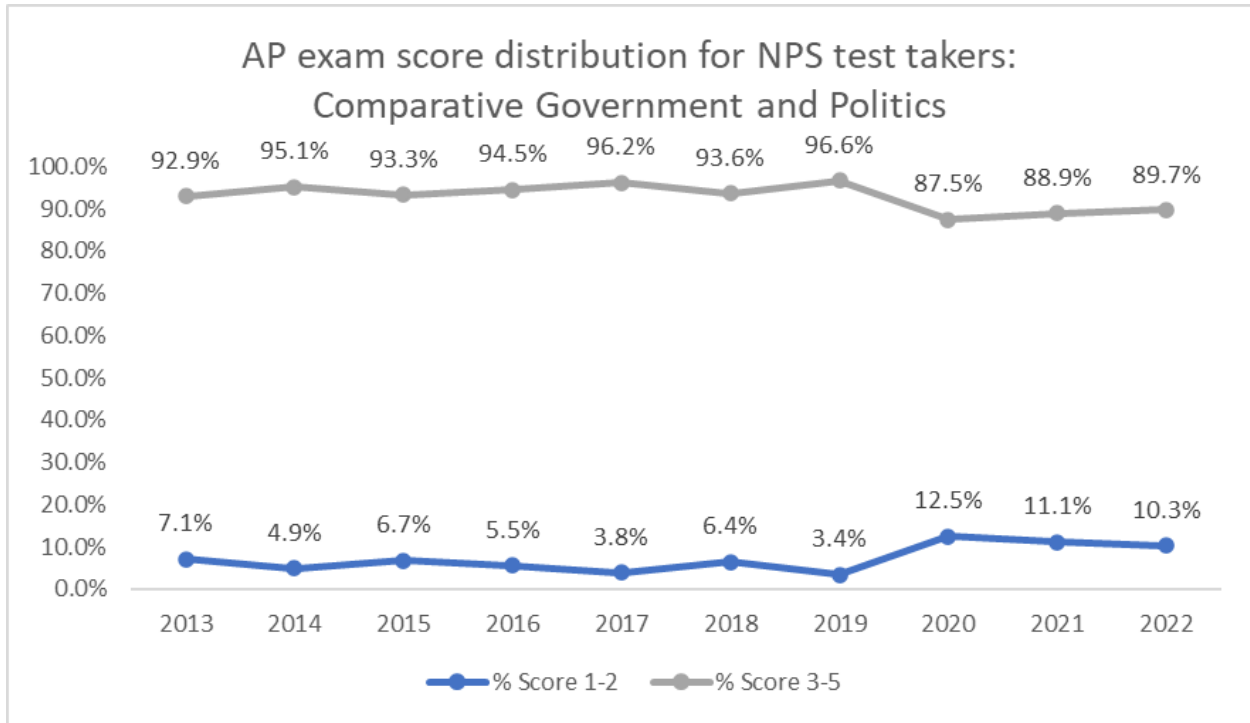


World Languages

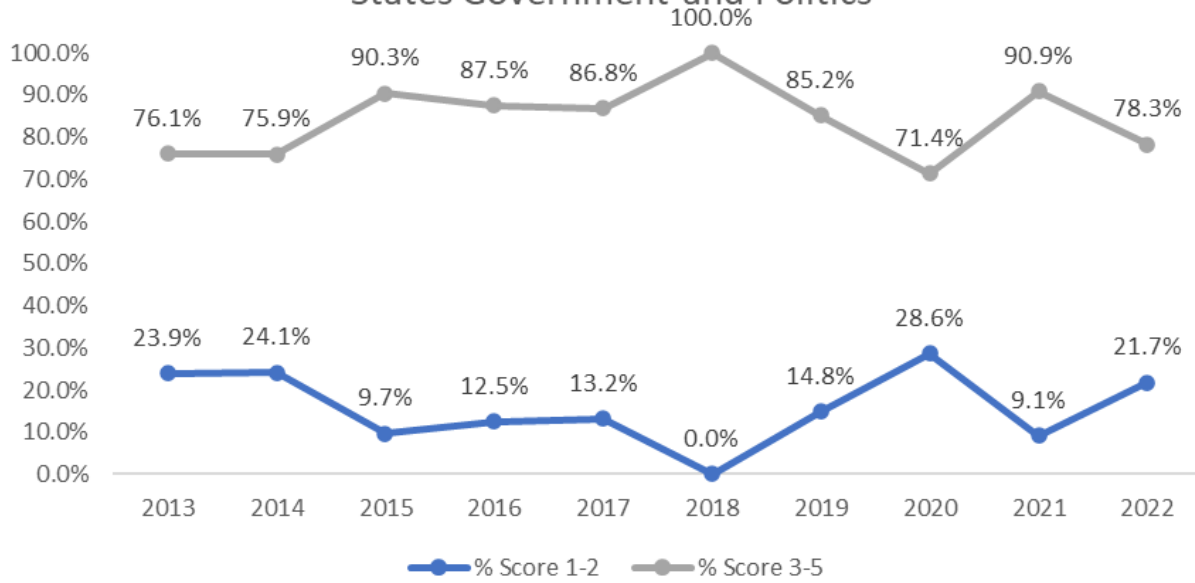




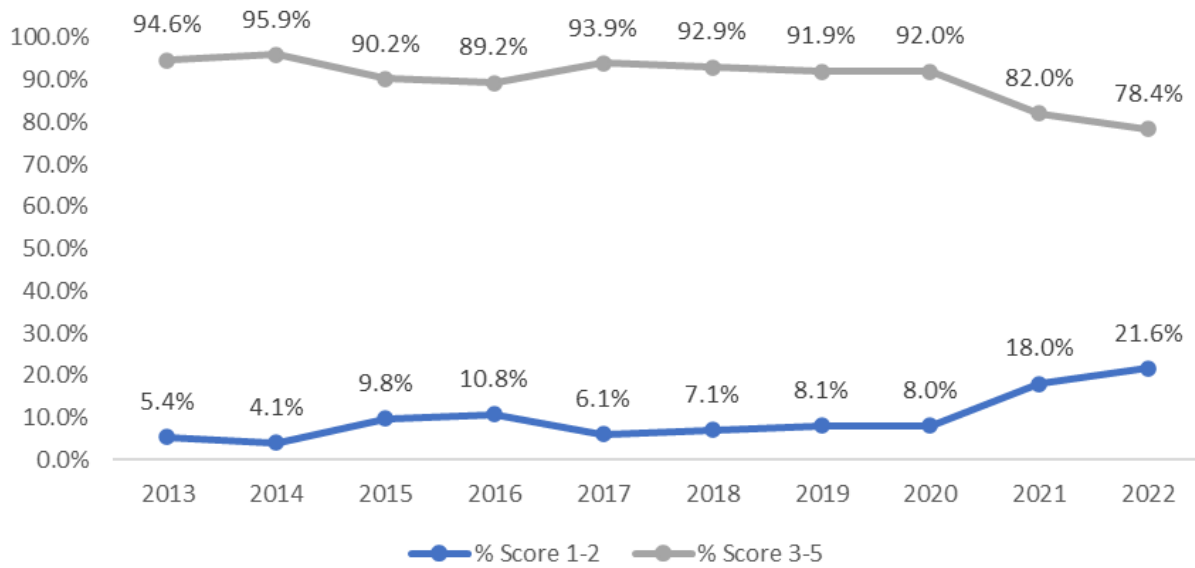
History and Social Science



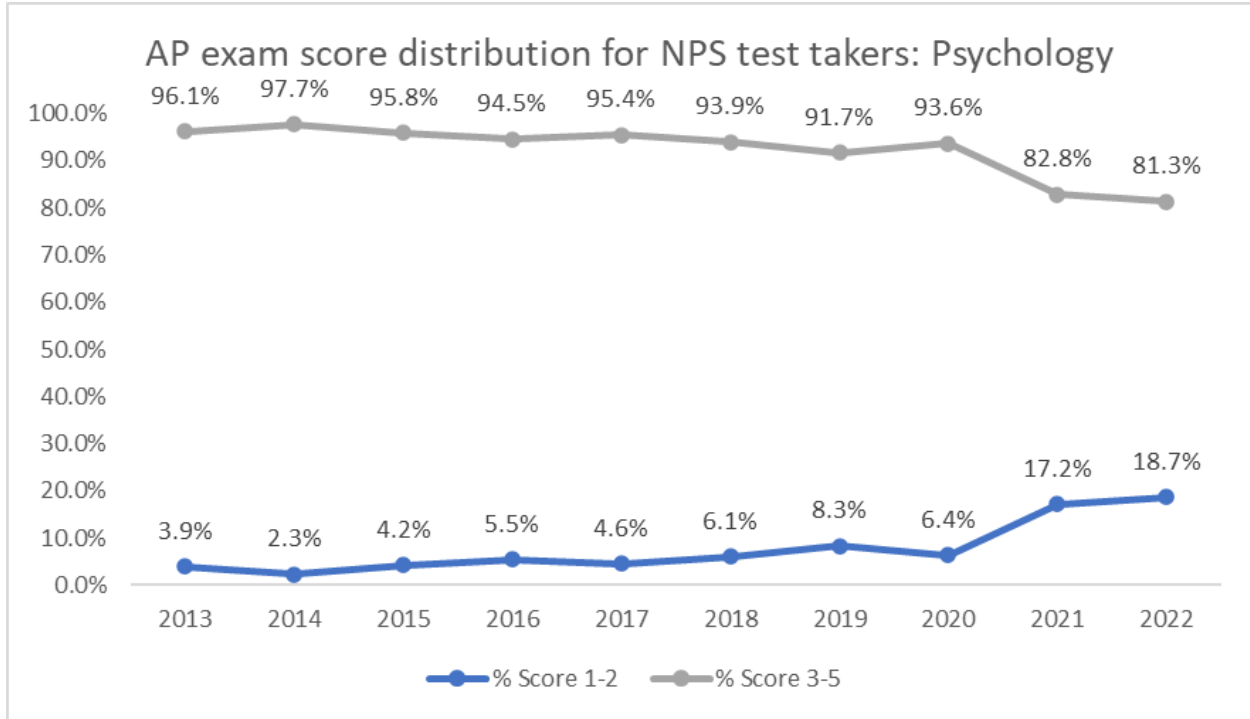
AP exam score distribution for NPS test takers: United States Government and Politics



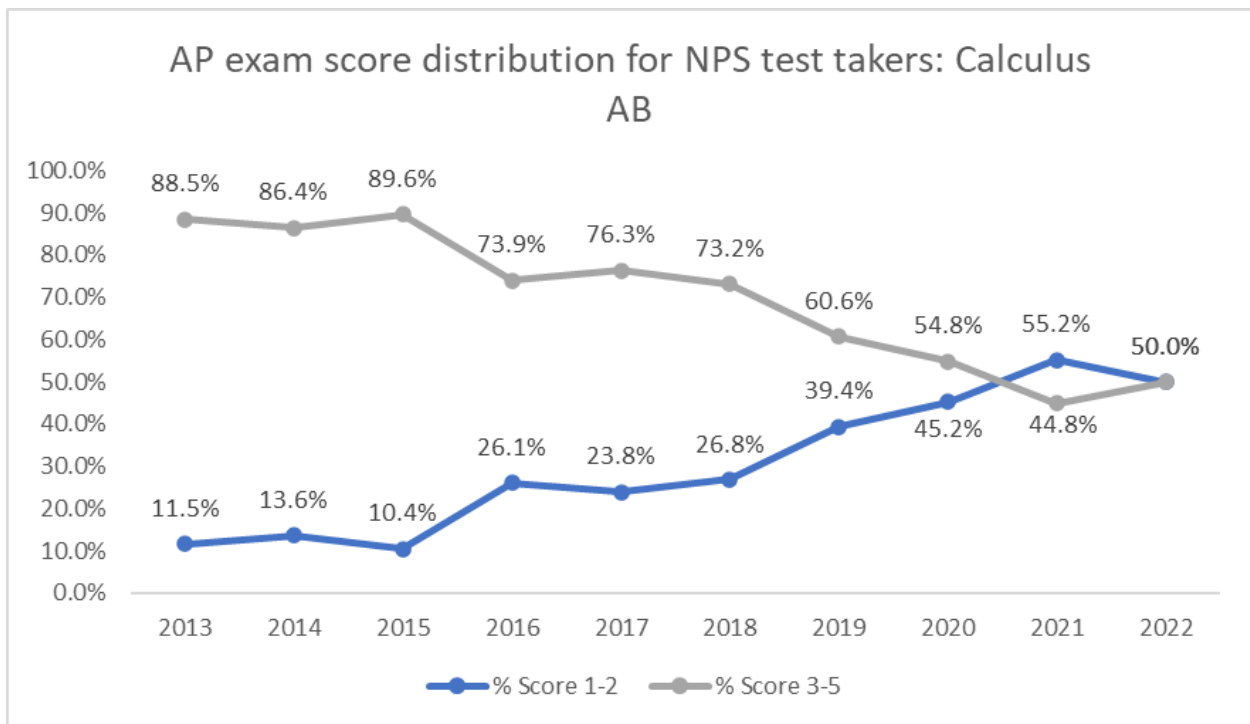
AP exam score distribution for NPS test takers: United States History

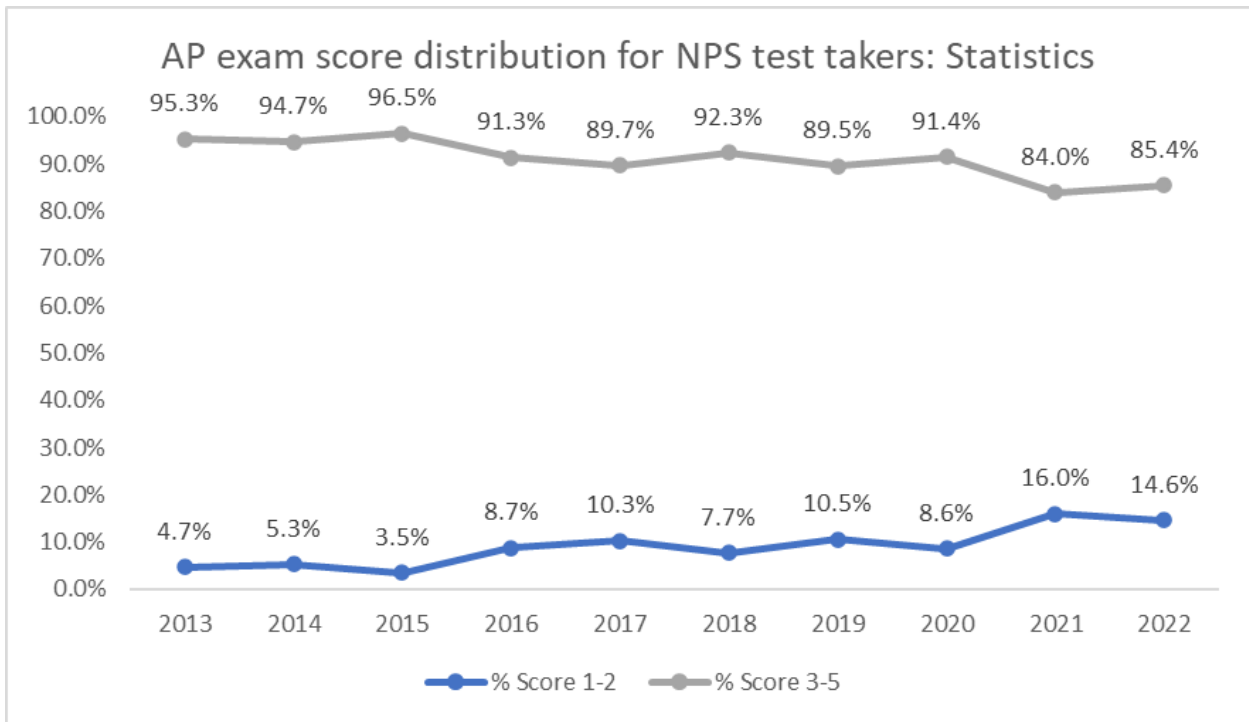
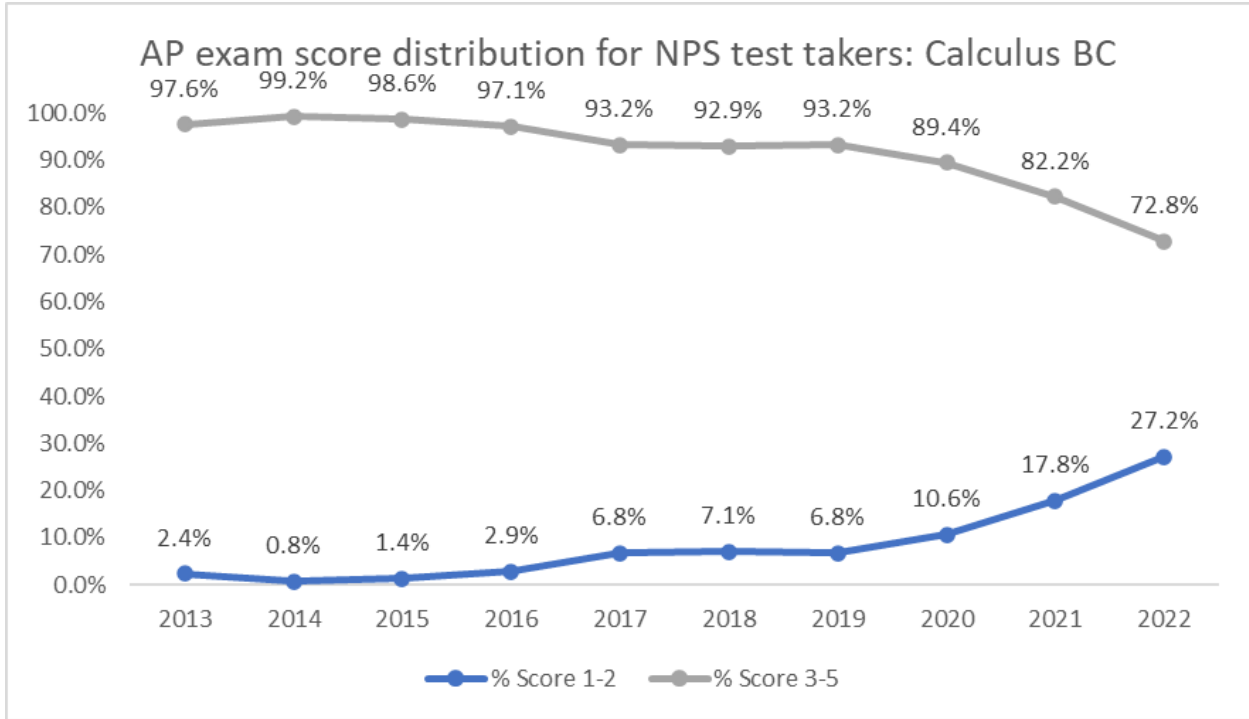




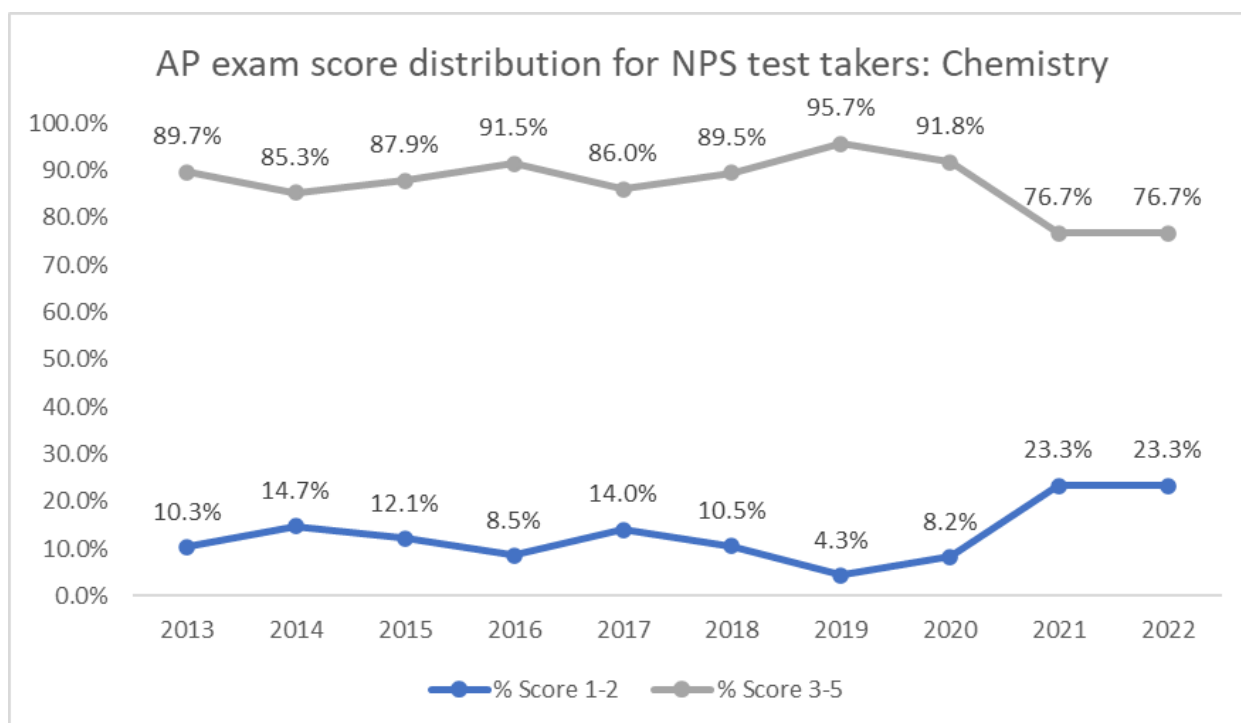
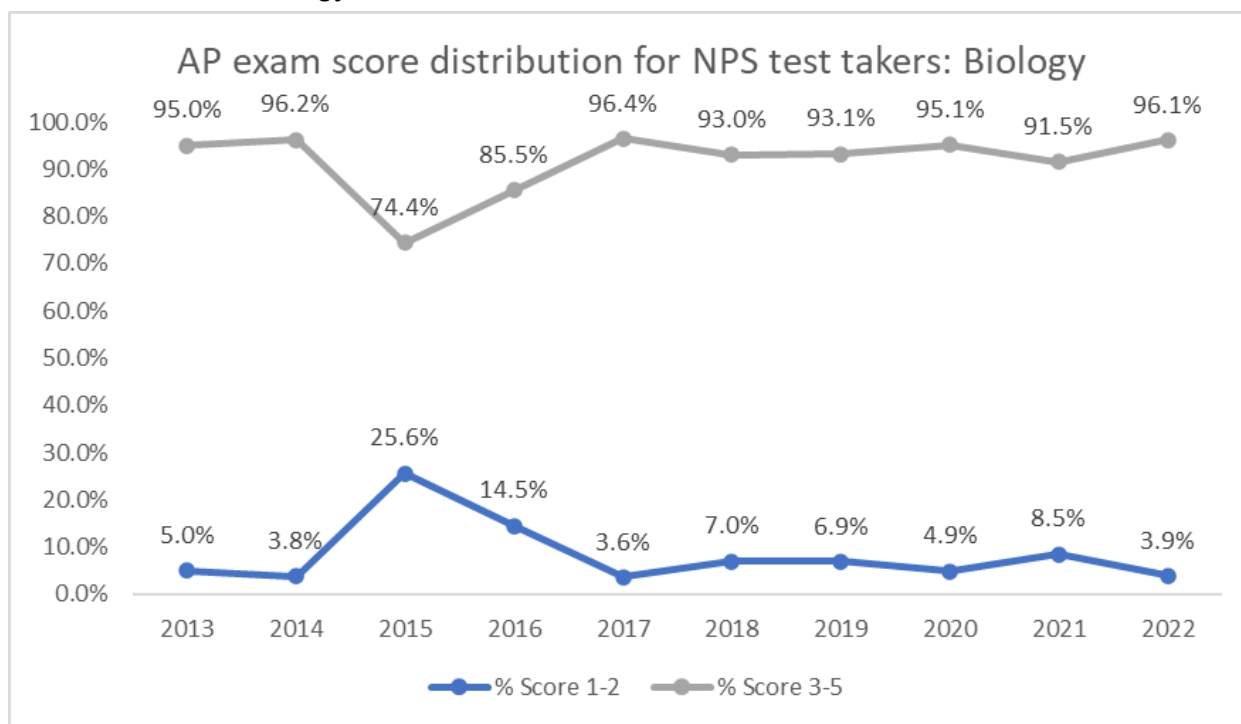


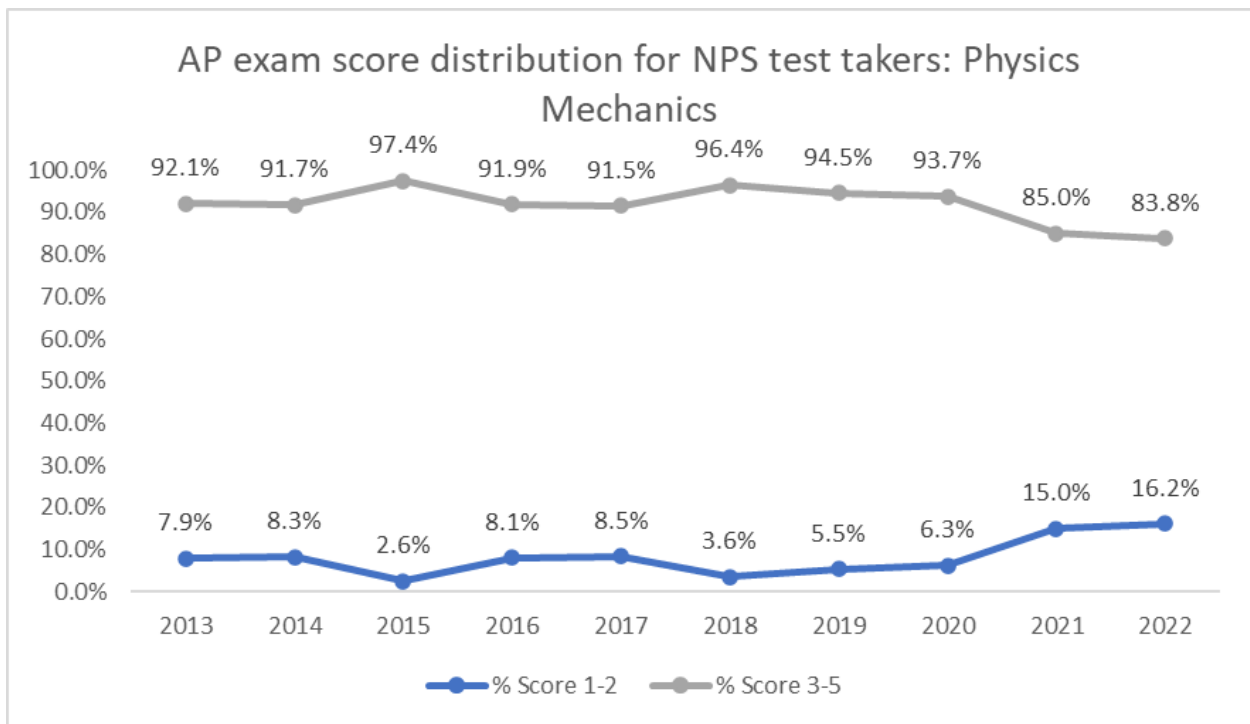
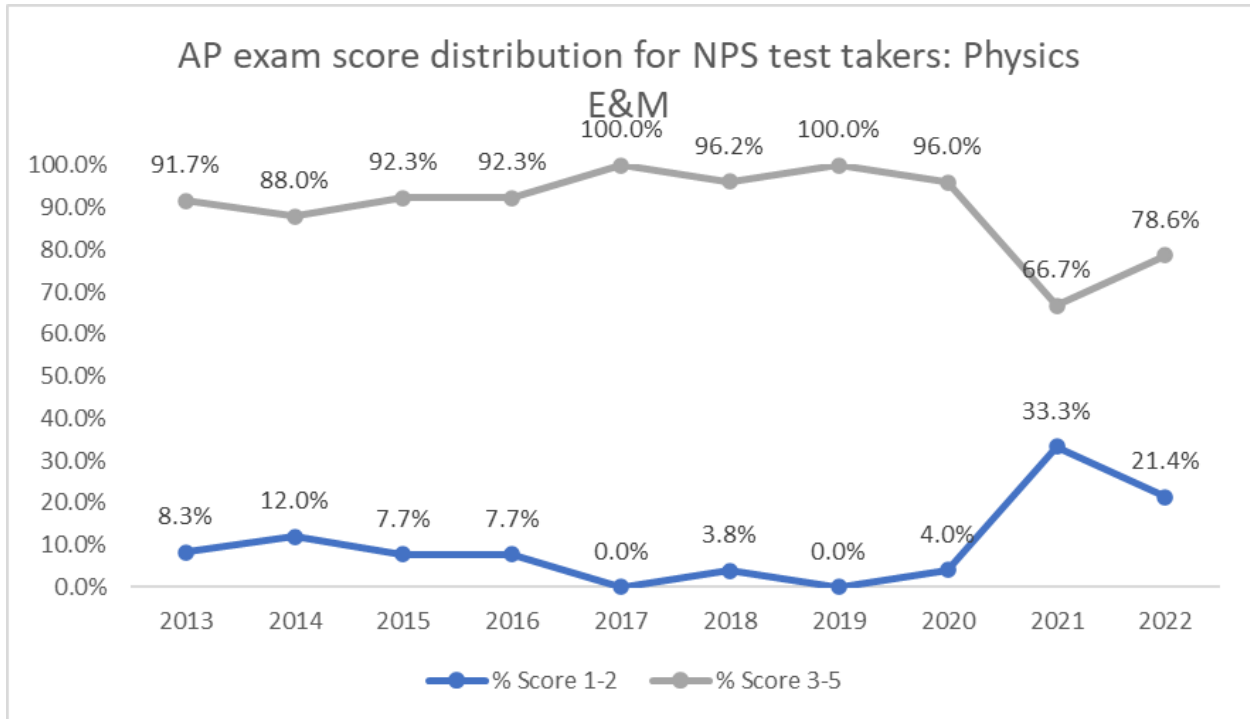
## Math





## Science and Technology



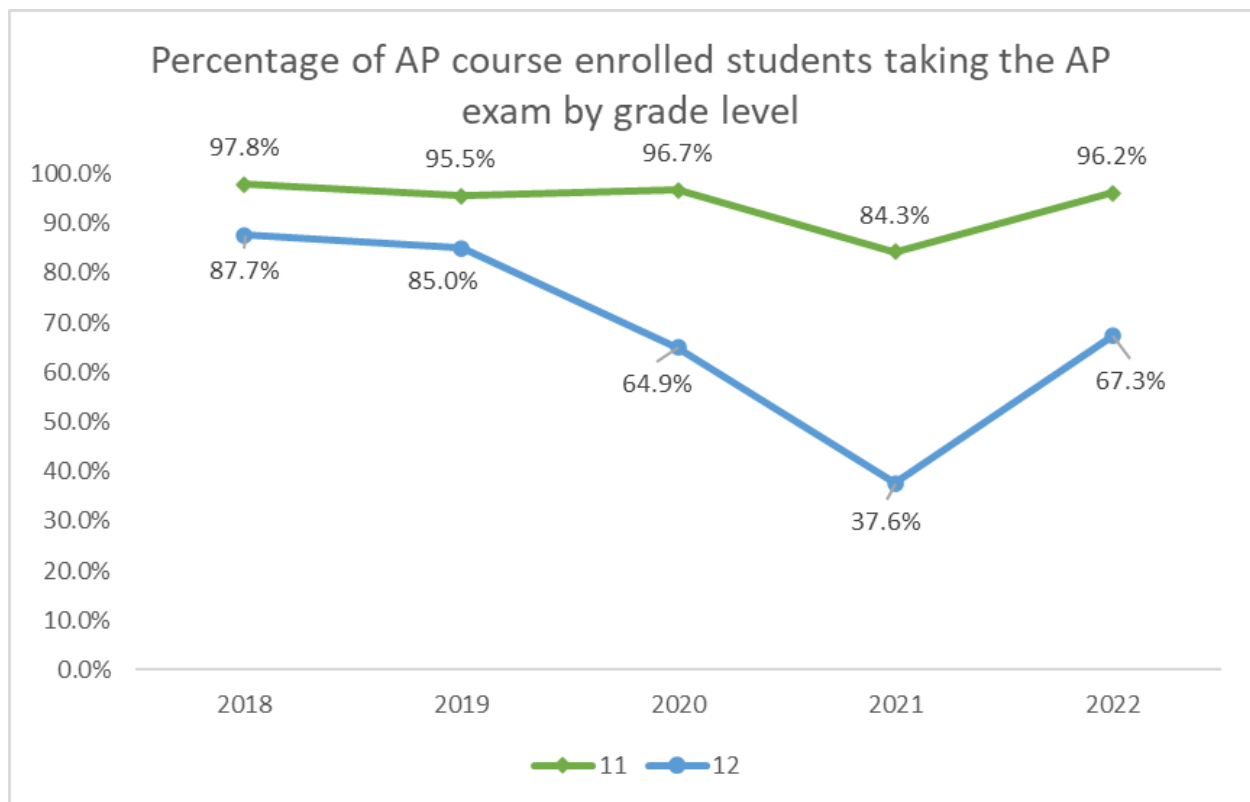


Because the pattern in exam score distribution shifts beginning in 2020 overall and for most subjects, the following analyses focus on trends over the past 5 years (2018-2022). Additionally, as described previously, the prerequisites to access AP courses changed beginning the 2019-2020 school year, so this analysis covers the two years prior to this shift and the years after the shift.

As mentioned in the introduction, AP exam participation is not required for NPS students enrolled in AP courses. Additionally, as Newton high schools are College Board approved testing sites, students can take tests for courses in which they are not enrolled. This section of the analysis focuses only on exam participation and scores for students enrolled in NPS AP courses.

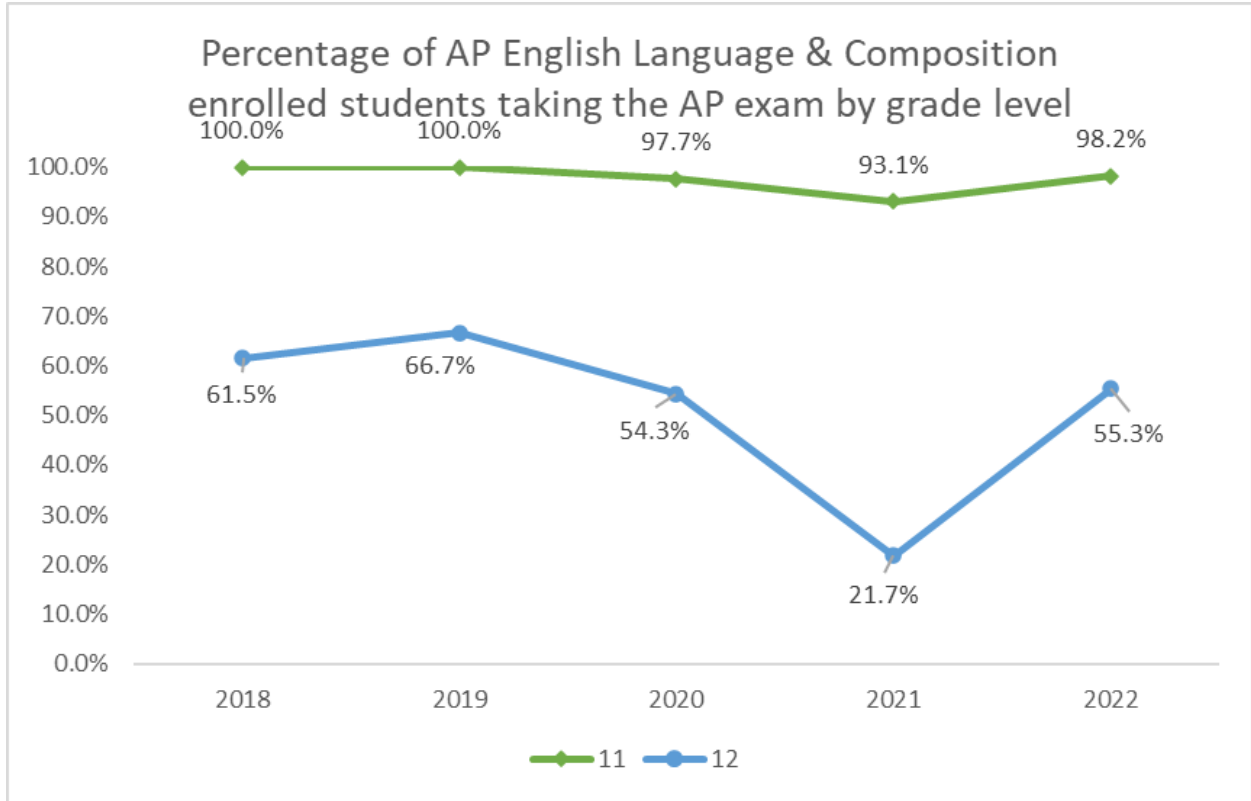
Understanding the percentage of students enrolled in each course who take the AP exams is important, especially because the majority of students enrolled in NPS AP courses are in grade 12. By the time that AP exams are administered (May), many students who plan to attend college have already been accepted. Additionally, as noted in the introduction, many colleges no longer provide college credit for AP exam scores. This may influence the decision to take an AP exam for individual students.

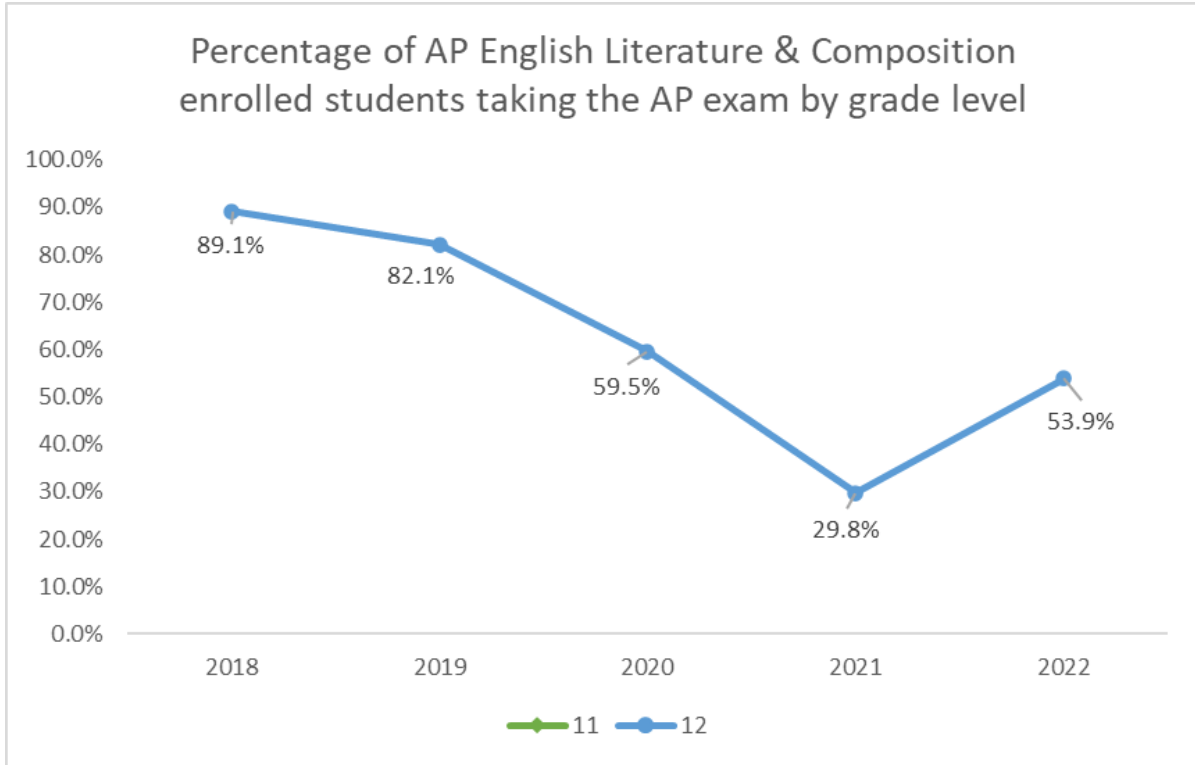
The following graph displays exam participation rates for students completing AP courses by subject and grade level over the past five years. As displayed in the graph, the majority of students completing AP courses in grade 11 take the AP exam. Students completing AP courses in grade 12 were slightly less likely to take the AP exam in 2017-18 and 2018-19, but the pattern shifted in 2019-20 (during the COVID-19 pandemic), with 12th graders much less likely to take the AP exam in recent years.



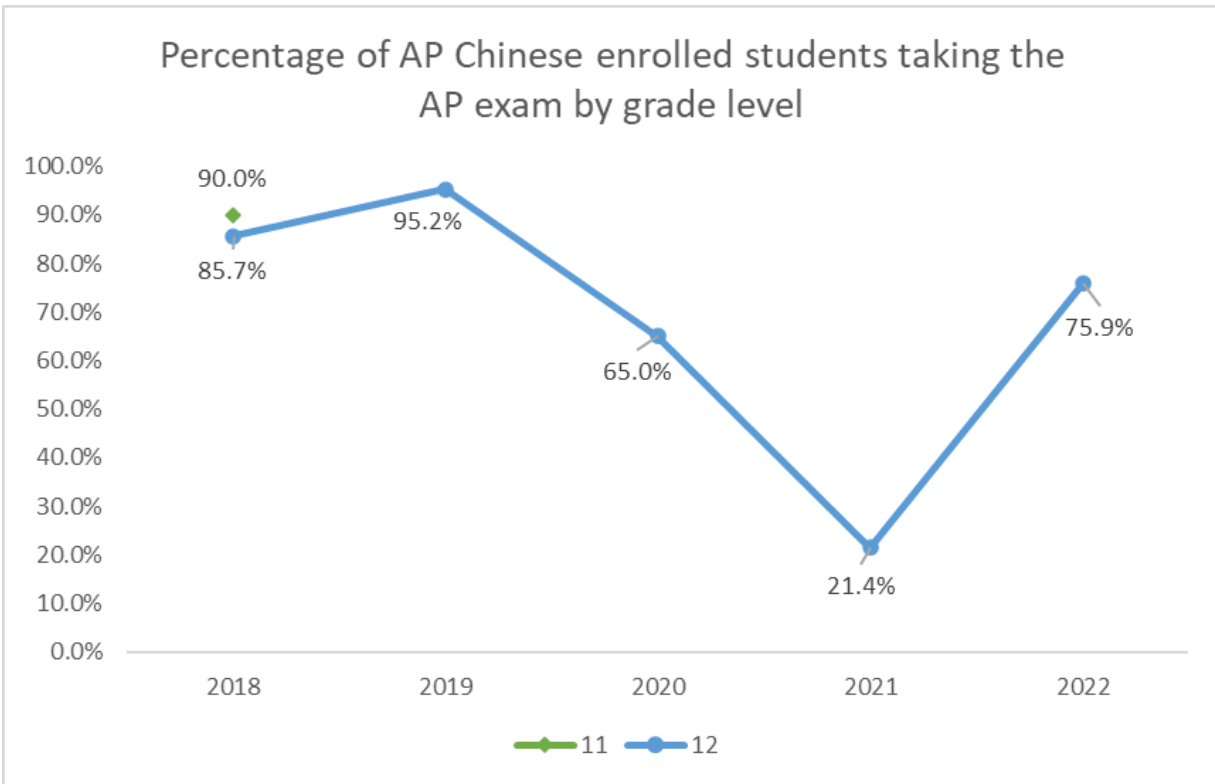
The following graphs display exam participation rates for students completing AP courses by grade and subject.

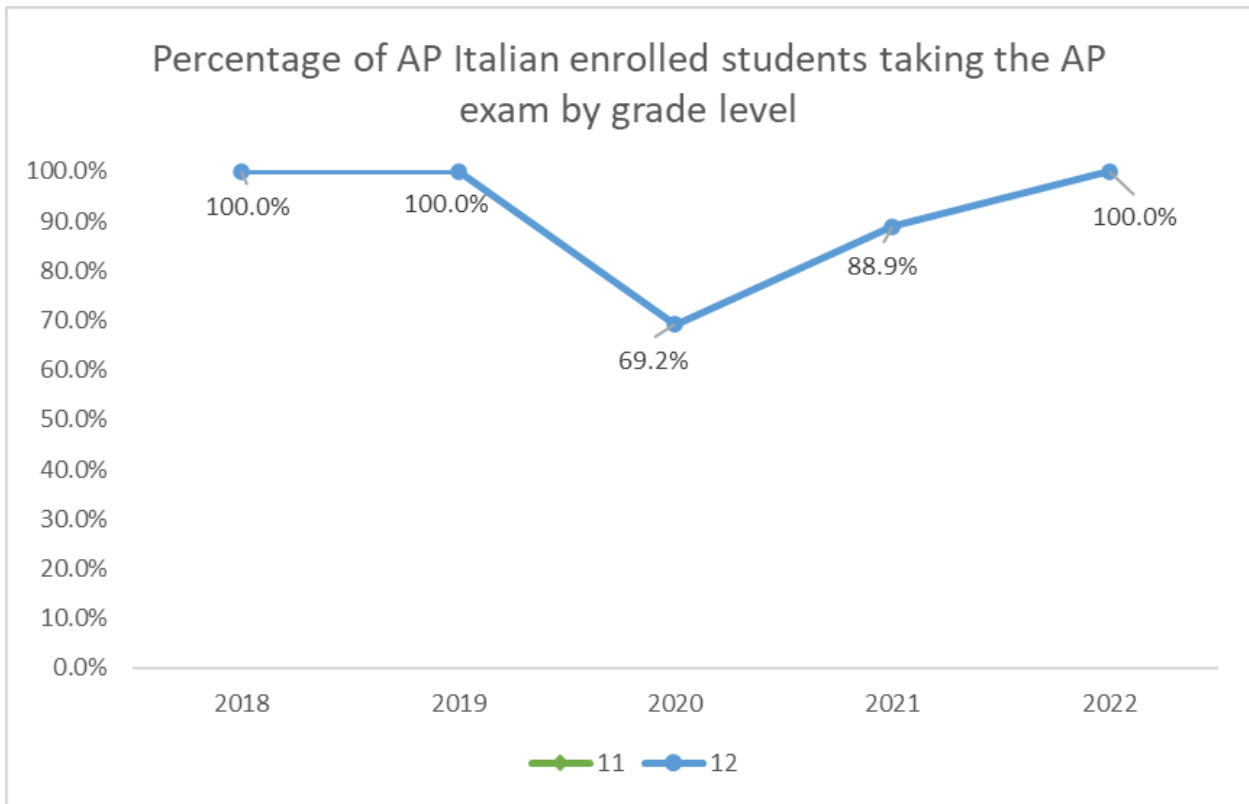
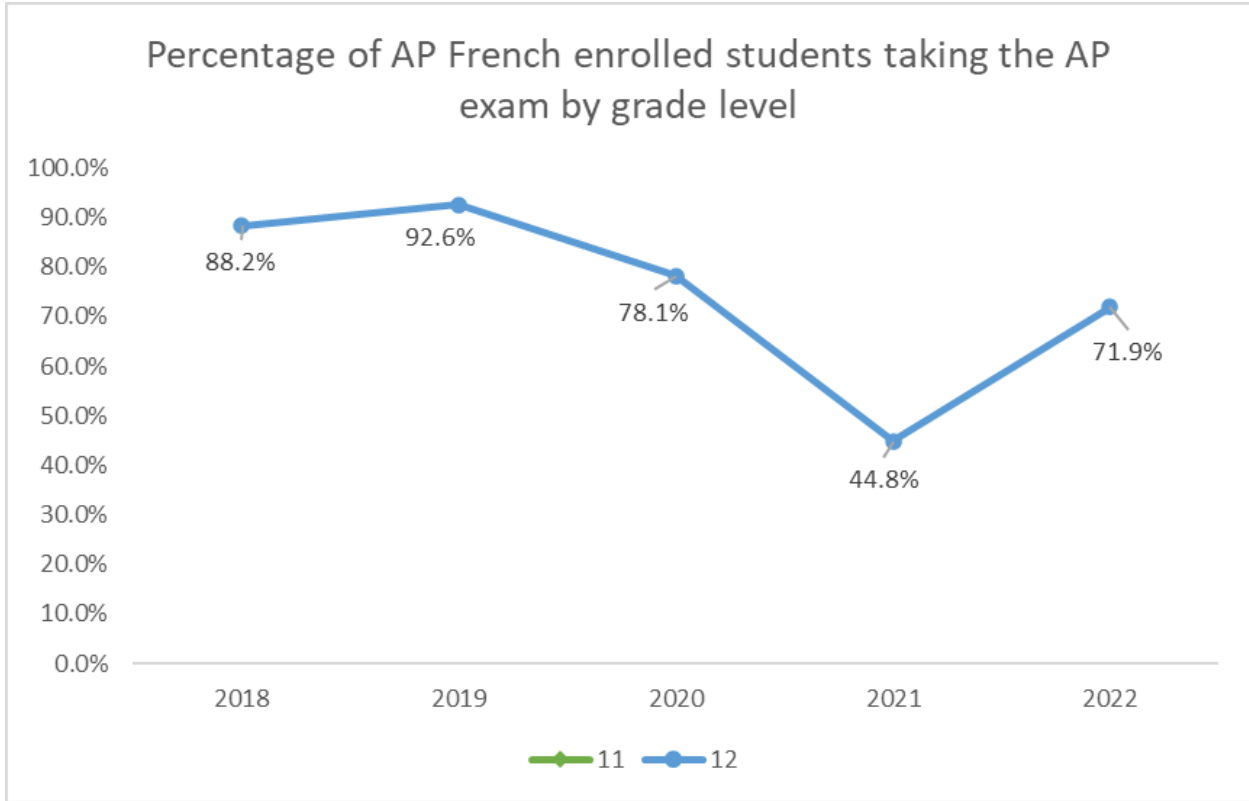
*English*



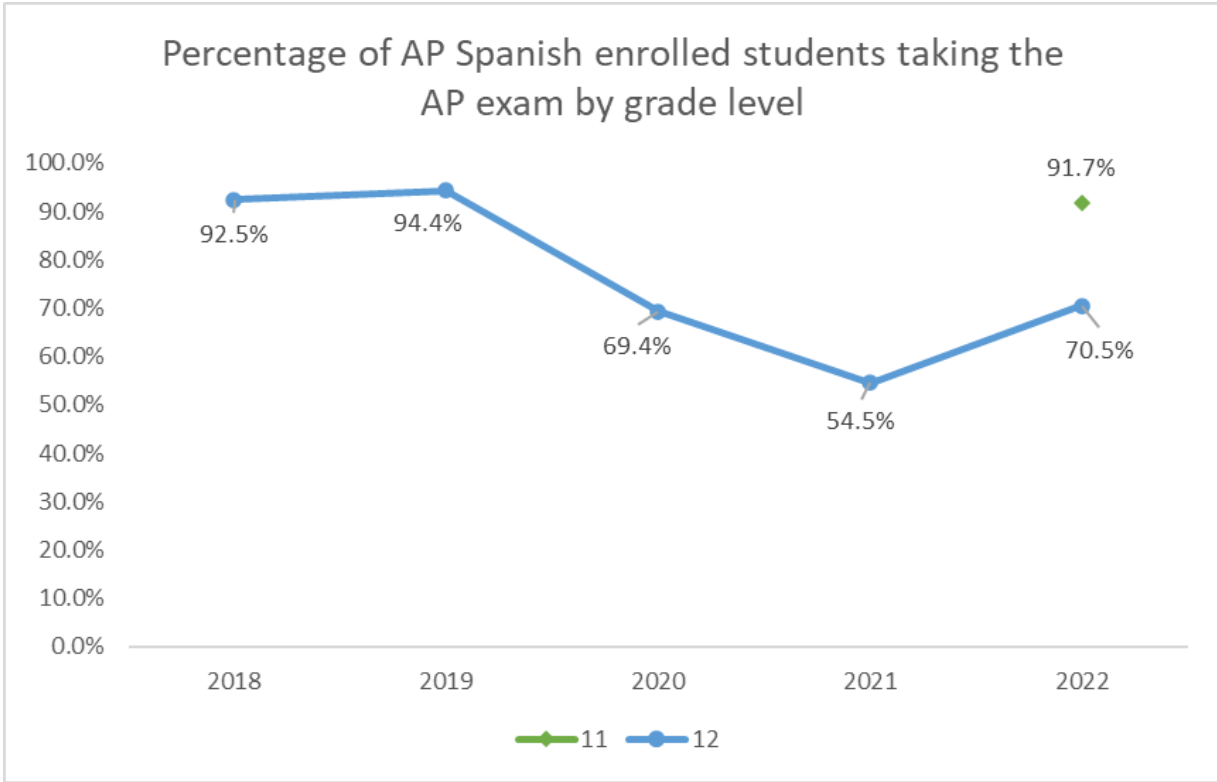


*World Languages*

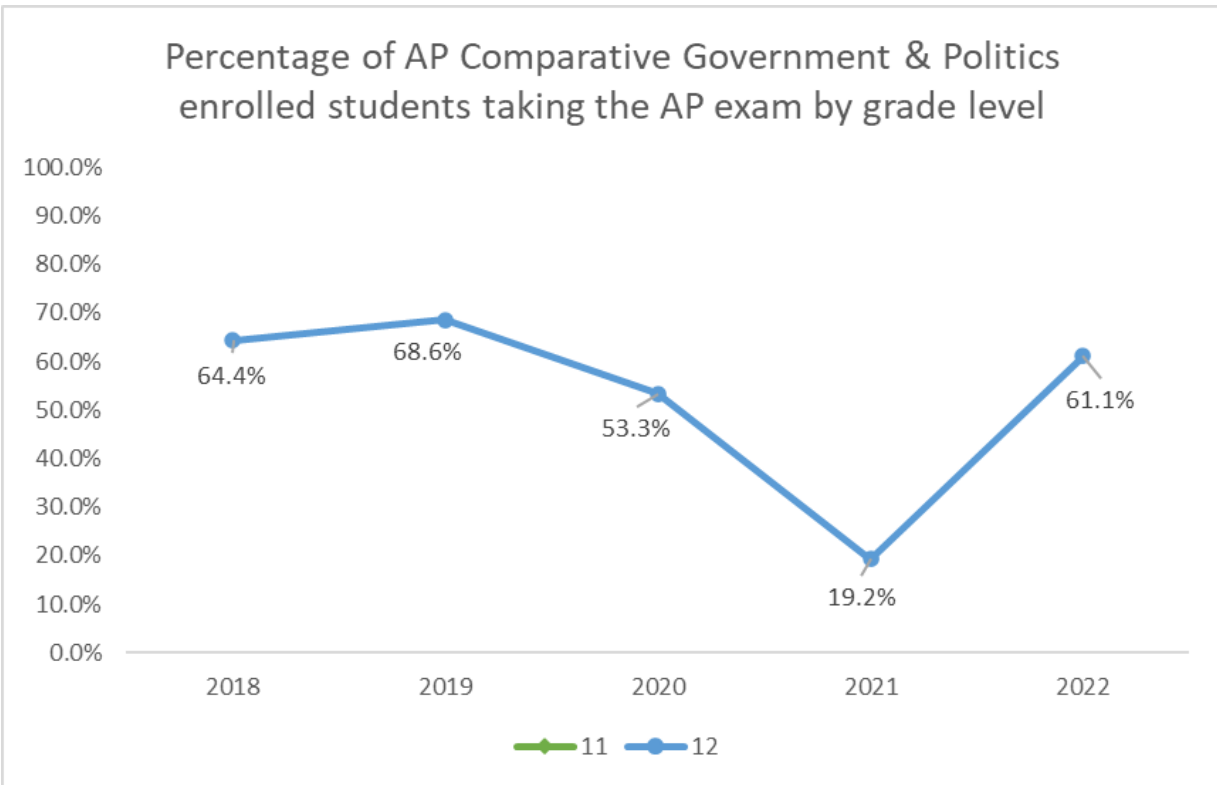




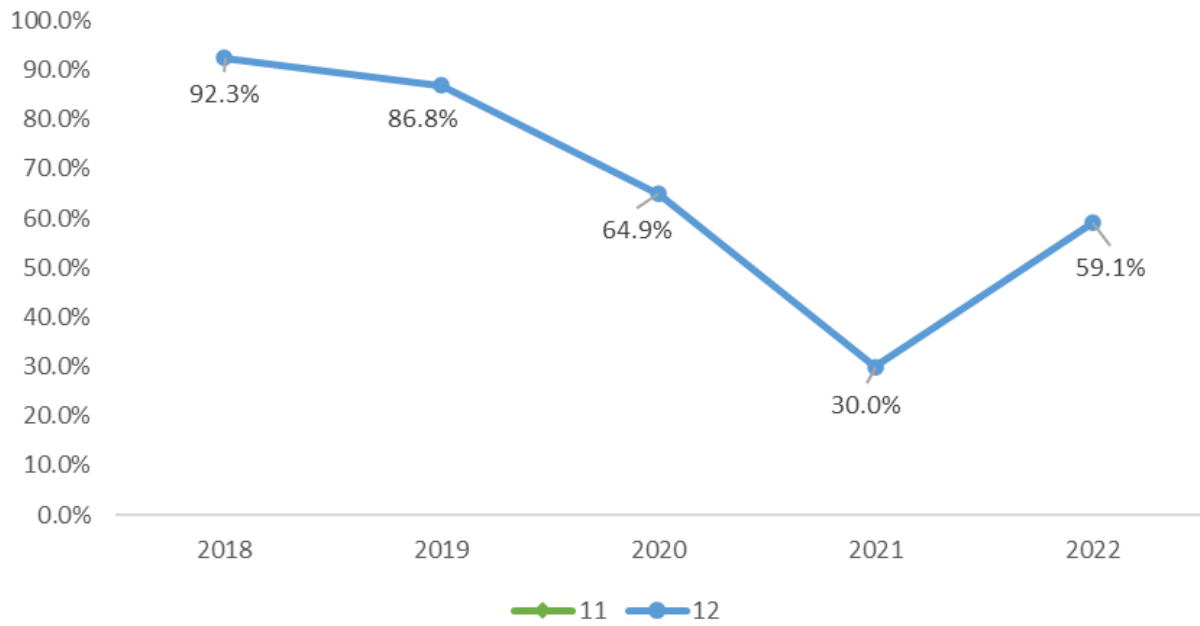




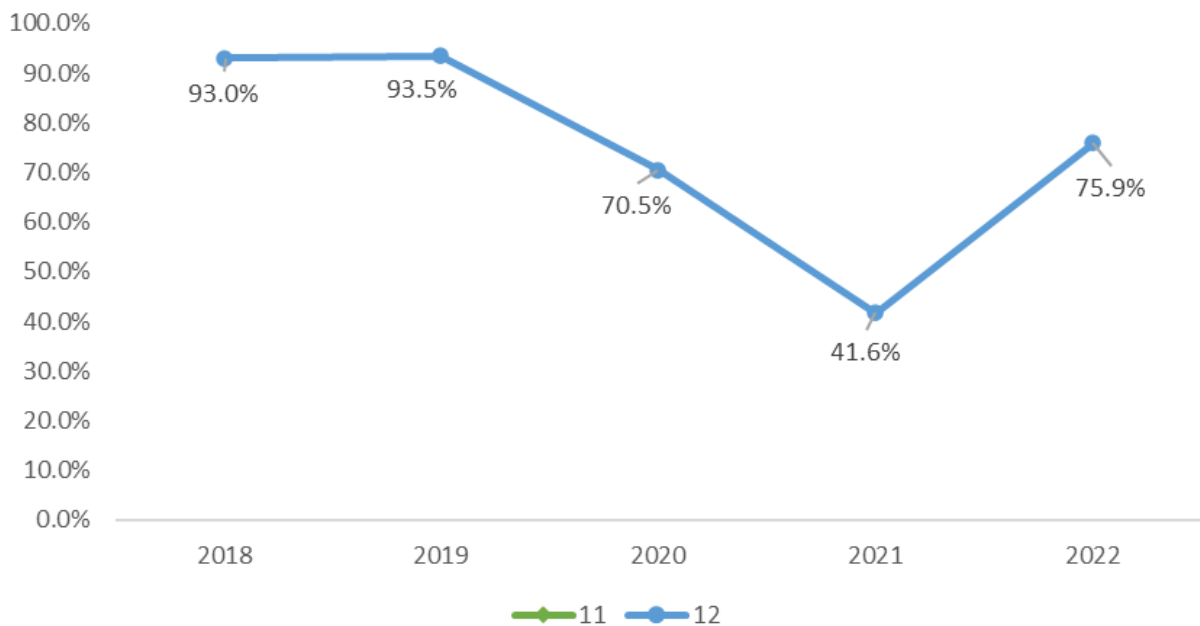
*History and Social Science*



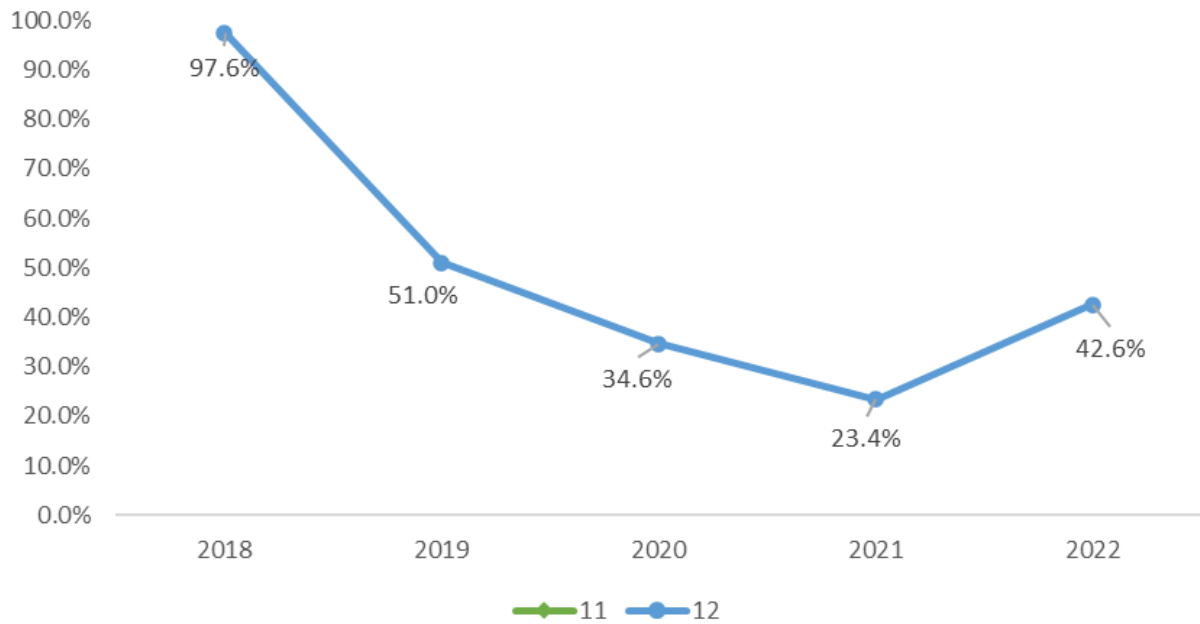
Percentage of AP European History enrolled students taking the AP exam by grade level



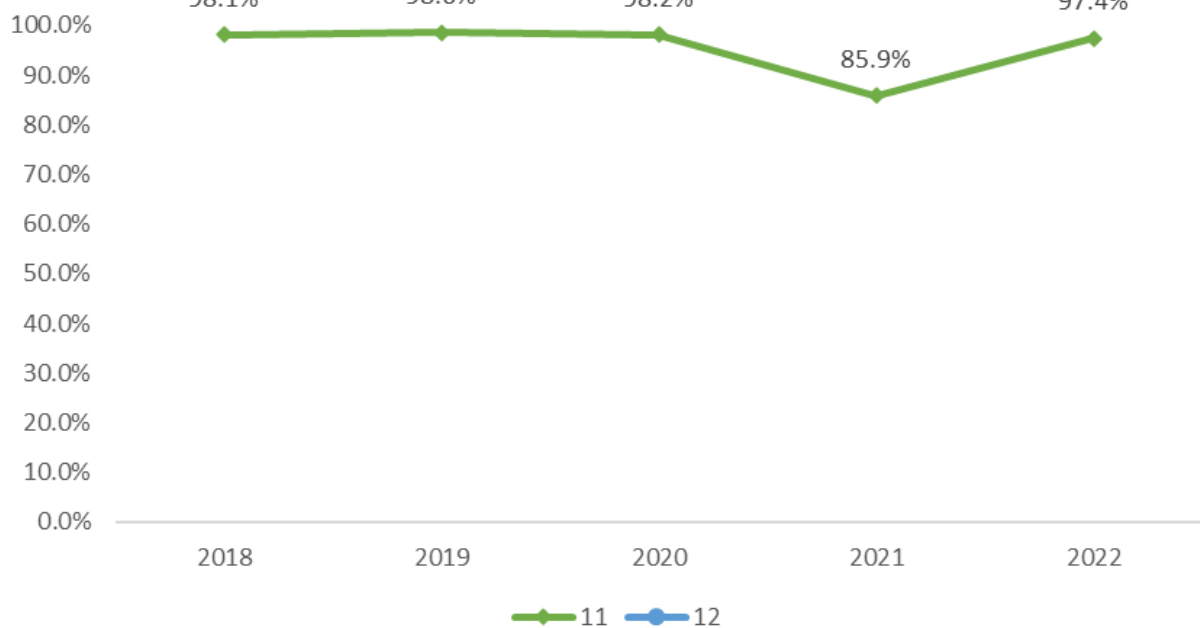
Percentage of AP Psychology enrolled students taking the AP exam by grade level



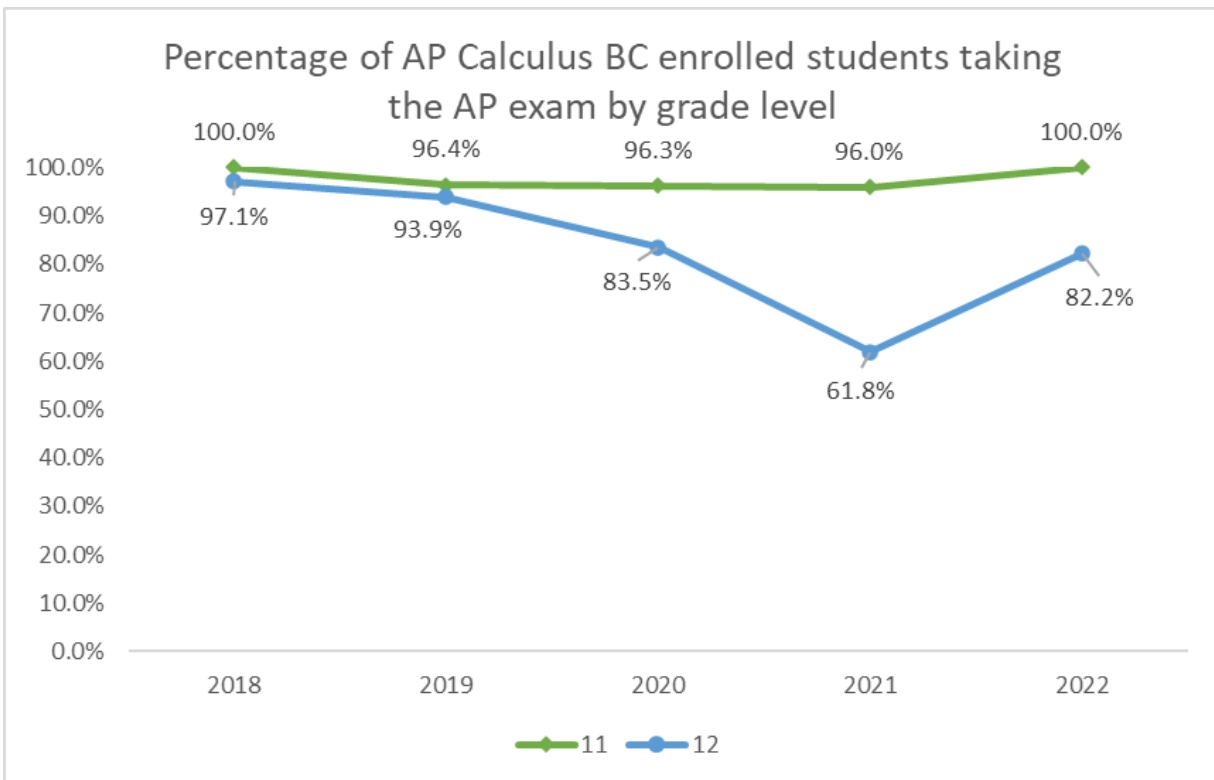
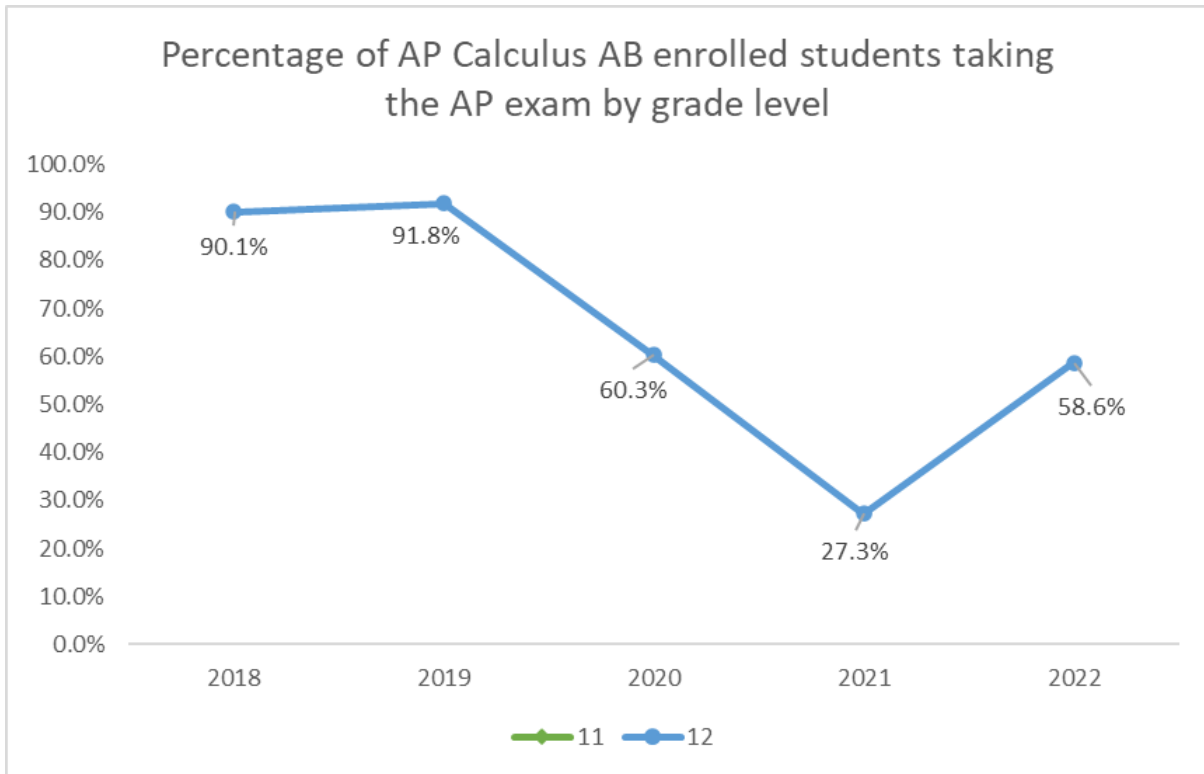
Percentage of AP US Government & Politics enrolled students taking the AP exam by grade level



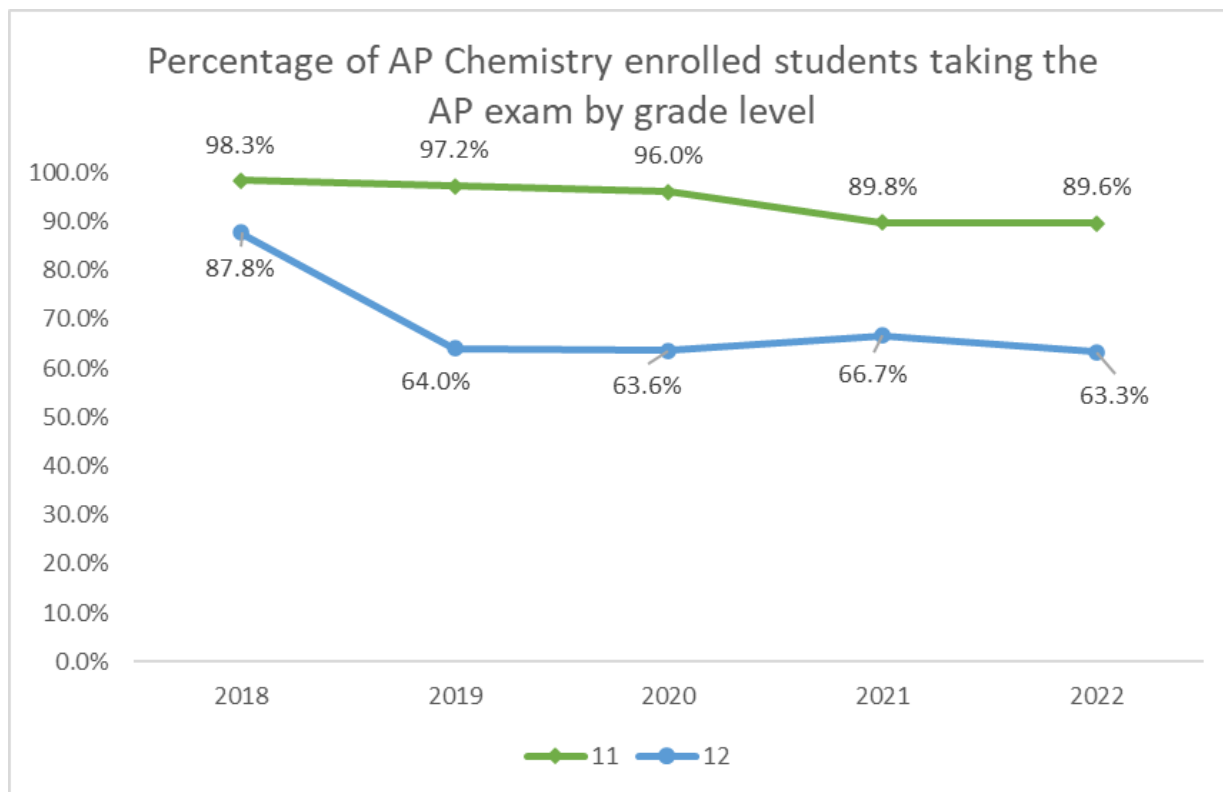
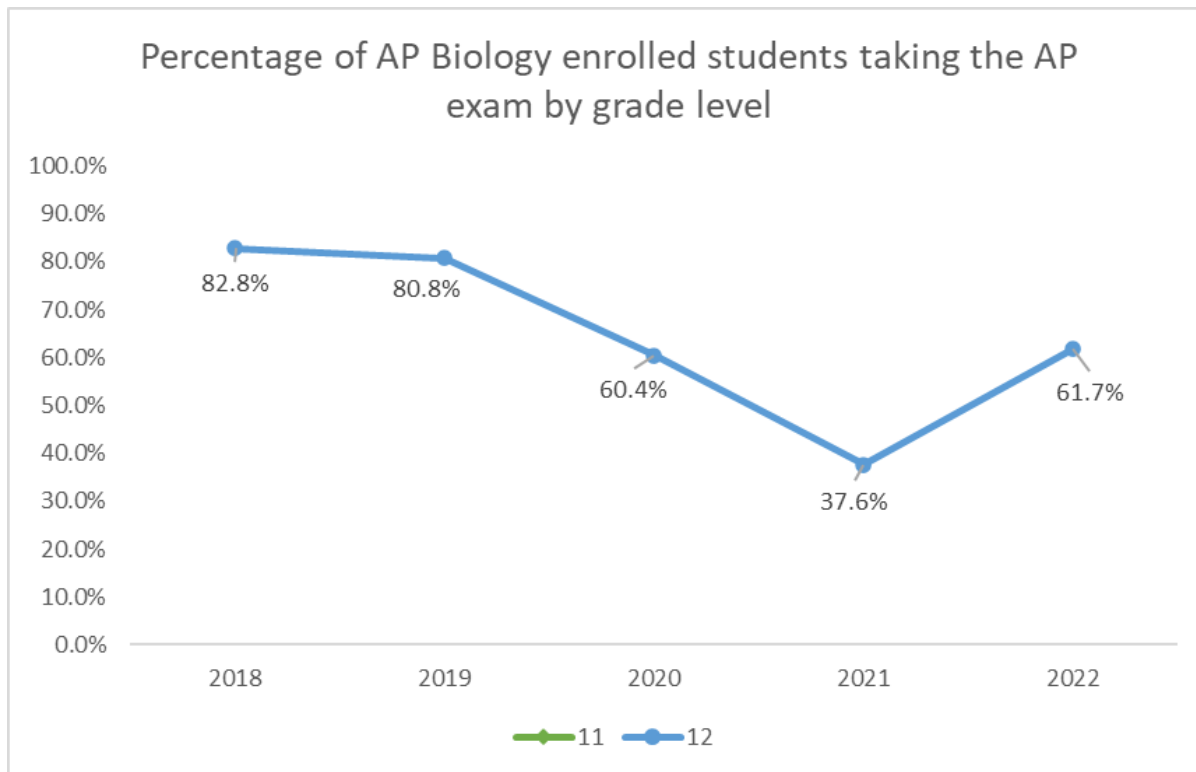
Percentage of AP US History enrolled students taking the AP exam by grade level



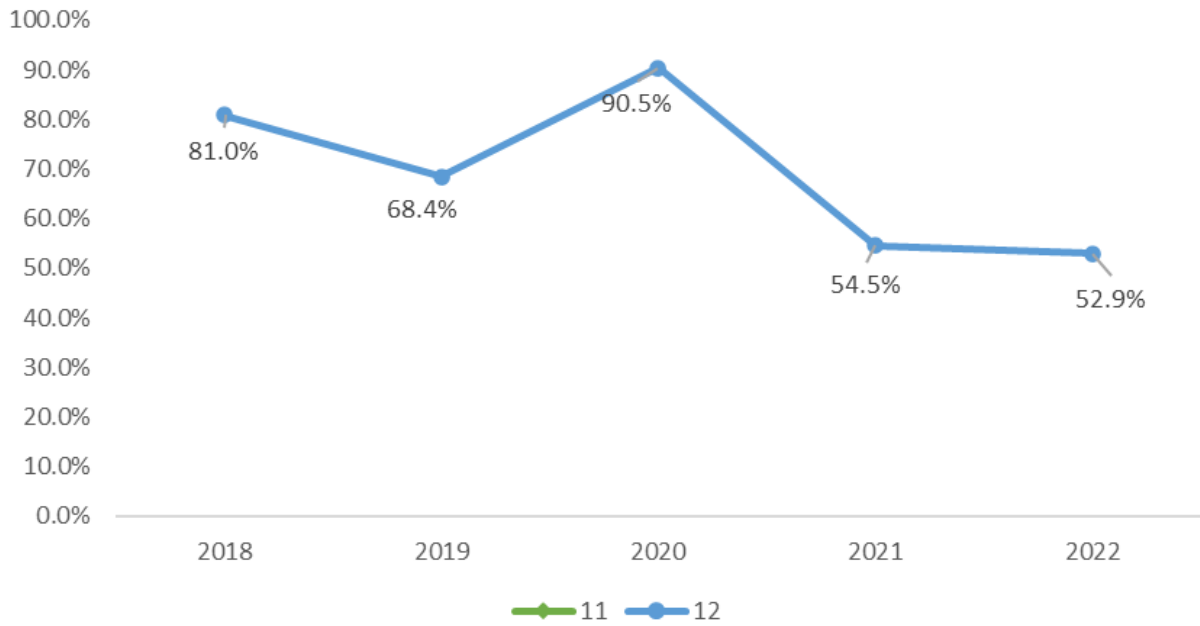
Math



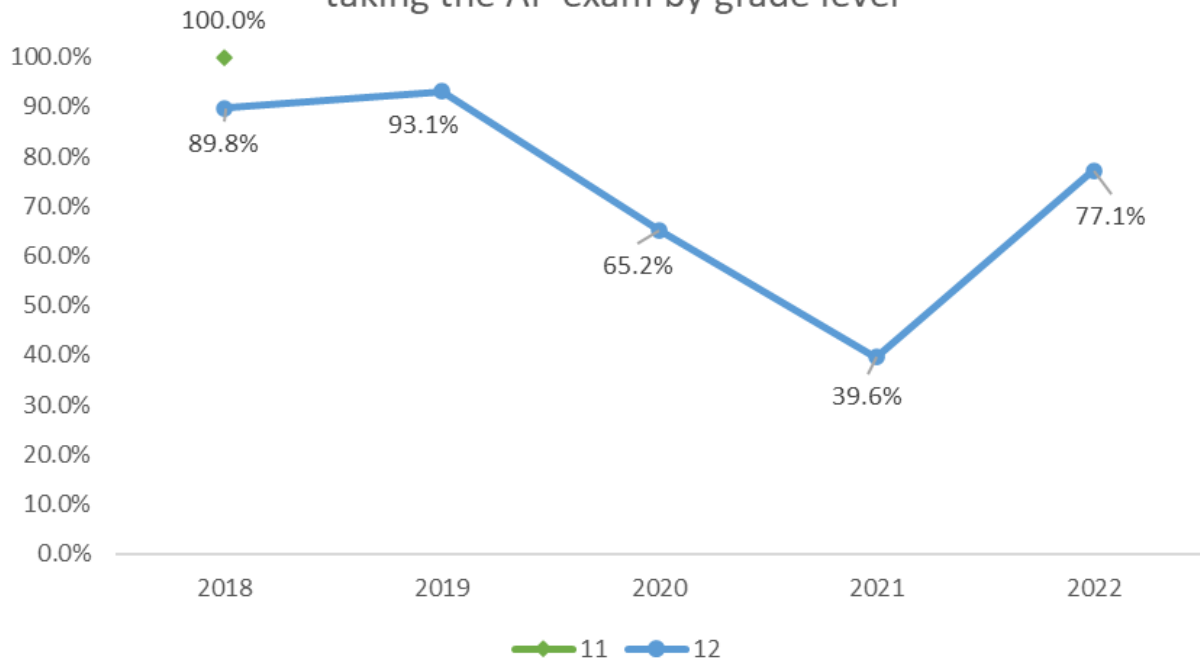
## Science & Technology



Percentage of AP Physics E&M enrolled students taking the AP exam by grade level

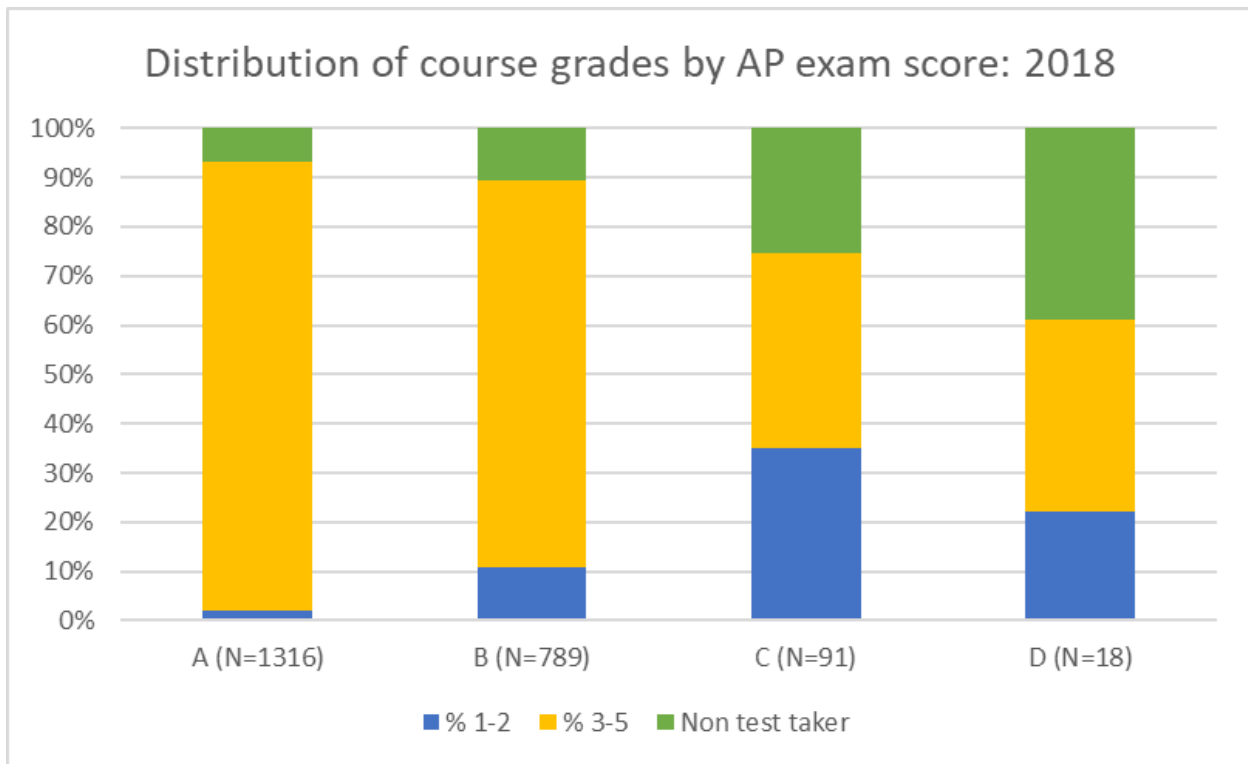


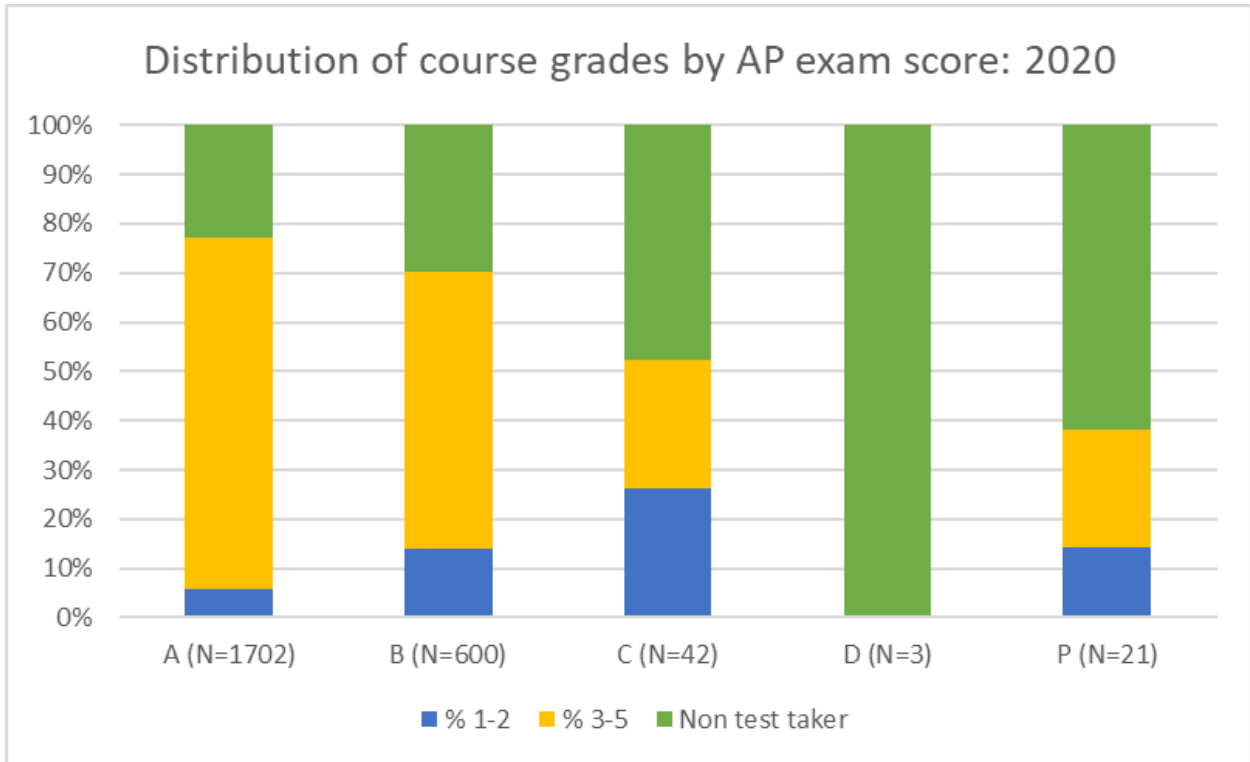
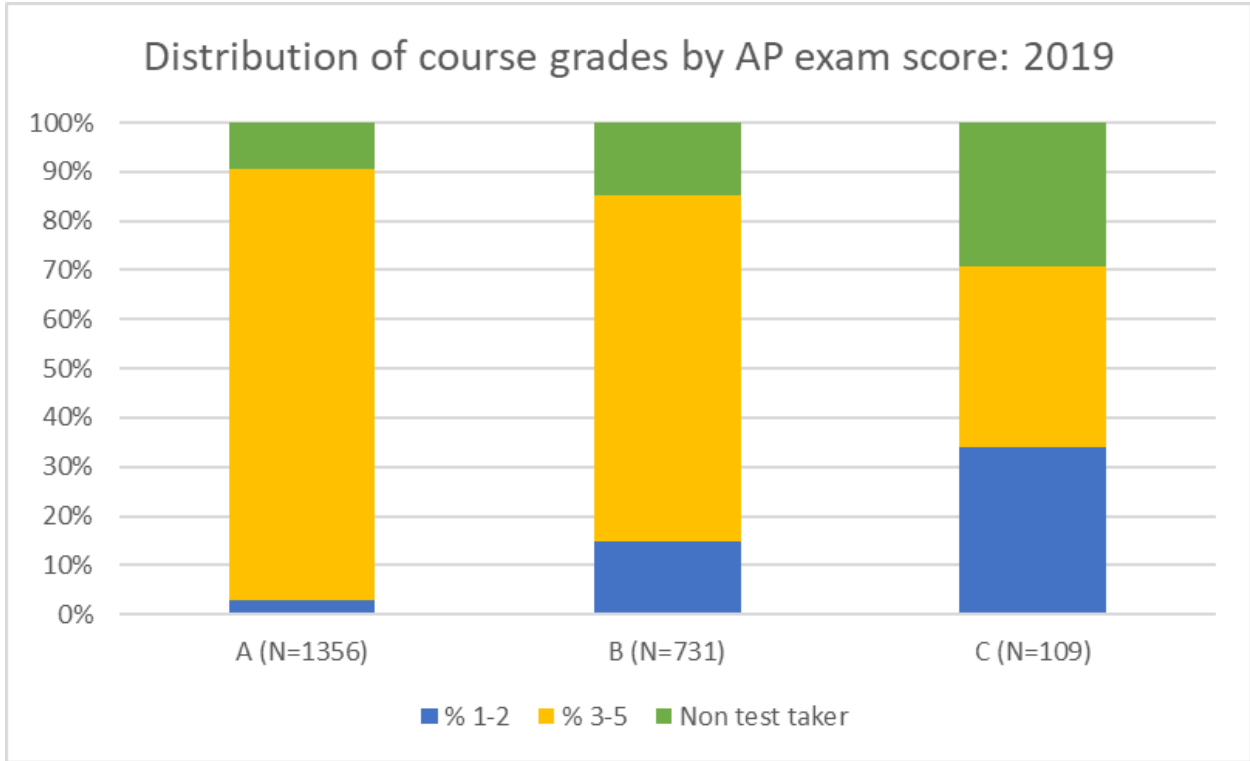
Percentage of AP Physics Mechanics enrolled students taking the AP exam by grade level



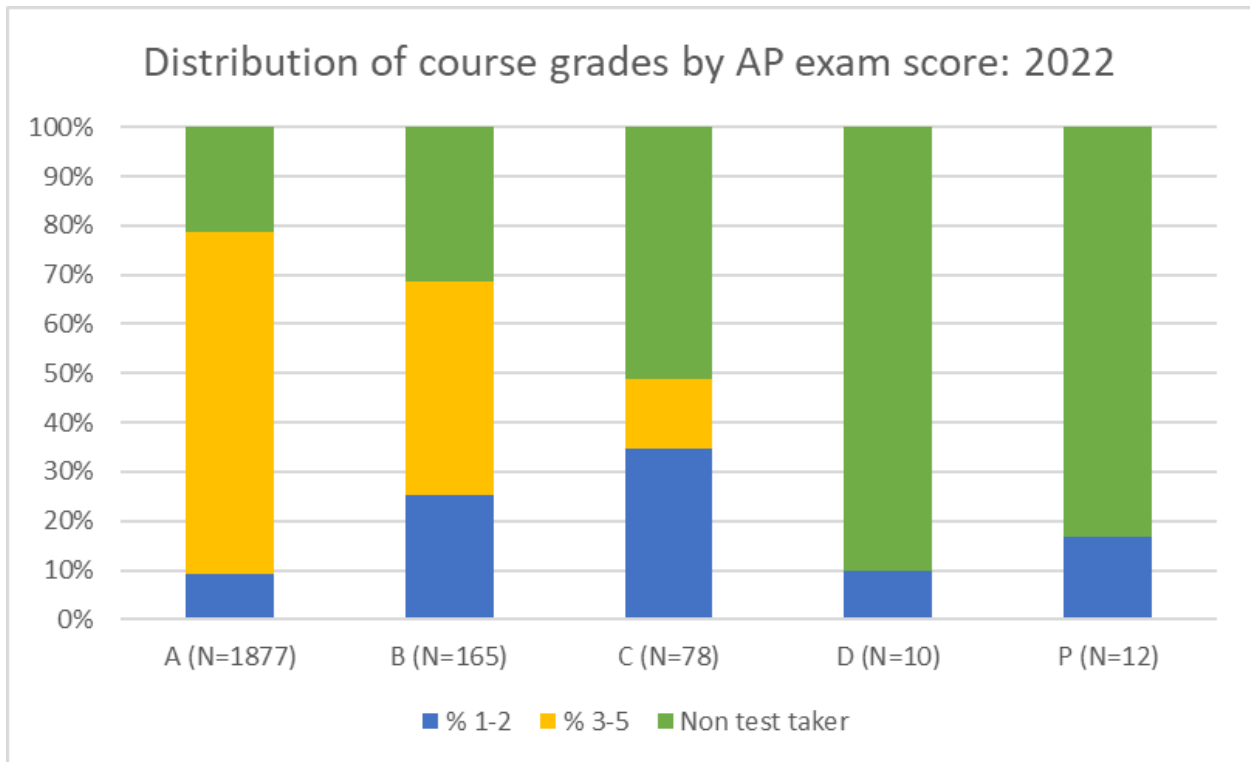
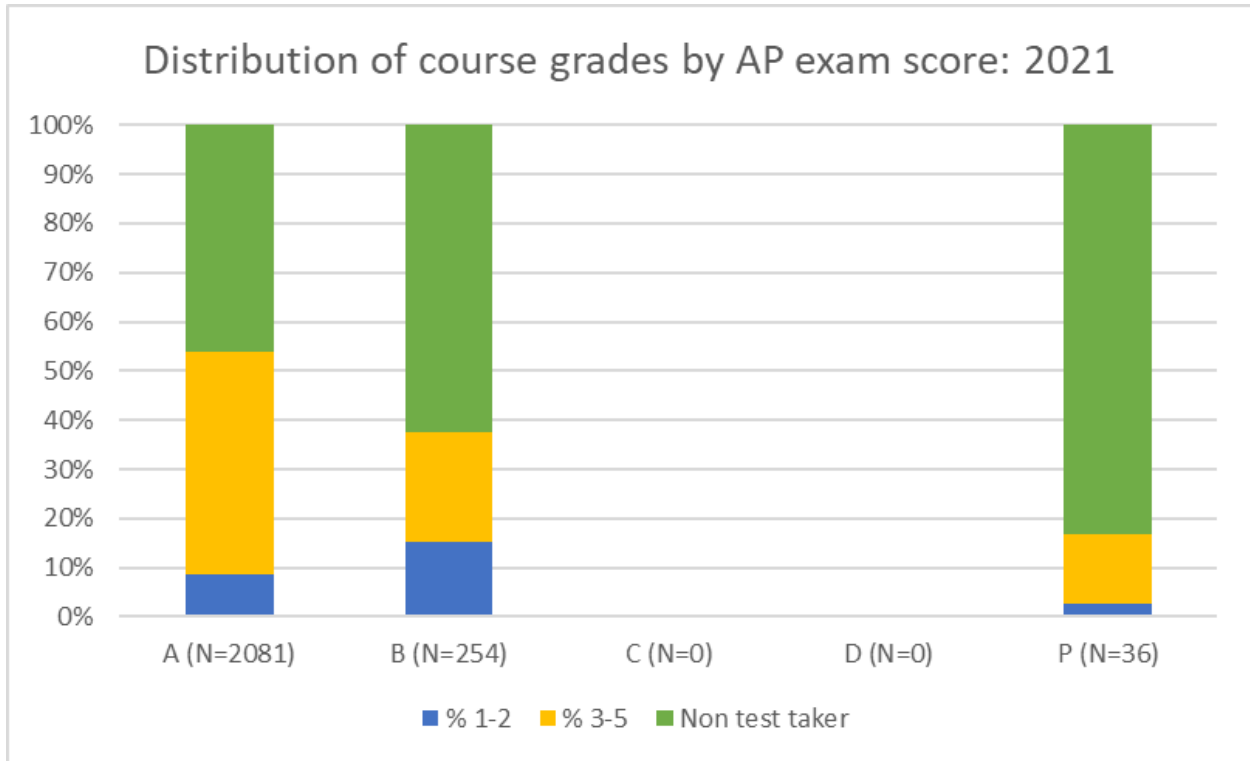
### Course grades and exam scores

The following graphs look at exam score distribution by final course grade for all AP exams over the past five years and also include the final course grades for students who did not participate in the test. As these graphs indicate, exam score is related to final course grade, with students receiving a final course grade of A or B more likely to score a 3-5 on AP exams.



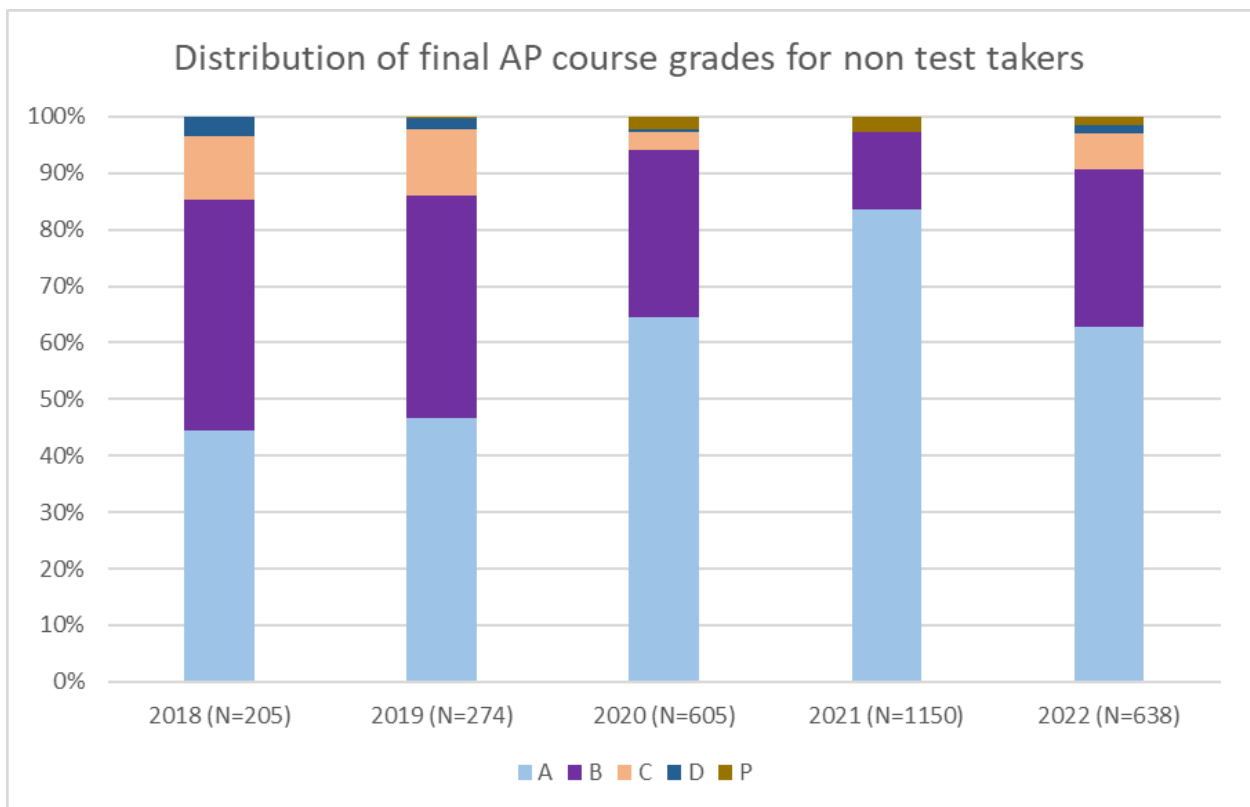






The following graph displays the final course grades for non test takers. As displayed in the exam participation graphs earlier in this memo, the number and percentage of non

test takers increased in 2020 and has remained at higher levels through 2022. Additionally, beginning in 2020, non test takers were more likely to receive a final course grade of A or B than in prior years. This indicates that on average, the population of students not participating in the AP exams has shifted since 2020 and a smaller percentage of NPS students receiving an A or B grade in their AP course are sitting for their AP exam. Based on the relationship shown above between course grades of A and B in AP courses and AP exam scores of 3 to 5, it is reasonable to hypothesize that many of these non-testing students would have scored in the 3 to 5 range had they taken the exam.



## Conclusion

There are many factors that influence the changes in AP scores for Newton students that have been detailed in this analysis. The effort to expand access to these rigorous courses, which has been shown to improve postsecondary outcomes for students regardless of exam score, may contribute to a wider range of scores, especially as new curricular and instructional strategies are adopted and refined to support the success of more students at the highest levels of academic challenge.

Additionally, the changes to the high school schedules have also likely impacted scores on AP exams. AP curriculum is created and managed by the College Board and the

content involved is inflexible and expansive. As high school courses shifted in 2020-21 to a virtual and hybrid model, and then in 2021-22 to a new schedule with 3 longer class periods each week rather than 4 shorter class periods, organizational and instructional shifts have been necessary to ensure that students are able to prepare for all of the aspects of the AP examination. These changes have been largely successful, but as with any change process, are being re-evaluated and further updated in each AP course based on data from the exams and the skills of students entering the classroom each year.

Finally, changes to the college admissions and credit granting processes have also likely impacted AP scores. The number of colleges that are granting the possibility of college credit for AP scores of 3, 4 or 5 has declined. As a result, a growing number of students, particularly seniors who have already been admitted to prestigious institutions, are choosing to not take the AP exams in May of their senior year, as there is limited benefit to receiving a score on these exams. AP scores from the sophomore or junior year can still be helpful in the admissions process, though the shift to test optional and test blind admissions for many institutions has also likely decreased the participation among many top students. The declining test participation rate for 12th graders who complete AP courses in Newton provides some evidence of this hypothesis.

Additionally, the percentage of students who are not taking the exam but received an A or a B in the course has increased in recent years; the relationship between course grades and AP exam scores for Newton students indicates that many of these non test takers may have scored a 3, 4, or 5 if they had taken the exam.

Many thanks to the department heads, schedulers, vice principals, and principals of both Newton North and Newton South for their assistance and feedback on this report.