



PAVILION RESEARCH

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**Data-Driven Support for Students
on the Path to College:
Identifying useful variables for college
planning throughout high schools**

Final Report

Submitted to the
Association for Institutional Research

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Report Overview

The path to college consists of a complex set of choices and achievements completed over a long period of time. Middle and high school students working with their parents, teachers, and counselors are often unable to estimate the consequences of various decisions on their career trajectories and are unaware of the linkages between decisions made "today" and choices that might be available in the future. Having an early plan increases the likelihood of students taking appropriate college preparatory coursework and ultimately enrolling in a postsecondary institution. Though colleges and universities make data about admissions requirements readily available to potential applicants, students early in their high school careers rarely recognize this abundance of materials and likely are unable to process how those data points can help them make informed decisions to position themselves for the future.

Our research team took up the challenge of identifying ways to make more information about postsecondary education available by exploring how college readiness data can be brought directly to guidance counselors, students, and families in an easy-to-use manner to help them make important and difficult decisions. We investigated this issue from a variety of perspectives, including defining and understanding the problem by engaging high school counselors and advisors, and exploring how the Virginia Longitudinal Data System (VLDS) might be leveraged to better understand the system and inform policy and practice. We report our findings in the following broad sections that were defined by our team and in consultation with VLDS team members:

1. Understanding gaps in the college preparation process (new qualitative data)
2. Investigating the relationship between the high school curriculum and college enrollment (analyzing data from VLDS)
3. Identifying variation in course schedule reporting (analyzing data from VLDS)

Note: Funding for this research was provided by the Association for Institutional Research. The research plan was developed and adjusted by Pavilion Research in close consultation with the Virginia Department of Education's Virginia Longitudinal Data System team.

Executive Summary of Findings

Understanding gaps in the college preparation process (new qualitative data)

We collected open-ended survey data from 48 guidance counselors from across the Commonwealth Virginia (from 43 unique schools) and conducted in-depth interviews with 5 members of the Virginia College Advising Corps. Major findings are as follows:

- Positioning Students for College
 - Half of the respondents told us that many students wait until their junior years to begin thinking about college, which is often too late to be able to influence course taking patterns, academic performance, and preparation for standardized testing.
 - Data considerations are highly variable, students and parents tend not to consider data throughout the college positioning process, and it depends on the students' background on whether data are part of their planning process.
 - Respondents suggested that parents and students often do not understand that the combination of curricular rigor and performance is important.
 - Some guidance counselors thought the Virginia Wizard helped at the very front end of the college readiness process but then became irrelevant at the middle or back end. Broadening the sector of students targeted by the Virginia Wizard or expanding its focus could be an opportunity for future development.
- Data That Would Help Guidance Counselors and College Advisors
 - Having a system that facilitates a quick view of students' ambitions and all data related to their college readiness would facilitate more streamlined and personally tailored advice. A "one-stop shop" would be extremely helpful.
 - Guidance counselors do not understand the college admissions decision-making process. They wanted more information on the factors that are valued by different institutions, how they are weighted in admissions decisions, and what elements of an application help students stand apart from other applicants.
 - While it may be unlikely that individual colleges and universities make their admissions criteria and selection procedures open to the public, VLDS data can be leveraged to retrospectively identify the characteristics of students admitted to those institutions, which may serve as a reasonable proxy for selection criteria.
 - The VLDS could readily enable analyses to support guidance counselors in real-time, through benchmarking or longitudinal data about college students' successes in college and employment, pervasive majors at different colleges, academic preparation required for each college, and the curricular rigor that is associated with different colleges. Some of these analyses are demonstrated in the quantitative section in this report.
 - If any kind of decision-support system were built to support the college preparation process, targeted dissemination with guidance counselor training workshops should be a key component to its success.
 - Building in a system to facilitate this communication process throughout students' entire educational experiences remains an important unmet need. Current strategies do not appear to reach all students in a timely manner.

- Information and Resource Needs in the College Preparation Process
 - Nearly half of the respondents said students do not realize that the total performance in high school impacts their available options. Developing new mechanisms to show parents and students that what happens early influences potential decisions at high school graduation emerges as a definite need.
 - Disseminating better information about financing students' postsecondary educations is a distinct area in need of improvement. Such communication should target parents well before high school.
 - Our quantitative section using the VLDS can shed insight on the level of rigor of high school courses taken by students from different colleges and universities to bring data into the college preparedness conversation.
 - If guidance counselors had endless resources, they would develop a system to facilitate the following: 1) help students begin planning earlier, 2) store and accumulate information in a single location over time, 3) match goals with processes and decisions in middle and high school, 4) reduce financial surprises, and 5) change guidance counselor time allocation so it can be used more effectively as opposed to gathering information from multiple locations.

Investigating the relationship between the high school curriculum and Virginia college enrollment (analyzing data from VLDS)

We analyzed high school course enrollment data and four-year postsecondary enrollment data from a cohort of Virginia students who graduated high school at the end of the 2011–2012 academic year. The analysis involved the Student Records, National Student Clearinghouse Enrollment, and Student Schedule data sets from VLDS. We aimed to quantify the association between high school course selection and college enrollment outcomes with an emphasis on students who met the requirements for the Advanced Studies Diploma. The study cohort we examined included more than 19,000 high school seniors who enrolled in one of Virginia's 14 most commonly attended four-year colleges and universities. Major findings are as follows:

- Most students in the study cohort attained the Advanced Studies Diploma. This indicates that the Diploma is a strong indicator that four-year postsecondary education is an option for a graduating senior.
- The ubiquity of the Advanced Studies Diploma designation among college-enrolling students also suggests that this designation is not a strong differentiator of the *profile* of the postsecondary institution in which Virginia's high school students ultimately enroll. Instead, course enrollment (examined as individual courses and clusters of courses) beyond the minimum Advanced Studies Diploma requirements is a strong differentiator of the profile of colleges and universities that Virginia high school seniors attend.
- The association between high school course enrollment and postsecondary institution enrollment can be quantified and shared with students, parents, and guidance counselors to provide more concrete benchmarks for curricular planning.
- Course enrollment at the high school level is highly variable across the Commonwealth. Analysis of five common clusters of advanced study courses raised potential concerns about the equality of education options in Virginia that require further investigation.

Identifying variation in course schedule reporting (analyzing data from VLDS)

We compared high school course enrollment records to student state assessment records available from the VLDS to identify possible gaps in course enrollment reporting across the Commonwealth. The comparison was based on a cohort of students who were enrolled as juniors in the 2011–2012 school year based on the Student Records data set. Major findings are as follows:

- There are large inconsistencies between the course enrollment data and state assessment records at many high schools in Virginia. A majority of schools report a higher number of students taking state assessments than the number enrolled in the courses for which state assessments are required.
- Very few schools in Virginia reported consistent numbers of students taking the state assessments we examined and enrolled in the courses for which those exams would be required.
- Course enrollment data is more complete for the math and science courses we examined than for the English and social studies courses we examined.
- Information about substitute credit practices for state assessments based on Advanced Placement exams at the individual school level is needed to increase confidence in evaluating course enrollment reporting based on state assessment records.
- Continued improvements to the course enrollment records are necessary to ensure validity and representativeness of analysis based on this component of the VLDS.

Understanding Gaps in the College Preparation Process

To understand students' current information gaps in their college preparation processes, we collected information from two different groups of stakeholders: 1) high school guidance counselors, and 2) members of the College Advising Corps who were embedded within high schools. We selected these stakeholders as opposed to working with students or parents directly because they provided the best opportunity for gathering information across a broad range of students. Collecting information from parents or students directly would have provided specific insights on individual cases, but our objective in data collection was to develop a better understanding of the dynamics at play from a more systemic perspective. Thus, we prioritized school-level perspectives over student-level perspectives.

The following sections summarize and integrate findings for both data streams. Subject recruitment and data collection procedures were approved by the Institutional Review Board at Portland State University (Protocol #142934), which reviews research protocols from non-profit organizations.

Participants and Data Collection Procedures

Guidance Counselors

To develop our sample of guidance counselors, we first contacted public high school principals across the Commonwealth of Virginia via email (n=261 publicly available contact information) to introduce our research project and research organization and ask for email contact information for either the lead guidance counselor or team of guidance counselors. Two weeks after our initial contact, we sent a follow-up email to principals who did not respond to our initial inquiry in an effort to boost our response rate.

Because many principals did not respond to our initial recruitment emails with guidance staff members' contact information, we contacted guidance counselors directly using their publicly available contact information located on school websites (n=235 schools with publicly available contact information). Contacting principals first was a professional courtesy and not a requirement for conducting our research, as outlined in our approved IRB protocol. When principals refused participation by his or her school, we did not contact the guidance counselors associated with that school. Administrators from two school districts, Fairfax County Public Schools and Richmond City Public Schools, informed us of district-level review processes for external researchers, possibly accompanied with an additional fee. Because this research was still in the exploratory phase, we elected not to include participants from those districts in our sample—the count of 235 schools with publicly available contact information for guidance counselors does not include guidance counselors from those districts.

We invited guidance counselors to participate in a web-based survey to understand how—and when—students, parents, and guidance counselors consider data in the college planning process. 75 guidance counselors answered “YES” to agreeing to participate in the study, and 1 guidance counselor responded “NO” regarding study participation. We did not receive responses from other guidance counselors in the sampling frame. 27 of the respondents did not produce any data after agreeing to participate. Thus, our sample of respondents who produced data was comprised of 48 guidance counselors from across the Commonwealth of Virginia.

These guidance counselors represented 43 unique public high schools of all sizes spread geographically across the Commonwealth; 18% of the schools contacted produced data. On average, respondents had been in their current positions as guidance counselors for just over 7 years (ranging from 1 year to 23 years). The average student case load for respondents was 328 (ranging from 172 to 577). Following IRB guidelines, we cannot report specific school information of the respondents.

The survey consisted of the questions shown in Table 1.1, which sought open-ended responses. We coded each response using themes that emerged from the data to characterize the consistency and variety of responses across participants. Each response could be coded in multiple ways as appropriate. In the sections that follow, we present frequencies with which codes appeared across the sample of respondents, which provides insight on the pervasiveness of different themes.

Table 1.1 Web-based survey questions presented to guidance counselors

<ol style="list-style-type: none">1. When do students/parents tend to begin positioning themselves for college?2. How do students/parents consider data when they make plans to improve their positioning?3. How have you found tools like the Virginia Wizard in working with students/parents?4. If you could be provided with unlimited data about your students, what would be useful to know?5. If you could be provided with unlimited information about colleges, what would be useful to know?6. What do you think would be the most effective way to get college preparation information to students and parents that would lead to proactive planning?7. What do students tend not to know about the college preparation process?8. What do parents tend not to know about the college preparation process?9. In your view, what are the most important steps students should take to position themselves for the college admissions process?10. What would you do in your current position (in terms of college planning) if you had all the resources in the world?
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Virginia College Advising Corps

The Virginia College Advising Corps (VCAC) was developed in 2005 by the University of Virginia to address college readiness issues for low-income, first generation, under-represented students. Recent University of Virginia graduates are placed around the Commonwealth for two years to work with school guidance counselors to assist high school students with college applications, financial aid, and scholarship searches.

For our project we conducted interviews with five VCAC members (note: there are 17 current VCAC members). A key informant who was familiar with our project and research organization gained approval from her supervisor within the Corps and introduced us to four additional College Advisors, and we invited them to participate in a 35–45 minute phone interview. PI Knight conducted each interview (five total, including the key informant) following the semi-structured interview protocol shown in Table 1.2. All interviews were recorded digitally and fully transcribed by the project's research assistant. In analyzing the data, we searched for themes to emerge following a similar process as with guidance counselors. In this report we present data that triangulate findings from the guidance counselor survey. Interview questions that were asked of the VCAC that did not overlap with the guidance counselor survey topics are not included in this report.

Table 1.2. Semi-structured interview protocol for Virginia College Advising Corps

Overview of Role

We'd like to get a sense of your typical responsibilities with the College Advising Corps in your assigned high school. Will you please tell us about your major responsibilities?

Overview of Mentoring

1. How do you usually interact with school staff from your current position?
 - a. What kind of mentoring do they provide in how you should advise and work with students? From where do they suggest you get your information to share with students?
2. How do you usually interact with other College Corps of Advisors staff members from your current position?
 - a. What kind of mentoring do they provide in how you should advise and work with students? Where do they suggest you get your information to share with students?

Overview of Working with Students

3. What kind of support do you provide students from your current position?
 - a. How do those interactions vary across students from different class years?
 - b. What tools or resources do you rely on to provide that support?
 - c. How have you found tools like the Virginia Wizard in working with students?

Overview of Working with Parents

4. What kind of support do you provide parents from your current position?
 - a. How do interactions vary across parents based on the class year of their student?
 - b. What tools or resources do you rely on to provide that support?
 - c. How have you found tools like the Virginia Wizard in working with parents?

College Planning Process

5. What do students tend to know about positioning themselves for college?
 - a. When do they start positioning themselves?
 - b. How do they consider data when they make plans to improve their positioning?
 - c. How do students decide how to better position themselves for college acceptance?
 - d. What differences do you see across students from different backgrounds?
 - e. What differences do you see across students who have different aspirations?
6. What do parents tend to know about helping their children position themselves for college?
 - a. When do they start helping their children position themselves?
 - b. How do they consider data when helping their students position themselves?
 - c. What differences do you see across parents from different backgrounds?
 - d. What differences do you see across parents who have students with different aspirations?
7. What do school counselors tend to know about helping students position themselves for college?
 - a. When do they start the planning process with students?
 - b. How do they consider data in the planning process?
8. What do students tend not to know about the college application process?
9. What do parents tend not to know about the college application process?
10. What do school counselors tend not to know about the college application process?

Concluding Questions

11. If you could be provided with unlimited data about your students, what would be useful to know?
12. If you could be provided with unlimited information about colleges, what would be useful to know?
13. What do you think would be the most effective way to get college preparation information to students and parents that would lead to proactive planning?
14. In your view, what are *the most important steps* students should take to position themselves for the college admissions process?
15. What would you do in your current position (in terms of college planning) if you had all the resources in the world?
16. What should we have asked you about that we didn't?

Early portions of the interview helped us develop an understanding of the typical roles and responsibilities of our VCAC study participants. Their major daily tasks were assisting students who were applying to a postsecondary option (including two-year, four-year, and military careers, though this varied across our participants), navigate the application process, and assemble the required application components. In addition, they helped students complete FAFSAs and apply for scholarships. The modes of interaction included both one-on-one meetings as well as class or workshop presentations with students and parents. Across all five VCAC study participants, their time early in the semester tended to be spent with seniors; time with juniors built throughout the semester. All five expressed the desire to work with ninth and tenth graders to begin the college planning process early and cited examples of class presentations and outreach to those students, but it was not their primary role or concern.

Results: Positioning Students for College

Timing

We first asked guidance counselors when students and parents begin to position themselves for college and received a variety of responses. As shown in Table 1.3, positioning begins as early as middle school, with steady increases up until 11th grade followed by a smaller percentage beginning in twelfth grade. Remarkably, *half* of the respondents told us that many students wait until their junior years to begin thinking about college, which is often too late to be able to influence course taking patterns, academic performance, and preparation for standardized testing. One finding that the table does not portray is that many respondents pointed to two distinct groups of students—those who prepare in middle school or 9th grade and a second group who prepares in junior or senior year.

Table 1.3. Percentages of guidance counselors indicating when students and parents begin positioning students for college.

Middle School	16.7%
9th Grade	27.8%
10th Grade	33.3%
11th Grade	50.0%
12th Grade	19.4%

Note: Categories not mutually exclusive

Data Considerations

We also asked guidance counselors how students and parents consider data to inform or improve students' positioning for college (Table 1.4). Our major take-away message from responses was that data considerations are highly variable, students and parents tend not to consider data throughout the college positioning process, and it depends on the students' background on whether data are part of their planning process.

Of all potential data sources taken into consideration in the college preparation process, a little over a quarter of guidance counselors suggested that students and parents pay attention to grades in the form of grade point average. That single number was thought to provide an indication of academic ability. Half the number of respondents, however, pointed to the rigor of the curriculum as being an important data point, and respondents suggested that parents and students often do not understand that the combination of rigor and performance is important.

Table 1.4. Percentages of guidance counselors indicating how students and parents consider data when positioning themselves for college.

Grades	28.6%
Unsure	17.1%
Tests	17.1%
Curricular rigor	14.3%
They don't	11.4%
Need prompting	8.6%
University profiles	8.6%
Finances	8.6%
Only most academically advanced students use data	5.7%
Narrows the options	5.7%
Benchmarking	2.9%
Important	2.9%
Overwhelming	2.9%
Job markets	2.9%
Use it a lot	2.9%

Note: Categories not mutually exclusive

Other data points that are taken under consideration include standardized test scores (generally SAT scores) and financial information. For example, one respondent noted:

Many of the students in my school focus on the financial aspects of attending college. Most are blue collar workers and they shy away and can't see past the \$40,000/year sticker price of most colleges. Many of our parents and students assume that their college pathway will begin at a community college.

Tools to help such students recognize available financial support mechanisms might broaden the data sources taken into consideration. 17% of respondents either were not sure what students or parents used or did not understand the question, and another 11% said explicitly that data do not enter the conversation. For example, one counselor said:

I don't think many students or parents consider concrete data. They typically go on word of mouth or information they assume is correct about what colleges want or need from student applicants.

As a VCAC participant similarly noted:

They don't [consider data] until we set it down in front of them and say, "Look, you're within this range. This is the school that you think you're going to go to – this is the range that..." Generally data on GPAs and SAT score isn't considered until they sit down with the guidance counselor or with me, and that usually is happening in their junior year or their senior year. That's too late in my opinion.

VCAC participants went a step further and suggested that students often times avoid data in their planning process:

They are intimidated by data. Especially when I bring it up, they are sort of taken aback and hesitant to believe it. I find myself having to sort of edit the way that I present things especially when I talk about Federal programs or the FAFSA.

Finding ways to systematically understand and address "word-of-mouth" misconceptions about the college preparation process is an important need if students and parents rely heavily on those sources of information. Smaller percentages of guidance counselors described explicitly that data were used for benchmarking purposes or as a means to understand differences across universities, but noted that such data use was highly variable and often limited to "students with GPA's above 3.5." As another counselor described:

Although this [data use] varies widely, the most technically oriented use data to compare themselves with the students who were accepted at the particular school(s) which they are considering and gauging how likely it is they would be accepted at those institutions.

Use of Tools like the Virginia Wizard

Because we partnered with the Virginia Department of Education for part of this project, we also asked specifically about the use of the Virginia Wizard by students and their parents to help inform future development and use of that tool (Table 1.5). 8% of respondents thought it was an excellent resource. Several respondents pointed to its usefulness for students in middle school or early in high school. For example, one respondent noted:

Virginia Wizard can be nice for some of the younger students who are starting out in their career and college searches. We use it with all 9th grade students in their new Academic/Career Plans to learn about career interests and aptitudes which helps guide our academic planning for the remainder of high school.

Contrastingly, other sets of respondents did not offer resounding endorsements of the tool, indicating it was somewhat useful (17%), not the best tool (11%), or challenging to use (11%). Over a quarter of respondents had never used the tool, so there is certainly room for expanded marketing among the Virginia guidance counselor population (note: those "have not used" responses varied geographically and across school sizes). 11% of respondents pointed to Naviance (though we did not ask for other recommendations), so it would be worth determining the features that Naviance offers that the Virginia Wizard could potentially incorporate.

Table 1.5. Percentages of guidance counselors indicating how guidance counselors find tools like the Virginia Wizard in working with students and parents.

Have not used	27.8%
Somewhat useful	16.7%
Encourage use for younger students	13.9%
Use Naviance	11.1%
Not the best tool	11.1%
Some challenges	11.1%
N/A	11.1%
Excellent	8.3%

Percentages; Categories not mutually exclusive

An opportunity for future development could be to identify parts of the college readiness process that the Virginia Wizard could support that would be useful for students throughout their time in high school. It appeared as if guidance counselors thought it helped at the front end of the process but then became irrelevant at the middle or back end. In addition, broadening the sector of students targeted by the Virginia Wizard also could be an opportunity for future development. Multiple respondents pointed to its community college focus as a negative feature because it did not engage many potential users, as described by the following response:

For my families in particular, the initial education plan for college can be off-putting because it immediately assumes starting at a community college - many of my families are biased in a negative way against this starting option and sometimes the fact that the Virginia Wizard starts there, my families will discount any information provided.

VCAC participants tended to agree with the guidance counselors' take on the Virginia Wizard in its limited scope:

The Virginia Wizard isn't very helpful because the career clusters that it offers are so limited. If someone is really interested in engineering and they go through and answer those questions, engineering doesn't even come up as an option, so Virginia Wizard has not been helpful and I don't really encourage students to use it.

The VCAC participants also pointed to technical issues that should be taken under consideration:

I don't like the Virginia Wizard. I just don't like the layout – I don't find it user-friendly. A lot of our students don't have computers at home or internet access, so they're just not familiar with basic computer knowledge – so they don't know, when I say "go to 'File, open'" they say "Where's that?", things like that. So I find that College Board is easier for them to navigate, so that's why we use that instead of Virginia Wizard.

The VCAC participants touted other tools, including Career Cruiser, College View, and the Big Futures feature from College Board's website as being effective and preferred resources, so additional research could explore features from these tools that could be integrated into or linked from Virginia Wizard. Considering both guidance counselor and VCAC perspectives, it was clear that these individuals use a variety of tools for helping students with the college planning process and have not coalesced around a single tool.

Results: Data That Would Help Guidance Counselors and College Advisors

Our next series of questions asked respondents to describe the kinds of data about students or colleges that would enable them to provide better guidance throughout the college preparation process. In asking this question, we asked the respondents to think about “unlimited” data so they would think a bit past typically known metrics.

Student Data that Would Be Useful

First, we asked about data on students; Table 1.6 displays the wide variety of responses. One-third of respondents wanted information about students’ personal goals. Having a quick view of a students’ ambitions, both for college and their careers, would facilitate more streamlined and personally tailored advice. One respondent acknowledged that such data are available, but housing the various metrics or career surveys in one location would improve the process:

[I would like] individual reports from the [career or personality] inventories, along with the possible career options for them. Again, I know those are available but the process for students connecting [those inventory results] to me is cumbersome.

Table 1.6. Percentages of guidance counselors indicating data that would be useful to know about their students.

Career info/plans/goals	33.3%
Family info	33.3%
Students' interests	15.2%
Tests	9.1%
All info together	9.1%
Co-curricular activity	9.1%
Info on former students	9.1%
Motivation	9.1%
Honors/awards	9.1%
Grades	6.1%
Nothing else needed	6.1%
Absences	3.0%
Time spent	3.0%
Personality trait	3.0%
Personal issues	3.0%
Follow-up after first college year	3.0%
Readiness	3.0%
Link student to college	3.0%
Track path	3.0%

Percentages; Categories not mutually exclusive

If data were stored in one place, counselors and advisors could conceivably streamline their own processes by bringing similar students to the same meetings, as described by a VCAC participant:

If I’m about to have the same conversation like six times in one day, it would be great if I could pull all those kids at the same time, and they’re all interested in engineering and want to go to Tech. That would be great if I could just sit them all together and have that

conversation and then they would have peers that they would know who would be doing the same type of thing.

We heard similar calls from guidance counselors for a system that could bring the disparate sources of student data together so that it could be viewed quickly and considered as a complete package, as exemplified by the following response:

[I would like] a summation of standardized test scores; grade history; absences and tardies; any extenuating circumstances; parent education levels; siblings & their ages & educational background. Most of this is available, but not in one readily accessible place.

Another third of respondents wanted information about students' families and argued that such information could help them focus on students who might not have access to the required social capital to successfully navigate the college application process. As one respondent noted:

[I want to know] which students are first time college attenders and which students have parents who attended college. This would allow us to concentrate more attention to those families who have no experience at all in helping their child in the college admissions process.

VCAC participants reported wanting similar information about family backgrounds:

I would just love to know about family history or family background. . . . So I have the events, but students need to go back and tell their parents. So I think if I could get any data kind of like what makes students and parents click, what makes them care more.

As Table 1.6 indicates, guidance counselors pointed to an array of other data that would be helpful, from co-curricular participation to personality traits to students' honors or awards. Some respondents went beyond listing data and described how the data could be used in a benchmarking sense, suggesting tools that could help facilitate the process of showing students how their own academic paths or portfolios compared to students enrolled in different colleges. Such a high school-to-college matching idea was the initial impetus for our research, and potential users articulated value this type of tool could have. As one respondent described:

In a perfect world it would be cool to have a program or App where we can plug in certain student information (GPA, classes taken, etc.) and then be able to compare that data with admitted students from various colleges, i.e. what is the percentage likelihood that a student with X academics will get into X college.

As our quantitative analyses demonstrate, the VLDS could readily enable that kind of analysis to support guidance counselors in real-time. Other respondents pointed to other ideas that the VLDS could support, citing the need for longitudinal data about previous students' successes in college to help inform their advice given to current students. As one counselor noted:

I would like to know what happens after my students leave our doors. I would like data regarding college/tech school completion rates as well as rates of transfer to four year schools for our students who enter community college. The data exists on a national level but I want data that is specific to Virginia, to [our county] and to [our high school].

Many of these ideas can become a reality by leveraging VLDS, and these responses point to ideas to take a state-level data set and use it to inform practice at the individual school level.

College and University Data that would be Helpful

We also asked guidance counselors to describe the information about colleges that could improve their facilitation of the college application process (see Table 1.7). Such findings should inform university admissions departments as they work to streamline the K–16 pipeline. With renewed calls for transparency and accountability in education, these findings point to suggestions that postsecondary institutions could implement to enhance the overall system.

Above all else, guidance counselors do not understand the admissions decision making process. They wanted more information on the factors that are valued by different institutions, how they are weighted in admissions decisions, and what elements of an application help students stand apart from other applicants. If the professionals who are responsible for helping students prepare for the process have such uncertainty, it is not surprising that students and parents struggle with understanding the process. As one respondent noted:

What is the bottom line in looking at a student? It seems that year to year, very similar students get different answers. I would like admissions counselors to be more honest when a student asks questions regarding classes they should or should not take in high school. Several times when I have called asking about taking or not taking a specific class, the counselor will just dance around the issue.

Table 1.7. Percentages of guidance counselors indicating data that would be useful to know about colleges.

Decision making process	44.1%
Financial information	35.3%
Success in college/employment	26.5%
Programs/majors at college	26.5%
Academic preparation	17.6%
Transfer policies	8.8%
Curricular rigor	8.8%
N/A	8.8%
Activities/campus culture	5.9%
Support services available	5.9%
Undocumented student policy	2.9%
Weighting AP course policies	2.9%
Objective ranking system	2.9%

Percentages; Categories not mutually exclusive

Over a third of respondents pointed to the need for more financial information from universities. They did not understand the variation in available financial aid from one institution to another and suggested a common program or website to house this information for Virginia schools. Colleges and universities should take these results under serious consideration to improve their information dissemination plans to improve the overall system.

Similar to other themes that keep appearing in our data, VCAC participants suggested that having all data about colleges and universities in a single location would greatly streamline work processes. For example, one participant said:

If information that you needed easily, GPA ranges, SAT scores, all those types of things – deadline dates, quick facts—if it was all in one place . . . if there was some easier way to funnel that information . . . I think that sometimes the gatekeeper is that [students] don't know where to go. We tell them “Oh, you can use the College Board to research colleges and majors, or you can use Virginia Wizard or you can use College View.” So they've made all these things, but it's almost too much – we need to just use one.

Data from the VLDS could be leveraged to address a few of the points raised by guidance counselors, including college students' successes in college and employment, pervasive majors at different colleges, academic preparation required for each college, and the curricular rigor that is associated with different colleges. Some of these analyses are demonstrated in the quantitative section in this report. Others, such as career placement success for different institutions, could be conducted using the VLDS and disseminated to students and parents through guidance counselors. While it may be unlikely that individual colleges and universities make their admissions criteria and selection procedures open to the public, VLDS data can be leveraged to retrospectively identify the characteristics of students admitted to those institutions, which may serve as a reasonable proxy for selection criteria.

Communicating College Preparation Information

We suggest using guidance counselors as conduits of information because of their responses to a question about effective communication of college preparation data and information to students and parents (see Table 1.8). Nearly half pointed to in-person meetings as most effective, 13% suggested curricular-based approaches, 10% said in-class guidance, and others suggested home visits, career coaches, and evening classes. That personal touch appeared to be important as opposed to leaving students and parents to find appropriate resources via online resources or mailings. Thus, if any kind of decision-support system or platform were built to support the college preparation process, it appears as if targeted dissemination with guidance counselor training workshops would be a key component to its success. VCAC participants have tried a variety of different communication mechanisms and found that Facebook combined with text message instant alerts were effective means of communicating in-person meeting dates as well as major application process deadlines to parents (e.g., signing up for the SAT).

Table 1.8. Percentages of guidance counselors indicating how college preparation information should be best communicated to students and parents.

Meetings (in-person)	48.3%
Website or online material	24.1%
Media spots (TV, social)	20.7%
Email	17.2%
Curricular-based approaches	13.8%
Direct mailing	10.3%
In-class guidance	10.3%
Sample software	3.4%
VA Wizard	3.4%
Home visits	3.4%
Career coaches	3.4%
Workbook	3.4%
Evening classes	3.4%
Text messages	3.4%
Tours	3.4%

Percentages; Categories not mutually exclusive

What was clear about responses is the clear need to begin communication efforts earlier about broad college preparation processes, with one VCAC participant pointing to kindergarten as the appropriate first contact point. As one guidance counselor respondent noted:

Interweaving the expectation of college into the curriculum from elementary school onward [is needed]. Including ALL postsecondary education options in the concept of "college" [is important] so that students/parents understand they are all included and need to prepare regardless of the type of program/training they are seeking.

Another respondent similarly echoed:

It needs to start earlier. I am the junior senior counselor. By the time they get to me students and parents should have at least a general plan in place. With students below a 3.5 GPA I am often the first person to encourage solid planning.

Building in a system to facilitate this communication process throughout students' entire educational experiences appears to be an important need. Current strategies do not appear to reach all students in a timely manner.

Results: Information and Resource Needs in the College Preparation Process

Our final set of questions asked guidance counselors to identify student and parent information gaps in the college preparation process, steps that students should follow to be successful in the process, and changes that guidance counselors would make to the process if given unlimited resources.

Information Gaps among Students

Nearly half of the respondents said students do not realize that the total performance in high school impacts their available options (see Table 1.9). As one guidance counselor summarized:

Even though we emphasize to upcoming 9th graders the importance of doing well in 9th grade because their credits will now be counted into their GPA, I don't think it "registers" for them until they begin 11th grade by which time many of them have closed the door on being able to attend a four year school immediately after graduation.

Finding ways to help students recognize that early actions and decisions directly relate to potential of college options later was a definite need identified by our data. In addition, nearly half of respondents indicated that students do not understand the entire college application process, in particular those who are first generation. They generally do not recognize that colleges and universities hold firm application deadlines. As multiple respondents suggested, applying to college is often the first activity that students must complete on their own by a specific date and time. Developing some kind of tool to assist in that process could help students better understand the full process and everything it entails.

Table 1.9. Percentages of guidance counselors indicating what students tend not to know about the college application process.

Total performance in high school impacts options	43.3%
Requirement for applications/deadlines	43.3%
Finances	30.0%
Choosing right program/institution	16.7%
Rigor definition	10.0%
First generation issues	6.7%
Importance of communication in app process	3.3%
AP/dual enrollment	3.3%
College one step toward career	3.3%

Percentages; Categories not mutually exclusive

The VCAC participants corroborated much of the responses from guidance counselors. One participant elaborated about misconceptions tied to finances:

I find that [students'] knowledge is pretty limited just because it's based on what their parents have told them or what friends have told them. Generally, students first come in saying that they just don't think that they can go to more than maybe two schools in the area just because they can't afford [tuition]—that's the first concern.

Another VCAC participant elaborated on the lack of knowledge about the actual college application process:

They're usually not familiar at all with the application process itself. They have no idea, for example, that they needed to take SATs or ACTs before applying to a 4-year school. They have no idea that there was financial aid available. They didn't know that most schools accept applications in January at the latest. A lot of students have come to me thinking that they apply for college at the end of their senior year when they're pretty much done with classes. So they have a pretty limited knowledge base about college.

VCAC participants also told us that many students do not have an accurate sense of the admissions requirements of different institutions, which corresponds to the guidance counselors' notion of choosing the right institutional fit. Students often overestimated their academic options in their junior or senior years, and advisors were left in the difficult position of explaining academic requirements after it was too late to make any changes to an academic trajectory. Another theme to emerge from the VCAC interviews was high variation across students:

I've seen a student who attended senior night or college night and got all that information and they took it and they applied it, they did it – it was great, had good outcomes. Then I've had other ones who were at those events or half-heard what I said when I met with them, and they come to me and they filled out the Common App but they didn't put the school down . . . So it's things like that, just the breakdowns, they don't think all the way through and they almost don't read it all the way. There's some breakdown in there.

A one size fits all model certainly is not appropriate—the students who already successfully navigate the process (with the help of their parents or other mentors and advisors) could benefit from our research but are not the target population for our research.

Information Gaps among Parents

Similar themes emerged for questions related to information gaps among parents (Table 1.10). As previously discussed, disseminating better information about financing students' postsecondary educations is a distinct area in need of improvement. Such communication should target parents well before high school, as described by one respondent:

They [parents] do not realize that they should plan early for paying for college. They really need to think about that when their children are very young, well before they know if they would even want to go to college. Some parents do realize this, but many do not.

Along those same lines, over a quarter of guidance counselors indicated that parents do not recognize the importance of having their children plan ahead from an academic standpoint:

For some reason, parents and students don't seem to get the message that college preparation begins very young and becomes very critical starting in 8th and 9th grade. Too often, the end of the junior year, parents are suddenly concerned about what has been going on the past couple years. I basically beg students to get involved in extracurricular but this does not seem to sink in.

Table 1.10. Percentages of guidance counselors indicating what parents tend not to know about the college application process.

Finances	42.9%
Need to plan ahead	28.6%
Application process	21.4%
Admissions requirement	14.3%
Ownership should be held by student	14.3%
Unreasonable expectations of school	10.7%
First generation issues	7.1%
Overestimation of child ability	7.1%
How to motivate kids	3.6%
Competitive nature	3.6%
Importance of extra-curricular	3.6%

Percentages; Categories not mutually exclusive

Again, developing new mechanisms to show parents and students that what happens early influences potential decisions at high school graduation emerges as a definite need. Such new mechanisms or tools could also address knowledge gaps among parents related to the application process and admissions requirements.

Most Important Steps for College Positioning

The importance of planning in advance similarly rose to the top of most important steps that guidance counselors said students should take to position themselves for college (Table 1.11). Waiting until the junior year is far too late to begin positioning for college. As one guidance counselor noted:

They need to enter high school understanding that they only have 3 years to achieve the GPA they need to enter college. In my opinion, this is about work ethic. They need to develop and foster it from elementary school on.

Table 1.11. Percentages of guidance counselors indicating the most important steps students should take to position themselves for college.

Academic planning in advance	56.7%
Rigorous courses	36.7%
Academic preparation	36.7%
Volunteer/extra-curricular	26.7%
Visit colleges	20.0%
Realistic college search	20.0%
Take standardized tests	13.3%
Understand self/goals	10.0%
Financial planning	10.0%
Prepare for essay writing	3.3%
Meet deadlines	3.3%

Percentages; Categories not mutually exclusive

Another guidance counselor suggested that students should start thinking about an end goal early on in their school careers and identify the application requirements of colleges that would enable them to reach that goal. Such purposeful planning would allow them to develop the skill sets throughout high school so they could be a viable applicant:

They should focus on their career goals and research colleges that are best prepared to help them reach those goals. Then, working backwards from there, they should build the skills and knowledge needed to gain acceptance into their colleges and into their careers. This includes their academic skills, interpersonal skills, writing skills, work habits and successful employment skills. They needs to keep their eye on the goal -- successful entry positioning [for] the career(s) of their choice.

Over a third of respondents suggested that students should take rigorous courses throughout their high school careers to keep as many options open as possible. As a VCAC participant suggested:

I think the biggest thing is taking the most challenging courses, not being afraid to be challenged . . . and you could start that set up early when you're like a freshman and a sophomore, you start taking advanced classes or honors or however it's set up at your school, taking those AP classes.

Another VCAC participant echoed a similar sentiment:

Start rigorous classes as soon as you can and to find out early about what you're good at-what you're not good at. And then pursue the things that you're good at, take the things that you're not, but really, start finding what your strengths are academically early on and then push to do really well in those.

Our quantitative section using the VLDS can shed insight on the level of rigor of high school courses taken by students from different colleges and universities to bring data into this conversation. Though not as common an answer as academic or course planning, guidance counselors also pointed to volunteer or extra-curricular activities as being important activities in which students should engage as they position themselves for college. Expressing to students that an entire portfolio of academic and non-academic activities over an extended period of time was what will enable multiple postsecondary options appears to be the biggest challenge and need for successful college preparedness. We are unaware of any current systems that capture these data; leveraging VLDS is a step forward but can only contribute insight on a portion of the admissions/acceptance story.

Suggested Improvements if Resources were Unlimited

Finally, we asked respondents to think outside the box and describe what they would do in their current positions if resources were unlimited (see Table 1.12). Many of these response categories echo a previously noted theme—personal touch matters. Both guidance counselors and College Advising Corps participants wanted more in-person sessions, fewer students in their case loads, visits to college campuses, and more direct access to students. It appears as if time and student-to-counselor ratios are the most limiting factors in the college preparation process. Thus, identifying mechanisms to reduce time spent on administrative tasks or developing tools to improve the efficiency of their current work processes could greatly improve the current system by allowing counselors to spend more time with students and parents. Bringing all of the necessary information together in one place would be a very positive first step, as described in detail by one respondent:

I would begin planning with middle school students and parents. I would want each one of them to begin a portfolio with the career/college plans. I would want them to have a section in the portfolio for a study skills/work ethic class (which I would want taught), I would want them to have a section about extra-curricular involvement and community service, I would want a section on test preparation and timelines for college admissions testing, I would want a section on GPA's with information about colleges and the acceptance rate of certain GPA's, I would want a two-year and four-year college research section, and a dual enrolled/AP classes section. Lastly (or maybe it should be first), planning financially for college for both parents and students that would be discussed on at least a yearly basis. Most of all I would want time for counselors to work with students on this type of planning. At the middle school, case loads would need to be smaller or career coaches would need to be hired to focus specifically on this type of college and career planning. At the junior and senior level, I would be able to be much more effective if years of groundwork had been laid.

Table 1.12. Percentages of guidance counselors indicating what they would do in their current positions if they had access to unlimited resources.

More in-person sessions/planning seminars	46.7%
College visits	30.0%
Get students/parents working earlier	23.3%
Teach study skills/college planning class	13.3%
New web-based programs (or use existing)	13.3%
Fewer students in case load	10.0%
Bring in external speakers	10.0%
Connect students with admissions counselors/college students	10.0%
Give college guide to students	3.3%
Share more resources with students	3.3%
Boosted communication with parents	3.3%
Counselor visit to colleges	3.3%
Work directly with students on applications	3.3%
Have complete college portfolio on student	3.3%
Have students do self-assessments	3.3%
Guidance position only for college	3.3%

Percentages; Categories not mutually exclusive

Developing a system to accomplish such a task would serve multiple purposes, and provides an encompassing summary of our findings from this section: 1) students would begin planning earlier, 2) information would be stored and accumulate in a single location over time, 3) goals could be matched with processes and decisions in middle and high school, 4) there would be no financial surprises, and 5) guidance counselor time could be used more effectively rather than gathering these pieces of information from multiple locations.

Investigating the Relationship between High School Curriculum and College Enrollment

Description of Study and Cohort

The Advanced Studies Diploma is a benchmark of academic performance in secondary education in the Commonwealth and serves as a potential indicator of readiness for postsecondary study. Requirements for the Advanced Studies Diploma are established by the Virginia Department of Education and include credit totals and subject-specific expectations. However, not all students who achieve the Advanced Studies Diploma follow identical course plans, and students who attend schools with greater resources and/or who are pursuing postsecondary education at a top-tier college or university may be more likely enroll in courses that are well above and beyond Advanced Studies diploma requirements. The goal of this analysis was to understand variability in the course enrollments and postsecondary education enrollments of students receiving the Advanced Studies Diploma in Virginia.

We examined a cohort of 21,436 students who were in grade 12 in academic year 2011–12 and enrolled in one of Virginia’s 14 most attended colleges and universities in August or September of 2012 (see Table 2.1 for list of colleges and universities). High school grade-level status was determined from the VLDS Student Records data set, high school course enrollments were derived from the VLDS Student Schedule data set, and postsecondary education information was gleaned from the VLDS National Student Clearinghouse Enrollment Records data set.

The postsecondary education choices these students made and the number of high school course enrollments available for students attending each postsecondary institution are shown in Table 2.1. Notably, there is considerable variability in the number of VLDS records available per student across the set of universities and colleges we examined. More course enrollments were available for students who attended universities like the University of Virginia, Virginia Tech, and James Madison University, and fewer enrollments were available for students who attended universities like Norfolk State and Virginia State. Causes for these differences may include variability in high school reporting practices (e.g., high schools with more resources for reporting also tend to be those producing students who attend certain institutional types) as well as actual differences in course taking (e.g., high schools that produce more students who attend certain institutions offer more classes that college-bound students would take).

Table 2.1. Postsecondary and high school course enrollment totals for Virginia’s grade 12 students in 2011–2012.

Colleges and Universities	Number of Students	Total # of High School Courses in Records	Course Records per Student
Christopher Newport University	1,126	6,202	5.5
College of William and Mary	733	3,730	5.1
George Mason University	1,865	9,872	5.3
James Madison University	2,356	12,842	5.5
Liberty University	529	2,467	4.7
Longwood University	888	4,868	5.5
Norfolk State University	811	2,910	3.6
Old Dominion University	1,966	8,439	4.3
Radford University	1,744	8,675	5.0
University of Mary Washington	712	3,435	4.8
University of Virginia	1,787	9,744	5.5
Virginia Commonwealth University	2,809	14,091	5.0
Virginia Tech	3,304	18,427	5.6
Virginia State University	806	2,406	3.0

Comparison of Diploma Types

Within the cohort, 19,332 students (90.2%) received advanced studies diplomas. An additional 1,580 received standard diplomas and 512 received IB diplomas, yet those students still attended one of the 14 institutions listed in Table 2.1. All other diploma designations added up to only 12 students.

We chose four institutions to represent different profiles of postsecondary education options in Virginia to perform comparisons in this report. We selected the University of Virginia (UVA), James Madison University (JMU), Radford University (RU), and Virginia State University (VSU) as four representative profiles. Table 2.2 compares the percent of students enrolling at each of these four institutions who received the Advanced Studies or IB diploma. Possession of an Advanced Studies or IB diploma is an identifying characteristic of nearly every student at the University of Virginia and James Madison University.

Table 2.2. Percent of cohort students enrolling at four Virginia institutions with advanced studies or IB diploma

	UVA	JMU	RAD	VSU
Percent of students with Advanced Studies/IB diploma	99.3%	99.0%	86.9%	52.6%

Course Enrollments

After restricting the data set to only students who completed the Advanced Studies Diploma (n=19,332 of the original 21,436), there were 108,108 course enrollments available in the data set from the students' senior year. This data set included records from 15,750 different students, a lower number than the possible 19,332 because of incomplete course enrollment reporting (see the subsequent section of this report on variation in course enrollment reporting).

The students in this cohort were enrolled in a total of 479 different courses in their senior year of high school across the Commonwealth. A vast majority of the course offerings were associated with relatively low enrollment statewide; 75% of courses had fewer than 161 students enrolled statewide. The mean enrollment across all courses in the data set was 225.7 and the median was 38. There were only 19 courses with enrollments of 1,000 or more students across the Commonwealth, and these courses accounted for more than 50.5% of all senior year course taking (54,690 enrollments). The ten most common courses taken by high school seniors in the cohort are shown in Table 2.3.

Table 2.3. Top ten courses (by enrollment) for Virginia high school seniors receiving the Advanced Studies Diploma and attending one of Virginia's 14 largest postsecondary institutions.

Rank	Course Code	Course Name	Enrollment
1	1004	Grade 12 English	8,065
2	4151	World History - Overview	6,965
3	4157	AP Government & Politics: United States	6,621
4	1006	AP Literature & Composition	5,193
5	3151	Physics I	4,197
6	2124	AP Calculus AB	3,776
7	2203	AP Statistics	2,221
8	3053	Biology II - Anatomy/Physiology	2,199
9	2104	Mathematical Analysis/Pre-Calculus	2,033
10	3056	AP Biology	1,853

The enrollment records indicate that seniors are indeed taking a wide array of courses beyond the requirements for the Advanced Studies Diploma. Focusing specifically on math courses, for example (SCED course codes 2000–2999), the most rigorous course meeting the minimum requirements is Algebra II. Only 300 students were enrolled in Algebra II in their senior year, far fewer than the number enrolled in offerings like AP Calculus and Mathematical Analysis/Pre-Calculus. Students receiving Advanced Studies diplomas and attending postsecondary institutions are largely continuing their math education into their senior year (Table 2.4). More than two-thirds of the senior year math enrollments in the study cohort was accounted for by five classes: AP Calculus AB, AP Statistics, Mathematical Analysis/Pre-Calculus, Probability & Statistics, and Algebra III. The rigor of their senior year math class correlates with the type of postsecondary institution at which they enroll (Table 2.4). Thus the extent to which students have the opportunity to—and choose to—pursue courses above the Advanced Studies Diploma minimum requirements appear to have significant ramifications for college enrollment outcomes.

In addition to encouraging students with interests in postsecondary education to pursue the Advanced Studies Diploma, it is also important for school across the Commonwealth to communicate to students the fact that if students are interested in choosing among different types of postsecondary institutions, the Advanced Studies Diploma is in and of itself a weaker indicator of the options that will be available to those students than their course enrollments above and beyond the minimum requirements.

Table 2.4. Common math courses taken by Virginia Advanced Studies Diploma recipients in their senior year of high school. Common courses are defined as those that account for at least 5% of total within-subject enrollment. (*Algebra II is included in the table because it is the highest course needed to meet minimum Advanced Studies Diploma math requirements even though it is not a commonly-taken senior year course).

Math Course	Percent of total math course enrollments in statewide cohort	Percent of math course enrollments among UVa-bound students in cohort	Percent of math course enrollments among JMU-bound students in cohort	Percent of math course enrollments among RU-bound students in cohort	Percent of math course enrollments among NSU-bound students in cohort
AP Calculus AB	23.3%	40.7%	26.2%	6.5%	5.8%
AP Statistics	13.7%	18.3%	20.6%	6.6%	5.8%
Math Analysis/Pre-calculus	12.5%	1.9%	13.5%	17.3%	19.2%
Prob & Stat	10.6%	2.4%	9.5%	19.9%	16.5%
Algebra III	6.3%	0.6%	5.8%	10.7%	6.2%
Algebra II*	1.8%	0.1%	0.4%	6.6%	12.7%

Similar patterns are seen for commonly taken courses in English, Science, and Social Studies (Tables 2.5, 2.6, and 2.7). Among English courses (SCED course codes 1000–1999), the course meeting minimum Advanced Studies Diploma requirements (Grade 12 English) is taken by less than 50% of college-bound¹ seniors across the Commonwealth (Table 2.5). More than 35% of college-bound Advanced Studies Diploma recipients take AP Literature and Composition or AP Language and Composition in their final year, and this percentage is even higher for students attending institutions with profiles like those of the University of Virginia and James Madison University. Conversely, at institutions like Radford and Norfolk State, approximately 70% of incoming students took Grade 12 English in their senior year.

¹ Throughout this section of the report, terms including “college-bound,” “postsecondary institution,” and “institutions of higher education” refer specifically to Virginia’s 14 most commonly attended four-year higher education institutions (see Table 2.1 for the complete list of these colleges and universities).

Table 2.5. Common English courses taken by Virginia Advanced Studies Diploma recipients in their senior year of high school.

English Course	Percent of English enrollments in statewide cohort	Percent of English enrollments among UVa-bound students in cohort	Percent of English enrollments among JMU-bound students in cohort	Percent of English enrollments among RU-bound students in cohort	Percent of English enrollments among NSU-bound students in cohort
Grade 12 English	47.8%	17.1%	42.1%	69.2%	70.5%
AP Literature and Composition	30.8%	55.6%	35.5%	13.1%	13.1%
AP Language and Composition	6.2%	12.0%	7.5%	4.0%	2.7%

Like math enrollment, science course-taking (SCED course codes 3000–3999) is variable in the senior year; five different courses have enrollments that are at least 5% of total statewide science enrollment in the senior year (Table 2.6). Also similar to mathematics courses, the typical science “track” to meet Advanced Studies Diploma requirements ends for many students in their junior year. While some students may be using their senior year to take their third and final science requirement for the Advanced Studies Diploma, the enrollment data suggest that many students are seeking more rigorous programs of study that include Advanced Placement courses in the sciences. Statewide, 24% of students were enrolled in AP Biology, AP Physics, or AP Environmental Science in their senior year. The percentage of science enrollments in these three courses is higher for students attending the University of Virginia (37%) and lower for students attending institutions like Radford and Norfolk State (<10%). (Note: AP Chemistry accounted for 4% of statewide senior-year science enrollments in the cohort we examined and is not reflected in the above totals).

Table 2.6. Common science courses taken by Virginia Advanced Studies Diploma recipients in their senior year of high school.

Science Course	Percent of science enrollments in statewide cohort	Percent of science enrollments among UVa-bound students in cohort	Percent of science enrollments among JMU-bound students in cohort	Percent of science enrollments among RU-bound students in cohort	Percent of science enrollments among NSU-bound students in cohort
Physics I	21.6%	13.0%	27.3%	23.3%	18.2%
Biology II – Anat/Phys	11.3%	6.4%	12.5%	13.5%	11.5%
AP Biology	9.6%	14.3%	10.1%	4.0%	4.1%
AP Physics	7.2%	15.4%	5.2%	1.5%	0.9%
AP Environ. Science	7.2%	7.8%	9.2%	4.4%	1.3%

Two social studies offerings (Virginia & U.S. Government and AP Government & Politics) account for more than 50% of statewide social studies senior year course enrollments (SCED course codes 4000–4999), and only four different courses account for 5% or more of total enrollments (Table 2.7). In the cohort we examined, nearly as many students are enrolled in a course offering that is above the minimum Advanced Studies Diploma requirement (AP Government & Politics, 29.3%) than the course that meets the requirement (Virginia & U.S. Government, 30.8%). This pattern is much different for students attending institutions with profiles like that of the University of Virginia and James Madison University, where more students are enrolled in the higher-level social studies offering. Conversely, three to five times as many students who enroll in institutions like Radford and Norfolk State are taking the minimum social studies requirements for the Advanced Studies Diploma.

Table 2.7. Common social studies courses taken by Virginia Advanced Studies Diploma recipients in their senior year of high school.

Social Studies Course	Percent of social studies enrollments in statewide cohort	Percent of social studies enrollments among UVA-bound students in cohort	Percent of social studies enrollments among JMU-bound students in cohort	Percent of social studies enrollments among RU-bound students in cohort	Percent of social studies enrollments among NSU-bound students in cohort
Virginia & U.S. Government	30.8%	8.9%	22.9%	49.9%	58.6%
AP Government & Politics: US	29.3%	46.2%	36.2%	15.1%	7.7%
Local History/Social Sci. Elective	6.6%	7.8%	6.6%	6.7%	1.8%
AP Psychology	5.4%	6.5%	6.0%	4.6%	1.8%

In Table 2.8 we have repeated selected rows from Tables 2.4–2.7 that demonstrate the percentage of senior year enrollment for the courses within each subject that meet the minimum requirements for the Advanced Studies Diploma. Although the particular courses listed in the table are not necessarily those that would typically be taken in the senior year (e.g., Algebra II is more frequently taken in the junior year), the table reiterates the high percentage of students taking courses beyond the Advanced Studies Diploma requirements in their senior year. This is especially true for students who enroll at postsecondary institutions like the University of Virginia and James Madison University, but also relevant to a high percentage of the students who enroll at institutions like Radford and Norfolk State. The observation that many students are pursuing more rigorous schedules than demanded by the Advanced Studies Diploma requirement is encouraging for the caliber of students at high schools in the Commonwealth of Virginia who are attending postsecondary institutions, but also indicates that there may be an opportunity for additional designations or course enrollment goals other than the Advanced Studies Diploma that have more relevance to discussions about choice between postsecondary institution type. Beyond serving as an indicator of general college readiness, we cannot identify

a high value for the Advanced Studies Diploma designation for those students who do enroll in four-year institutions. We suggest that the development of alternative, data-driven benchmarks with more specificity would aid students who are planning to pursue four-year higher educational opportunities.

Table 2.8. Percent of within-subject enrollment for four courses that students may take in their senior year of high school to meet the minimum requirements for the Advanced Studies Diploma.

Senior Year Course	Percent of within-subject enrollments in statewide cohort	Percent of within-subject enrollments among UVa-bound students in cohort	Percent of within-subject enrollments among JMU-bound students in cohort	Percent of within-subject enrollments among RU-bound students in cohort	Percent of within-subject enrollments among NSU-bound students in cohort
Algebra II	1.8%	0.1%	0.4%	6.6%	12.7%
Grade 12 English	44.7%	17.1%	42.1%	69.2%	70.5%
Physics I	21.0%	13.0%	27.3%	23.3%	18.2%
Virginia & U.S. Government	28.2%	8.9%	22.9%	49.9%	58.6%

Course Enrollment Clusters

To consider the impact of course selection above Advanced Studies Diploma requirements more systematically, we examined the course enrollment records for clusters of courses taken within the same academic year (e.g., Grade 12 English plus Algebra II plus Physics I plus Virginia & U.S. Government would be one individual cluster). We used the same cohort as described previously in this section of the report with 15,750 unique high school seniors from the 2011–2012 academic year who achieved the Advanced Studies Diploma and later enrolled in one of 14 commonly attended Virginia colleges and universities.

When examining all possible course combinations for English, math, science, and social studies (SCED codes 1000–4999), there were 8,785 different course clusters taken across the 15,750 students in the cohort, which correspond to an average of less than 2 students per cluster. The distribution of cluster enrollment is heavily skewed, with only ten clusters that included a total enrollment of 50 students or more. Even the most common cluster was only present 100 times in the data set. The breadth of course clusters across high school seniors is driven by many factors including different course offerings at different schools, different combinations of electives, different student course tracks and timing along those tracks, and quality of reporting

from individual schools. We determined that using the set of all possible course combinations was impractical for analytical purposes.

Using guidance from our findings listed earlier in this section of the report, we next developed a second set of course clusters with more limited search criteria of the course enrollment records. Clusters were developed based on enrollment in any combination of three commonly taken English courses, four commonly taken Math courses, three commonly taken science courses, and four commonly taken social studies courses (see Table 2.9). Cluster assignments were based on all possible combinations of those courses, including differentiation within specific subjects. For example, a student who took AP Literature and Composition and AP Language and Composition simultaneously would fall in a different cluster than students who took only one of either of those courses. Students did not need to take one course within each subject to be considered for clustering; taking AP Literature and Composition alone and no other English, math, science, or social studies courses would also be a theoretically possible standalone cluster using our method. We reiterate that the clustering outcomes are sensitive to the quality of course enrollment reporting across the state and any systematic bias in reporting would impact the results presented herein.

Table 2.9. Commonly-taken high school courses used to identify course clusters.

English	Math	Science	Social Studies
English Grade 12 (SCED code 1004)	Math Analysis/Pre-Calculus (2104)	Biology II (3053)	Virginia & U.S. Government (4151)
AP Literature & Composition (1006)	AP Calculus AB (2124)	AP Biology (3056)	AP Government & Politics: US (4157)
AP Language & Composition (1056)	Probability & Statistics (2201)	Physics I (3151)	AP Government & Politics: Comparative (4158)
	AP Statistics (2203)		AP Psychology 4256

The more restrictive clustering criteria led to 844 unique clusters across the cohort. 718 students were not enrolled in at least one of the 14 courses considered for clustering. The most common cluster was the combination of Grade 12 English and Virginia & U.S. Government with no science or social studies course, which was the case for 1,203 seniors (7.6% of the cohort) in 2011–2012. 34 different clusters had enrollment of at least 100 students, and these clusters covered 54.5% of the cohort. The five most common clusters taken by the study cohort (excluding the ‘blank’ cluster with no enrollment in one of the examined courses) are identified in Table 2.10.

Table 2.10. The five most common clusters of courses taken by Virginia high school seniors who attain the Advanced Studies Diploma and enrolled in one of Virginia’s 14 largest institutions of higher education.

Cluster Rank	Courses in Cluster	Number of Enrolled Students	Percentage of Enrollment in Any Cluster
1	Grade 12 English Virginia & U.S. Government	1,203	7.64%
2	Grade 12 English Physics I Virginia & U.S. Government	522	3.31%
3	AP Literature and Composition AP Calculus AB AP Government & Politics: US	509	3.23%
4	Grade 12 English Probability & Statistics Virginia & U.S. Government	373	2.37%
5	AP Literature and Composition AP Government & Politics: US	355	2.25%

We next subjectively identified two groups of course clusters to represent different levels of high school course attainment. The first group (“Low”) only includes the most common cluster discussed above: Grade 12 English and Virginia & U.S. Government. We assigned five other clusters into a “High” group that included various combinations of standard and advanced placement English, math, science, and social studies courses (Table 2.11). The high clusters collectively totaled 1,228 students, approximately the same number as who were enrolled in the low cluster.

Table 2.11. Courses included in two different groups representing minimum Advanced Studies Diploma requirements (Low) and coursework exceeding the minimum requirements (High).

Low Group (n = 1,203)	High Group (n = 1,228)
Cluster L1: Grade 12 English, Virginia & U.S. Government	Cluster H1: AP Literature and Composition, AP Calculus AB, AP Government & Politics (US)
	Cluster H2: AP Literature and Composition, AP Statistics, AP Government & Politics (US)
	Cluster H3: AP Literature and Composition, AP Calculus AB, Physics I, AP Government & Politics (US)
	Cluster H4: AP Literature and Composition, AP Calculus AB, AP Biology, AP Government & Politics (US)
	Cluster H5: Grade 12 English, AP Calculus AB, Physics I, AP Government & Politics (US)

Across the 14 higher education institutions we examined, these clusters accounted for between 9.3% and 32.3% of the clusters taken by incoming students. The percentage of students enrolled in the high and low clusters (out of the total number of students attending each institution from the cohort) are shown in Table 2.12. There is large variability in the ratio of the number of students enrolled in the high cluster to the number of students enrolled in the low cluster across Virginia's higher education institution types. At the University of Virginia and William and Mary, 17–27 times as many students were enrolled in the high clusters as compared to the low. Ratios are also greater than one at George Mason, James Madison, Mary Washington, and Virginia Tech. The lowest ratios (0.01) were among students enrolling in Norfolk State and Virginia State.

We also found variability in the percentage of students enrolling in each of the different high clusters across institution types (Figure 2.1). For example, a higher percentage of students who enroll at William & Mary took the course combination represented by cluster H4 (the only cluster we examined with four AP courses) than any other institution in the Commonwealth. Compared to statewide averages, enrollment in cluster H5 (less emphasis on English than math and science) was a more common characteristic of students who attended institutions including Christopher Newport, James Madison, Virginia Commonwealth, and Virginia Tech.

Identifying clusters of courses that are associated with differential enrollment rates and different higher education institutions may provide useful benchmarking for students', parents', and guidance counselors' college readiness efforts. Students who aspire to maximize their postsecondary education options—even within the subset of students pursuing the Advanced Studies Diploma—need to be aware of the significant ramifications their course selection with respect to the types of institutions they may be able to attend. Based on the outcome of our interviews and surveys with Virginia guidance counselors and members of the Virginia College Advising Corps, we recommend continued analysis to identify and communicate course clusters that are characteristics of students enrolling at different types of institutions.

Students may be better positioned to make informed choices about course selection in high school if they are able to see, for example, that more than three times as many students who enrolled at Virginia Tech were enrolled in one of the five high clusters when compared to the low cluster. At a more nuanced level, the data show that a higher percentage of students who attend Virginia Tech were in cluster H5 (which has a greater emphasis on advanced math and science than English) than the statewide average and other selective institutions. This information can help students prioritize the particular courses in which they enroll if they know more about the types of higher education institutions they would consider attending. Continued analysis of these data should include refinement of appropriate cluster groups based on high school offerings, institutional profiles, and quality of course reporting data. Clusters could also be expanded into prior academic years to enable students, parents, and guidance counselors to more easily connect the dots between choices early in high school and options available in the final year.

Table 2.12. A comparison of enrollment in high school course clusters among Virginia students entering one of Virginia’s 14 most commonly-attended higher education institutions in 2012.

College or University Name	High Cluster Enrollment	Low Cluster Enrollment	Ratio of High to Low Cluster Enrollment	Enrollment in a Cluster other than High/Low
Christopher Newport University (CNU)	5.5%	6.8%	0.81	87.7%
College of William & Mary (WM)	23.7%	1.4%	17.00	75.0%
George Mason University (GMU)	5.2%	4.1%	1.29	90.7%
James Madison University (JMU)	7.2%	2.3%	3.08	90.5%
Liberty University (LIB)	2.3%	13.5%	0.17	84.2%
Longwood University (LONG)	1.6%	10.7%	0.15	87.7%
Norfolk State University (NSU)	0.2%	31.6%	0.01	68.1%
Old Dominion University (ODU)	2.0%	14.7%	0.13	83.3%
Radford University (RU)	0.5%	18.9%	0.03	80.6%
University of Mary Washington (MW)	6.7%	3.1%	2.19	90.3%
University of Virginia (UVA)	22.2%	0.8%	27.67	77.0%
Virginia Commonwealth University (VCU)	4.3%	6.5%	0.67	89.2%
Virginia Tech (VT)	13.1%	3.6%	3.68	83.4%
Virginia State University (VSU)	0.3%	32.0%	0.01	67.7%

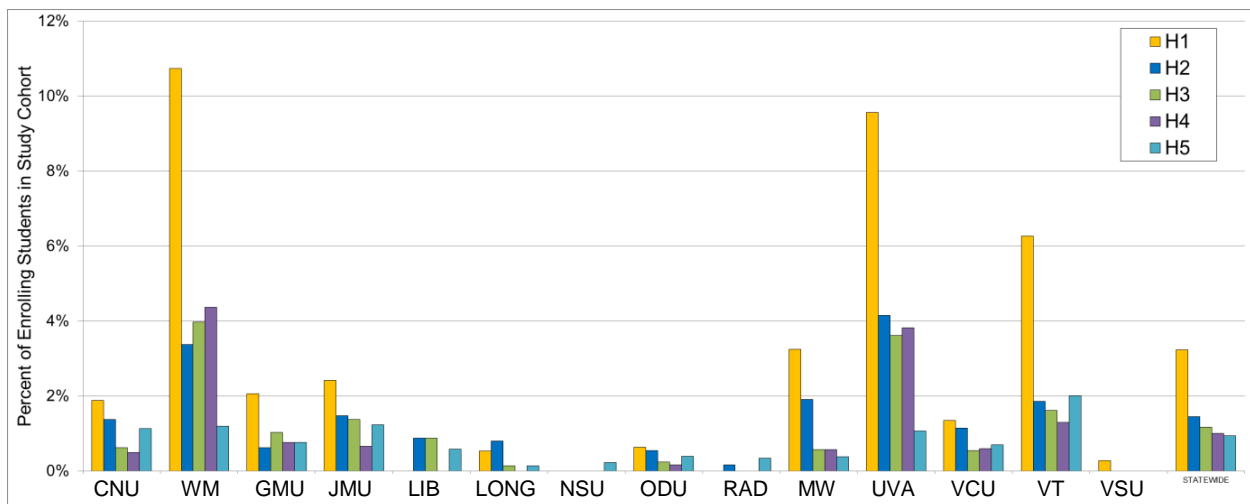


Figure 2.1. Percent of students in study cohort who were enrolled in each of the five high course clusters examined in this report separated by college and university of enrollment. The statewide average is shown on the far right hand side of the figure.

Course Cluster Offerings by School

Students at 237 different high schools across the Commonwealth were enrolled in one of the six course clusters (five high and one low) that we examined in the previous section. At least ten students were enrolled in one of these six clusters at 87 different high schools and between five and nine students were enrolled in these clusters at another 60 schools. Given that course enrollment is in part a function of course availability, we examined high and low cluster enrollment on a school-by-school basis. At schools where few students are enrolled in any of the high clusters as compared to the low cluster, it is possible that courses within the high cluster may not be offered. Given the influence of course-taking on college enrollment that we have demonstrated above, limited course offerings may significantly restrict the postsecondary education options available to high school students. Note that low enrollment in high clusters at any given school in this analysis does not necessarily mean that rigorous courses are not available at that school; other high clusters may be available to meet student needs that differ from the most common high clusters of courses statewide. However, given the widespread availability of many of the courses in the high clusters we established, we do not expect that non-traditional but equally rigorous courses are replacing those used in our clusters at a majority of high schools.

We found that the percentage of students enrolled in the high course clusters (out of the total number of students enrolled in one of the six clusters introduced above) was bimodal, with many more districts having nearly all or nearly no students enrolled in the high cluster versus a more even distribution (Figure 2.2). 108 schools had exactly zero students enrolled in a high cluster and 22 schools had exactly zero students enrolled in a low cluster (and thus 100% high cluster enrollment).

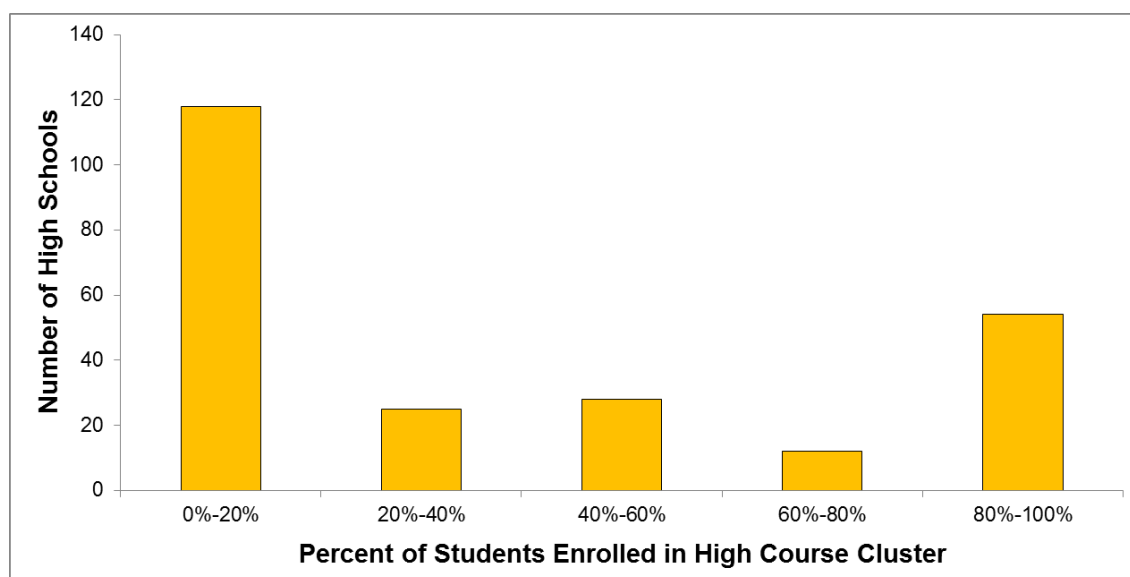


Figure 2.2. A histogram comparing the number of schools with different percentages of student enrollment in five clusters of “high” courses that exceed Advanced Study Diploma requirements. The number shown on the horizontal axis is the percent of Virginia high school seniors in the study cohort enrolled in a high course cluster out of the total number of students enrolled in either a high course or low course cluster as defined in this report.

The complete list of school-by-school cluster enrollments were provided to the Virginia Dept of Education as a separate spreadsheet, but a cross-section of Virginia high schools with enrollment totals in either cluster of at least ten students is shown in Table 2.13 below.

Table 2.13. A comparison of high school senior enrollment in high and low course clusters at a sample of Virginia’s high schools.

School Name	Total Enrollment in High and Low Clusters combined	Total Enrollment in High Cluster	Percent Enrollment in High Cluster
Albemarle High	25	21	84%
Carroll County High	11	0	0%
Centreville High	48	47	98%
Deep Run High	45	33	73%
Hampton High	15	2	13%
Hickory High	28	13	46%
I.C. Norcum High	27	0	0%
Louisa County High	14	0	0%

In future stages of our research, we intend to relate the findings concerning course enrollment and higher education enrollment to quantify how course offerings influence the college enrollment choices of Commonwealth students on a school-by-school basis. In this report we observed that course enrollment is a strong determinant of college enrollment (both in terms of individual courses and course clusters) and that enrollment in different types of courses varies across the Commonwealth, which may be a function of course offerings. We hypothesize that a measureable relationship will exist between the number of students enrolling at postsecondary institutions of different profiles and the number of students enrolled in different courses and course clusters on a school-by-school basis. We are also interested in determining if cases exist within Virginia where high schools have similar profiles in terms of student course enrollments but different profiles in terms of postsecondary education options pursued by graduating seniors. Finally, this analysis could be expanded to include students beyond those who achieve the Advanced Studies Diploma to paint a more complete picture of the pathway to higher education for all students in Virginia, building on preliminary work completed by our research team shared in a June 2014 presentation. Feedback from the Virginia Department of Education 1) to understand how VLDS data may not accurately depict course offerings, and 2) to identify particular courses and course clusters of interest, will help prepare our research team for this next stage of analysis.

Course Sequencing

As the course scheduling data within VLDS continues to be improved and added for future cohorts, VLDS will enable researchers and practitioners to explore the relationship between course sequencing (i.e., students’ course taking across grade levels) and postsecondary outcomes. Such a view of academic trajectories will greatly assist with the college planning process and help guidance counselors visually demonstrate to students and parents how courses taken in middle and high school relate to college enrollment. It directly responds to some of the ideas identified by guidance counselors and advisors in our qualitative data collection.

We provide an example of such a course sequencing approach for the 11th to 12th grade sequence of English courses for students who enrolled in the highly selective University of

Virginia, College of William and Mary, and Virginia Tech in Fall 2012 (Figure 2.3). We use English as the example for the sake of simplicity because the number of typical English course sequences was lower than the number of typical sequences for math, science, and social studies. The data used to build this sequencing analysis slightly differs from that used for the Advanced Studies Diploma-oriented analysis in that course data were included from multiple years and the cohort was not limited to Advanced Studies Diploma recipients.

Though the raw numbers shown in Figure 2.3 cannot be directly compared to other components of this report, the results add an important dimension to the overall theme that course enrollment is a highly important determinant of higher education enrollment. In the example shown, there are large differences in college enrollment outcomes across five different trajectories for English course sequences from junior to senior year. The trajectory with the highest number of students who attend a highly selective university is the most academically rigorous: 48.6% of students who took AP Language and Composition and AP Literature and Composition in the junior and senior year, respectively, enrolled at one of the three selective institutions we examined. There are interesting nuances that merit further investigation, such as the observation that the trajectory with the highest *percentage* of students enrolling at highly selective universities is not the most rigorous; a higher percentage of students who took Grade 11 English and AP Language and Composition in Grade 12 attended one of the three highly selective schools than those who took AP Language and Composition in Grade 11 and AP Literature and Composition in Grade 12. We recommend continued analysis of these trajectories to understand how other variables like non-English course enrollment, school-level course availability, college choice, and course grades relate to these observed patterns. We also recommend continued analysis of these trajectories extending back in time to provide information for students as early as possible in their high school career. With each new cohort added to the VLDS, this sequence will be able to be extended backward by one year.

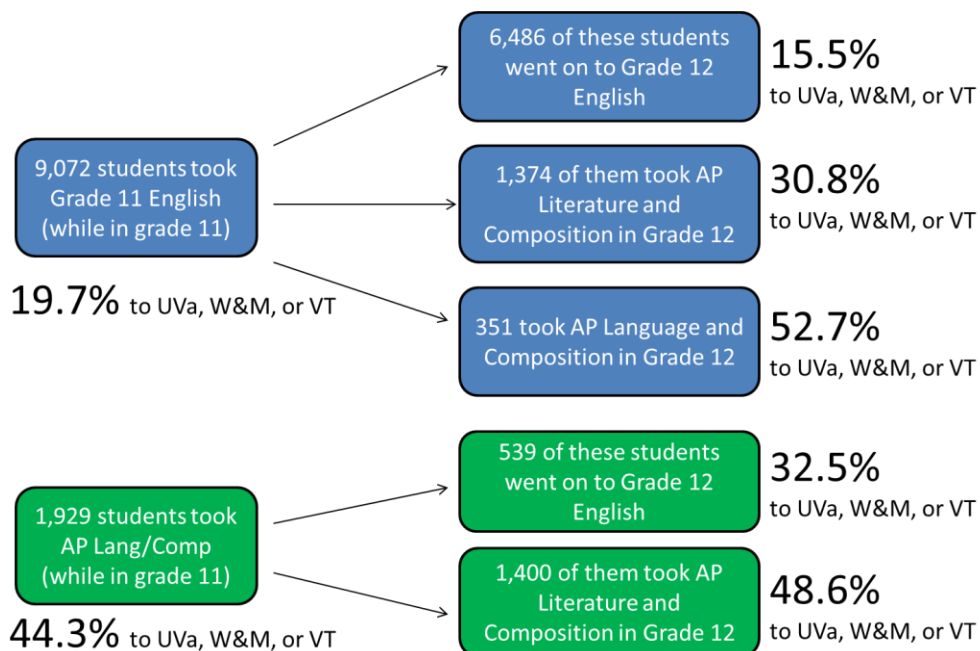


Figure 2.3. High school English course sequencing for students who enrolled in the University of Virginia, William and Mary, or Virginia Tech in Fall 2012. Note: categories are not mutually exclusive.

Summary

Most high school students in Virginia who attend a four-year postsecondary institution attain the Advanced Studies Diploma. In a cohort of more than 19,000 high school seniors we examined who graduated from a Virginia high school in 2012 and attended one of Virginia's most commonly attended four-year institutions in the fall of the same year, fewer than 10% had not attained the Advanced Studies Diploma. Meeting the course requirements for the Advanced Studies Diploma is a strong indicator that four-year postsecondary education is an option for a graduating senior.

Advanced Studies Diploma designation is not a strong differentiator of the *profile* of the higher education institution in which Virginia's high school students ultimately enroll. 85% of students enrolling at the University of Virginia, James Madison University, and Radford University—three representations of different institutional profiles across the Commonwealth—all achieved the Advanced Studies Diploma. More than half of Virginia students enrolling at Norfolk State had also attained the Advanced Studies Diploma.

Many high school students who pursue higher education in Virginia are taking courses beyond the Advanced Studies Diploma requirements in their senior year, and these high school course enrollment choices appear to be a much stronger differentiator of the profile of higher education institution in which these students enroll than the Advanced Studies Diploma. Students who ultimately enroll in institutions like the University of Virginia and James Madison University are much more likely to be enrolled in courses exceeding Advanced Studies Diploma requirements in their senior year (e.g., only 17% of students who attend the University of Virginia enrolled in Grade 12 English). These data may be especially helpful for students, parents, and guidance counselors in college preparedness efforts as they provide concrete evidence of the impact of course selection.

Grouping courses into clusters enables communicating the impact of course selection in a more holistic fashion and revealed similarly large differences with respect to college and university enrollment as examining courses on an individual basis. We found that enrollment in clusters associated with coursework exceeding the Advanced Studies Diploma requirements was linked with substantially higher percentages of enrollment in institutions characterized as highly nationally selective (e.g., 3.7 times as many students who enroll at Virginia Tech took a high course cluster in their senior year compared to a cluster representative of meeting minimum Advanced Studies Diploma requirements).

Finally, we observed that course cluster enrollment was highly variable across the Commonwealth, which may be indicative of variability in course offerings on a school-to-school basis. 108 schools in Virginia had no students enrolled in any of the five "high" clusters we examined with courses above Advanced Studies Diploma requirements even though these clusters were among the few dozen most commonly taken statewide, which raises potential concerns about the equality of education within the Commonwealth. Continued analysis comparing high school course enrollment and higher educational enrollment on a school-by-school basis is recommended to identify opportunities to maximize higher education options for all Virginia high school students.

Identifying Variation in Course Schedule Reporting

Overall Inventory of Course Listings and Assessments

We performed a comparison of high school course enrollment (available from the Student Schedule data set) and student state assessment records (available through the State Assessment Results data set). The objective of the comparison was to identify schools in which course enrollment may be under-reported relative to the number of state assessment tests taken, as the State Assessment Results data set is believed to have the lowest percentage of missing data.

We downloaded VLDS data for unique identifiers that had student records for the time period 2009–2012. Our aim was to construct a cohort of students who were enrolled as juniors in the 2011–2012 school year and then examine their course listings and assessment records. To do so, the following filtering criteria were applied:

- In the Student Records data set, students are listed as enrolled in grade 11 in academic year 2011-2012.
- Course enrollment data is extracted for these students (and only these students) from the Student Schedule data set. Duplicate and missing cases are removed.
- The course enrollment data are limited to courses with an enrollment date of academic year 2011-2012.
- State Assessment records were extracted for student identifiers that met the Student Records criteria above (if a student identifier was present in the State Assessment data set but not in the Student Records data set, it does not appear in this analysis. For the purposes of this report the Student Records data set is considered as the master reference for all possible students who may take a state assessment or enroll in a given high school course).
- The Grade Code listed in the State Assessment data set was 11.

After applying these filtering criteria, there were **99,099** unique student identifiers in the student records data set. **535,721** course enrollments were available from these students. The number of course enrollments available per student varied from zero to 30 (see Figure 3.1). The most common number of course enrollments available per student was seven, and over 86% of students with at least one course reported had between five and nine course enrollments available. As only 76,538 unique students appear in the course enrollments data set corresponding to the filtering criteria, we suspect that **more than 22,000** students have no courses reported for their junior year in 2011-2012. There are additional reporting concerns for students with an exceptionally high number of course enrollments. Our preliminary review of a number of individual cases revealed duplicate enrollments at multiple high schools as well as unexpected simultaneous enrollment (e.g., Grade 10, 11, and 12 English all taken in the same year) among the causes of these high counts.

The number of course enrollments available per high school (all course enrollments by all students in the cohort in their senior year) varied from **0** to **5,194** (Figure 3.2). There were 411 different schools available in the data set with at least one course enrollment. Of these schools, the median number of course enrollments available per school was **854** and the mean was **1303**. 25% of these schools reported fewer than 138.5 course enrollments and a separate 25% reported more than 2,255.

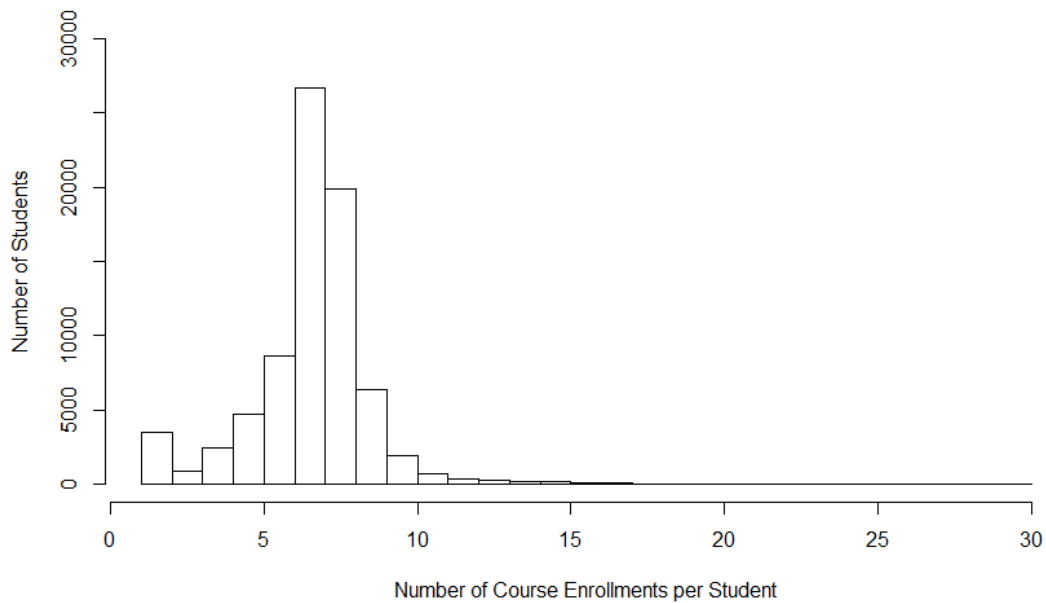


Figure 3.1: Histogram of course enrollments per student.

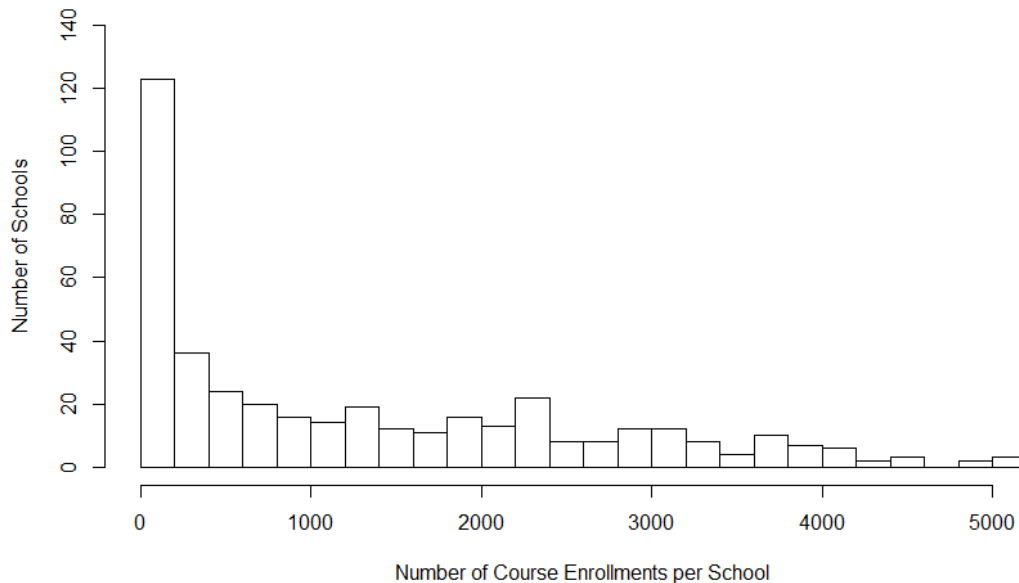


Figure 3.2: Histogram of course enrollments per school.

The number of enrollments available per course varied from **1** to **53,281** (Figure 3.3). There were 549 different courses available in the data set. The median number of enrollments available per course (statewide) was **193** and the mean was **975.8**. 25% of courses were taken fewer than 45 times, and a separate 25% of courses were taken more than 610 times. There were 105 courses with at least 1,000 enrollments and 8 courses with more than 10,000. The ten most common courses available in this data set are shown below in Table 3.1

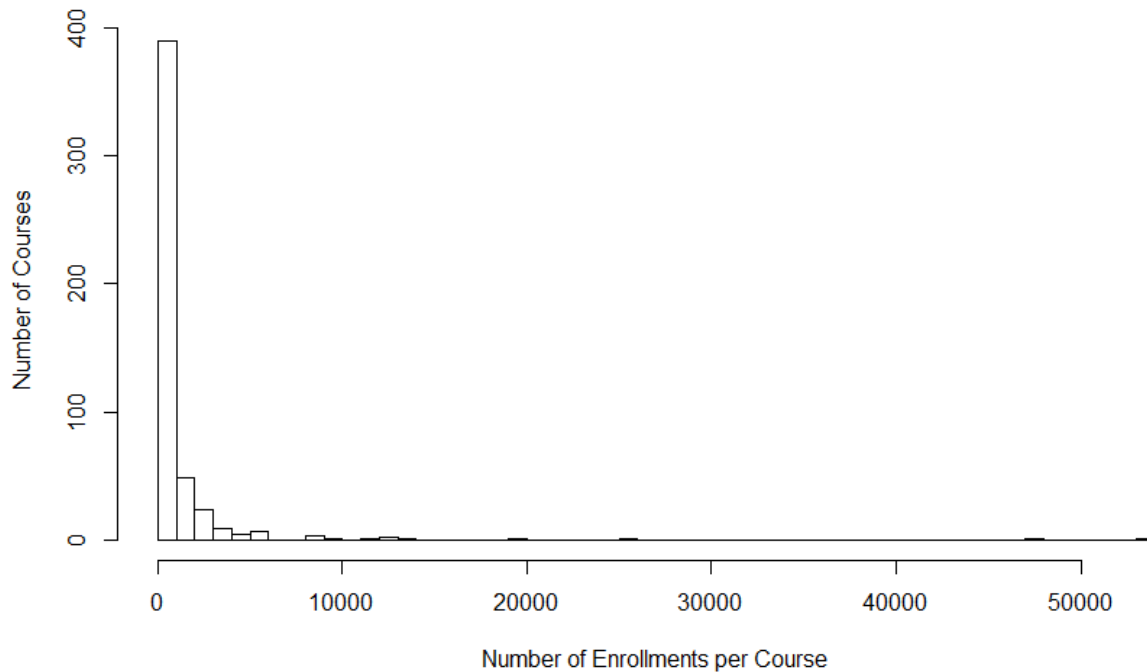


Figure 3.3: Histogram of enrollments by course, for courses with at least 10 total enrollments in the study cohort.

Table 3.1: Courses with the highest enrollment among the study cohort.

Rank	Course SCED code	Course Name	Number of enrollments
1	1003	Grade 11 English	53,281
2	4101	U.S. History – Comprehensive	47,506
3	3101	Chemistry I	25,667
4	2056	Algebra II	19,839
5	4104	AP US History	13,900
6	3151	Physics I	12,780
7	2104	Math Analysis/Pre-Calculus	12,502
8	2072	Geometry	11,539
9	6103	Spanish III	9,051
10	5154	Art I/Art Foundations	8,681

With respect to the State Assessment data set, after applying the filtering criteria to limit the data set to grade 11 exams taken by students listed in the student records data base as enrolled in grade 11 in school year 2011–2012, there were **356,706** assessment records (exclusive of duplicates). These records reflected 56 different SOL assessments given to high school juniors in academic year 2011–2012. The ten most common SOLs available in this data set are shown below in Table 3.2.

Table 3.2. The ten most commonly taken state assessment tests by students in the study cohort in 2011–2012.

Rank	SOL test code	SOL Name	Number of records
1	30	English: Reading (2002 standards)	82,415
2	170	Virginia and US History (2008)	80,601
3	2	English: Writing	75,070
4	15	Chemistry (1995 and 2003)	32,858
5	122	Algebra II (2009)	24,997
6	121	Geometry (2009)	14,906
7	14	Biology (1995 and 2003)	8,240
8	13	Earth Science (1995 and 2003)	6,869
9	172	World History II (2008)	6,096
10	21	Geometry (2001)	2,874

These ten SOLs represent more than 93% of the total assessments given to this cohort in the 2011-2012 school year.

Criteria for Matching Course Enrollments and Assessment Records

We determined that the course enrollment-assessment record comparison would be most fruitful if we focused on the most common English, Math, Science, and Social Studies courses for which Standards of Learning tests are required/most relevant (e.g., below AP level²). We identified the following course-SOL pairs with high enrollment (relative to other courses within the same subject) and high exam participation:

English: Grade 11 English paired with English: Reading and separately paired with English: Writing (a review of 1,000 random cases in the data set revealed that each of these SOLs was taken by between 40-50% of students enrolled in Grade 11 English).

Math: Algebra II paired with Algebra II (2009 standards)

Science: Chemistry I paired with Chemistry (1995 and 2003 standards)

Social Studies: U.S. History-Comprehensive paired with Virginia and US History (2008 standards)

More state assessment records than course enrollment records were available for all five of the pairs we examined (Table 3.3).

² We completed this analysis under the assumption that SOL testing requirements for students enrolled in AP courses vary across the state. We drew guidance from DOE's published materials on substitute testing for state assessments in identifying the course pairs used in this analysis (http://www.doe.virginia.gov/testing/substitute_tests/substitute_tests_verified_credit.pdf).

In high schools where a significant number of students complete AP courses and take the appropriately paired state assessment (i.e., they do not receive substitute credit), the methods used in this analysis will incorrectly lead to school districts being associated with large under-reporting of course enrollment data. We recommend consideration of AP course enrollment in continued examination of quality of reporting at the individual high school level.

Table 3.3. A comparison of the number of records available for paired high school courses and state assessments.

	Course enrollment records	State assessment records	Course reporting percentage
English - Reading	54,281	82,415	65.9%
English - Writing	54,281	75,070	72.3%
Math	19,839	24,997	79.4%
Science	25,667	32,858	78.1%
Social Studies	47,506	80,601	58.9%

We believe these patterns can be explained by the following:

- In general, course enrollment is under-reported relative to state assessment records by more than 20%
- A diversity of math, science, and social science courses are available for students to take in their junior year, and thus the number of students enrolled in any particular class will be lower than the number enrolled for English
- Students likely take courses other than US History-Comprehensive that direct them toward the US History SOL (e.g., at some high schools, Advanced Placement Government & Politics where substitute SOL credit is not offered)
- Students likely take courses other than Grade 11 English that direct them toward the English: Reading and English: Writing SOL (e.g., at some high schools, Advanced Placement Literature and Composition or Advanced Placement Language and Composition where substitute SOL credit is not offered).

More information about the complete set of SOL requirements based on course enrollment would help identify broader criteria for comparing the two data sets. Our working hypothesis is that patterns in reporting observed using these course-SOL pairs are representative of patterns that would be observed if a more complete assessment could be performed. If there is a bias in the school-level course offerings that direct students toward the SOLs we examined, the course reporting percentage for that school may be inaccurate. More rigorous examination of schools with reporting percentages of interest (unexpectedly high or low) is encouraged.

After limiting the data sets to these five SOLs alone, 539 schools had records of at least one state assessment.

Comparison of Course Listings and Assessment Records by School

Across the five subject pairs we examined, under-reporting of courses relative to state assessments was more common than over-reporting. We examined first the percentage of course listings available compared to the number of state assessment records available on a school-by-school basis (Figure 3.4). There were more than 150 schools that reported 0% of the paired courses for each of the SOLs we examined. On average across the five pairwise comparisons, 20.4% of schools reported exactly 100% of the enrollment expected based on SOLs. Over-reporting by any amount was roughly equally as likely as slight under-reporting (up to 25%), with an average of 102.4 schools in the former category and 97.8 in the latter. Math and science were the courses with the fewest number of schools under-reporting from a percentage basis.

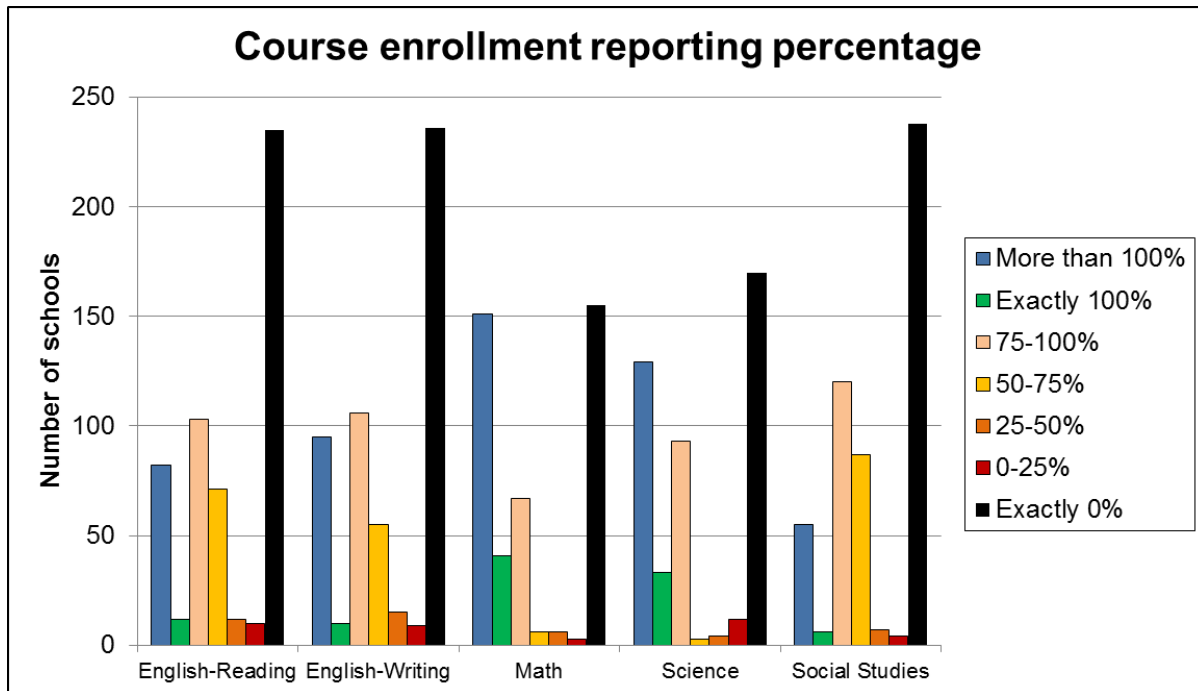


Figure 3.4. A comparison of course enrollment listings and state assessment records on a school-by-school basis. The comparison is made on a percentage basis and percentages below 100% indicate fewer course enrollment listings than state assessment records.

We next examined the absolute difference in the number of courses listed by school compared to the number of state assessment records available (Figure 3.5). We adopted the convention that a positive number is associated with under-reporting. Absolute difference comparisons reflect both reporting practices and school size. From an absolute standpoint, the most common occurrence was under-reporting between 0 and 100 cases, which was observed for an average of 287.4 schools across the comparisons we made. More schools over-reported course enrollment than had a perfect match between the two. Science and math were again the courses with the fewest number of schools under-reporting.

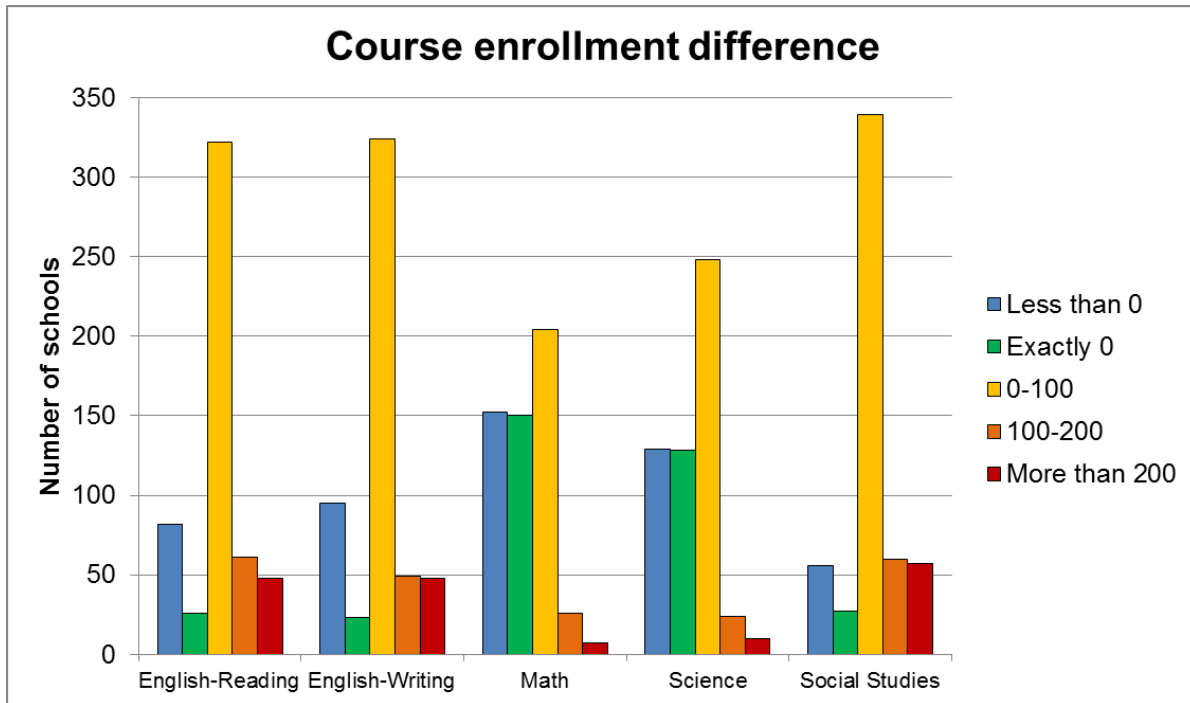


Figure 3.4. A comparison of course enrollment listings and state assessment records on a school-by-school basis. The comparison is made on an absolute difference basis and differences greater than zero indicate fewer course enrollment listings than state assessment records.

The full list of schools, course enrollments, assessment counts, reporting percentages, and enrollment differences on a subject-by-subject basis was included as a separate document for the VA Dept. of Education. To assess overall quality of reporting, we next summed the enrollment records and assessment records across all five subjects we examined to come up with overall reporting percentages and differences. We note that this metric is more heavily weighted by English than the other subjects (because two SOLs were examined). While these overall metrics based on five course-SOL pairs may not be identical to those that would be derived from examination of every course-SOL pair, we anticipate that they are highly representative of statewide patterns because these five courses and SOLs comprise a significant portion of all course enrollments and assessments.

On a school-by-school basis, overall reporting percentages ranged from 0% to 278%. The mean was 48.8%. 238 schools gave at least one assessment of the five examined and reported zero enrollments from related courses. The course reporting differences ranged from -438 to 540, and the mean was 207.8 courses under-reported. There were five schools that had a reporting difference of more than 2000 and 37 schools that had a reporting difference of more than 1000. These totals are also available in the separate document. The five schools with the greatest reporting differences are shown below in Table 3.4.

Table 3.4. High schools in Virginia with the largest reporting differences between course enrollments and state assessments. A positive reporting difference indicates that more assessment records than enrollment records are present in the data sets examined.

Rank (reporting difference)	Division number and school code	School name	Reporting difference	Reporting percent
1	075-0290	Battlefield High	2,493	0.0%
2	075-0080	Osborn Park High	2,443	0.0%
3	075-0060	Woodbridge High	2,268	0.0%
4	089-0424	Colonial Forge High	2,036	0.0%
5	075-0680	Stonewall Jackson High	2,006	0.0%

Of the 30 schools with the largest differences in reporting, 10 were in division #128 (Virginia Beach Public Schools) and 9 were in division #075 (Prince William County Public Schools).

Summary

We observed large inconsistencies between the course listing and state assessment records in many schools in the Commonwealth. Under-reporting of courses compared to state assessment records was more prevalent than over-reporting or perfect matches across five pairs of commonly-taken courses and state assessments we examined.

The Virginia Department of Education may consider using these results, and those contained in the supplementing documents, to identify schools that may be incompletely reporting course listings to VLDS. An exhaustive investigation of course listing-state assessment record mismatches on a school by school basis is beyond the scope of this initial report. Such an investigation would be helpful for drawing more definitive conclusions with respect to the extent of under-reporting at the individual school level and potential causes. As the conclusions drawn by any researcher utilizing VLDS course listing data are likely sensitive to the quality and completeness of the underlying data set, we recommend continue efforts to maximize course enrollment reporting from all schools in Virginia.