UTAH SYSTEM OF HIGHER EDUCATION

GENERAL REPORT

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Advantages of Completing College Acceleration Courses in High School

Key Findings

- High school students who enroll in college acceleration courses are more likely to be female and white.
- Seventy percent of enrollments are general education courses.
- High school students enrolling in college acceleration courses are 2.4 times more likely to enroll at a USHE institution than similar students who do not take those courses.
- Most awards earned when students receive their high school diploma are certificates in the health professions.

Purpose

The number of jobs across the United States requiring postsecondary education continues to grow (Carnevale, Smith, and Strohl 2018; Hemelt, Schwartz, and Dynarksi 2020). Concerns expressed by business leaders, policymakers, and the public include too few students enrolling in higher education (Carnevale and Rose 2015), the affordability of college (Looney and Lee 2018), and decreasing levels of college completion (Shapiro et al. 2015).

One solution to address these issues has been to enroll students in college-level courses and certificate programs while still in high school. Students are enrolled in college acceleration courses where they are awarded college credit toward technical or degree-granting colleges upon completion and often receive high school credit. Students who enroll in college acceleration courses are more likely to graduate from high school, enroll in college within one year of receiving their diploma, and are less likely to need developmental college courses (Shields et al. 2021). While most studies examined courses in which students receive both high school and college credit, the present analysis looks at all college courses students participated in regardless of whether they received high school credit.

History

Higher education institutions offered enrollment to high school students starting 50 years ago (Miller et al. 2017). California was the first state to adopt a policy establishing dual credit courses (Mohker and McLendon 2009). Other early adopters include Arkansas, Virginia, and Utah. Between 1976 and 2000, 16 additional states adopted college acceleration policies. In the next 20 years, 23 more states adopted policies that promoted college acceleration courses. Currently, only three states lack a formal college acceleration policy: Alaska, New Hampshire, and New York (Miller et al. 2017).

Early research showed that enrollment was limited to academically gifted students (Iatarola, Conger, and Long 2011; Speroni 2011a). Justifications for such restrictions focused on providing a challenging curriculum to bored students (Bailey and Karp 2003). Systemic policies prevented more students from enrolling by establishing eligibility criteria. For example, Texas requires students to meet a specific score on standardized tests (Miller et al. 2017). Florida requires both GPA and placement exam scores (Tobolowsky and Allen 2016). In response to legislators' concerns regarding the cost of college acceleration programs, some states require students to pay tuition and fees for college acceleration courses (Bailey, Hughes, and Karp 2002). At one time, the Chicago school district superintendent proposed capping the number of students who could enroll. In other cases, eligibility is determined by individual institutions (Museus, Lutovksy, and Colbeck 2007; Pierson, Hodara, and Luke 2017). Current research demonstrates that these restrictions remain (Duncheon and Relles 2020; Miller et al. 2017; Museus, Lutovksy, and Colbeck 2007; Roughton 2016).

One response to these barriers has been the promotion of "early college high schools." Supported through the Early College High Schools Initiative in 2002, over 280 such schools now exist. Early college high schools are small schools where all students are expected to take college-level courses. Often, these schools are housed on a college or university campus. The hope is for students to earn an associate degree by the time they graduate high school. The Early College High School Initiative was intended to support underserved high school students giving them an opportunity not available before (Lauen et al. 2017; Zeiser, Song, and Atchison 2021). Several studies have shown positive impacts during and after high school for early college high school participants (Edmunds et al. 2017; Haxton et al. 2016).

Key Terms

Charter Schools. A publicly-funded high school whose governing board is separate from a district but has the same accountability as district schools.

Career and Technical Education (CTE). Course credits are part of an organized course sequence that prepares students for employment in a specified field.

District Schools. A publicly-funded high school that is administered by a local district and district board.

College Acceleration Course. Any college course offered during high school, regardless of the funding source and whether students receive high school credit. Advanced Placement and International Baccalaureate classes were excluded from this study.

Locale. A high school geographic designation by the National Center for Educational Statistics of the type of area where a school is located. Locales may be designated as one of four categories: Rural, Town, Suburban, and City.

Other Schools. An educational opportunity that is not governed by a district, charter, or private board. Many students are homeschooled.

School Size. Four classifications are based on the size of the school population: small (less than 500 students), moderate (between 500 and 1,000 students), large (between 1,001 and 1,500 students), and very large (more than 1,500 students).

Underrepresented Student. Students identified by race or ethnicity whose presence in higher education is lower than state representation. For this study, underrepresented students include those who identified as Black/African American, Latinx/Hispanic, Native American/Alaskan Natives, Pacific Islander, and those who claim two or more races.

Prior Research

Several positive effects of college acceleration have been identified. Students who complete college acceleration courses are more likely to earn a credential than those who enroll later in college (Zeiser et al. 2021). For example, Ison (2022) found that students who enrolled in college acceleration courses were more likely to earn a bachelor's degree within five years of enrolling at a higher education institution. Such students earn their credentials in less time (Ganzert 2014). Additionally, these graduates tend to earn higher salaries (Phelps & Chan, 2016). Some argue that students develop better writing and problem-solving skills and create necessary study habits by enrolling in college acceleration courses (Morgan, Zakhem, and Loloff Cooper 2018).

Several researchers (Hutchins, Arshavsky, and Edmunds 2018; Jett and Rinn 2020; Allen, Thompson, and Collins 2020; Roberts, Takahashi, and Park 2018) concluded that participating in college acceleration courses increases high school students' aspirations for attending college. College acceleration courses also teach non-academic skills such as perseverance in overcoming barriers, increased self-confidence, and better college preparation (Burns et al. 2019; Garcia et al. 2018). For example, Lauen and colleagues (Lauen et al. 2017) found that students who had participated in college acceleration courses were more likely to persist in completing college applications. Further, Allan and colleagues (Allan, Thompson, and Martinez-Cosio 2019) suggest that college acceleration courses provide an easier transition to college.

Providing college acceleration courses to underrepresented students has large payoffs. While enrolled in college acceleration courses, Native Hawai'ian youth demonstrated improved mathematics and English grades and reduced behavioral referrals (Roberts, Takahashi, and Park 2018). Roughton (2016) found that underrepresented students in North Carolina overcome financial barriers to attending college by

earning associate degrees before graduating college. Once they matriculate into higher education institutions, underrepresented students demonstrate higher GPAs and persist beyond the first year (Jones, 2014). However, fewer underrepresented students participate in such college acceleration programs (Museus, Lutovsky, and Colbeck 2007; Zinth 2014).

Objective

This project aims to describe the landscape of high school students who enroll in college acceleration courses facilitated by the Utah System of Higher Education institutions.

The study addressed the following research questions:

1. Which students in Utah participate in college acceleration courses?
2. What do students accomplish by participating in college acceleration courses?
3. How do college acceleration courses affect student enrollment in Utah's public higher education institutions?

Data and Methods

Most of the data used came from the Utah System of Higher Education enrollment and graduation files. Students were identified and tracked from their first college course attempted in high school to the completion of their first term in college. The Utah State Board of Education provided high school graduation data. Five high school graduating cohorts (2017–21) were tracked. This data allowed attendance rates for USHE institutions to be calculated.

The final sample included 186,608 participating students and 52,823 non-participating students. Participation in college acceleration courses consisted of enrolling and completing at least one college acceleration course in high school. Pertinent characteristics of students at the high school level are presented.

See the Appendix for a more detailed description of the research methods.

Results

Individual variables are reported as proportions or percentages, whereas comparisons of two or more variables are presented in cross-tabulations. Five-year trends are also presented.

In examining whether college acceleration courses facilitated students attending college, a comparison group was matched with those students who participated in accelerated college courses. This matching process is known as propensity score matching. Students were matched on gender, race, cohort year, and high school GPA. The two groups were compared through logistic regression as to whether they attended college immediately after high school.

See the Appendix for a more detailed description of the analysis.

Participation

From the five years of data, 25.0% of public high school students completed at least one college acceleration course. This percentage includes district and charter high schools but excludes private schools. Students who participated in college acceleration courses were predominantly female (53.5%). As a comparison, high school demographics are slightly more male (51.4%) and have been for at least the last eight years. The other racial/ethnic groups with percentages above 1.0% included Latinx/Hispanic (12.7%), multi-racial (2.8%), and Asian Americans (1.6%).

College Acceleration Course Students Tended To Be White Females From Suburban Schools.

Table 1. Student participation in college acceleration courses in high school by gender and race.

	2017	2018	2019	2020	2021
Female	54.1%	52.9%	53.5%	53.9%	52.9%
Male	45.9%	47.1%	46.5%	46.1%	47.1%
Asian American	1.5%	1.6%	1.6%	1.6%	1.6%
Black/African American	0.7%	0.8%	0.9%	0.8%	0.8%
Latinx/Hispanic	11.5%	12.0%	13.9%	13.3%	12.3%
Native American	0.9%	1.0%	0.8%	0.8%	0.7%
Pacific Islander	0.6%	0.6%	0.5%	0.6%	0.4%
White	82.3%	81.7%	79.5%	79.5%	81.4%
Two or more	2.4%	2.4%	2.7%	3.3%	2.9%

Comparing the demographics of students participating in college acceleration courses to state demographics reported by USBE highlight discrepancies. White students comprise the majority of high schools (73.9%) and college accelerated courses. However, the proportion of white students in Utah's high schools has trended downward for at least the last eight years. Latinx/Hispanic students make up 17.3% of Utah high schools, and students who identify as two or more races are the only groups trending upwards. Other groups with lower participation rates regarding demographic representation include Black/African American (1.4% of all high school students), Native American (1.0%), and Pacific Islander students (1.6%).

Most participating students enrolled through public/district (89.7%) or charter schools (7.5%). Private school students and those who sought high school education through other venues were less than one percent. Of the private schools, 78.6% were enrolled at Catholic schools, 12.7% were in non-denominational private schools, and 8.7% were from other religious affiliations.

While most students who participated in college acceleration courses came from suburban schools (54.0%), suburban students are a larger proportion of Utah high schools (64.8%). Higher representation came from rural and town students. Rural high schools comprise 5.7% of college acceleration courses and

only 2.2% of Utah's high school population. High school students from towns included 19.1% of college acceleration courses compared to 14.0% of Utah high schools. Students attending in cities had slightly higher participation, with 21.2% of college acceleration participation compared to 18.9% of the state high school population.

Some students enrolled in college acceleration courses (7.2%) were enrolled at two USHE institutions while in high school. Most secondary enrollments were with regional universities (WSU, 55.4%; UVU, 19.0%) or SLCC (14.8%). Of all enrollments in college acceleration courses, 1.1% were enrolled at a technical college.

Participation by High School

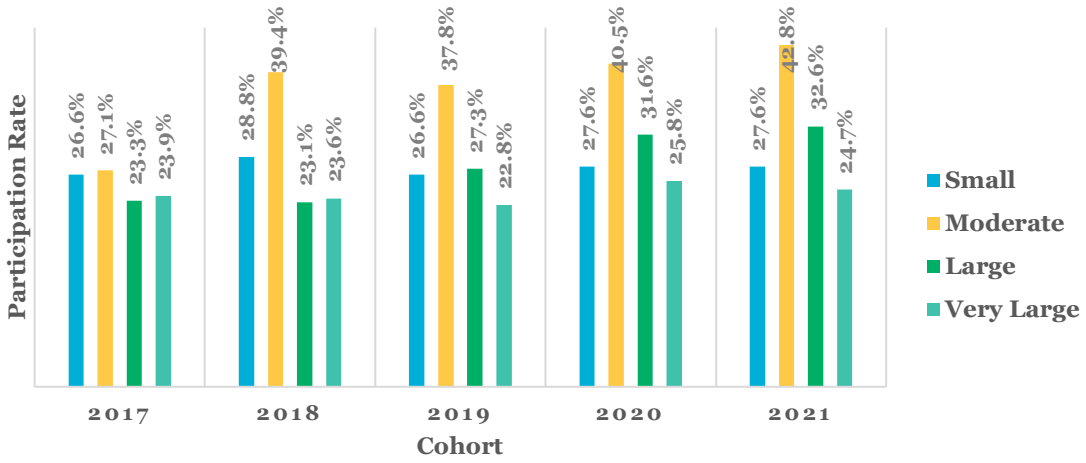
High schools from all 41 districts participated in some degree with college acceleration courses. Most charter and many private high schools also participated.

When looking at the locale, or geographic region, little difference existed in 2017. This homogeneity could represent a common belief about who should participate in college acceleration courses; however, such beliefs appear to change in the following years. In 2018, schools in cities and suburbs (to a lesser degree) appeared to have enrolled more students in college acceleration courses.

Figure 1. Percent enrolled in college acceleration courses by cohort and locale.

Somewhat similarly, students in moderate-sized schools (between 500 and 1,000 students) are more likely to be enrolled in accelerated college courses. Many of these schools are in suburban areas within Salt Lake, Davis, and Utah counties. Students in large schools (between 1,000 and 1,500 students) enroll more every year. This finding is consistent with Ambrose, Slate, and Moore (2016; see also Lee & Smith, 1997), who identified better academic outcomes for students who attend moderate-sized schools.

Figure 2. Percentage of high school students enrolled in college acceleration coursework by cohort and school size.



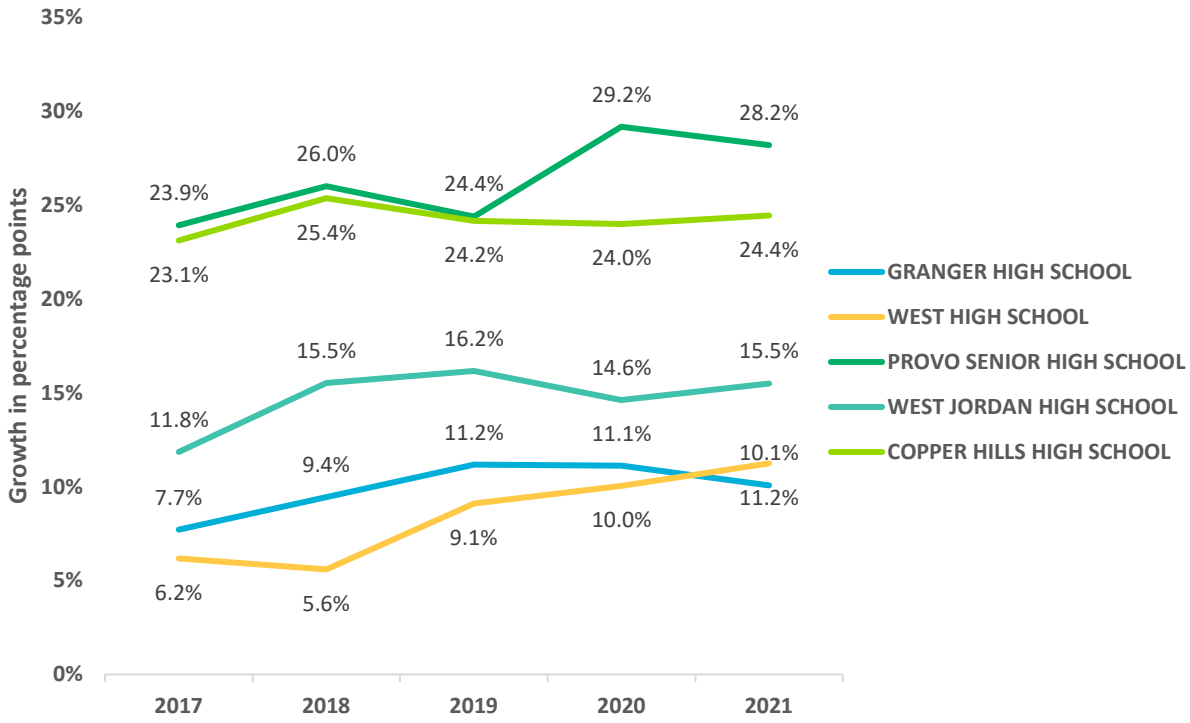
High Schools with the highest average participation rate (proportion of 10th, 11th, and 12th-grade students enrolled in college acceleration courses) were four "early college high schools." Utah's first early college high schools were established in 2003 as a partnership between school districts and USHE institutions (UCAS, 2022). Support came from the Utah Partnership for Education and The Bill and Melinda Gates Foundation. Except for Itineris Early College High School, the early college high schools are on USHE campuses.

Table 2. Early college high schools with the highest average proportional enrollment in college acceleration courses. County proportions are given for underrepresented populations for comparison.

High School	Institutional Partner	Enrolled in College Courses	BIPOC Enrolled	County BIPOC	Low Income Enrolled	County Low Income
UT Success Academy	UTU	93.2%	14.6%	20.9%	6.3%	20.9%
Northern Utah Academy for Math, Engineering, and Science (NUAMES)	WSU	90.0%	16.9%	17.9%	6.9%	16.3%
Success Academy	SUU	84.5%	12.6%	16.2%	22.8%	31.6%
Utah County Academy of Sciences (UCAS)	UVU	79.5%	30.8%	22.2%	17.5%	34.3%
NUAMES - North	WSU	60.4%	32.0%	28.7%	10.7%	34.5%
Itineris Early College	SLCC	59.9%	37.5%	37.6%	18.1%	33.4%
Academy for Math, Engineering, and Science (AMES)	UU	34.5%	44.7%	37.6%	22.7%	33.4%

One goal for early college high school by the state legislature was to serve underrepresented populations by providing academic preparation with the school paying tuition. As reported in the Utah State Board of Education's 2021 enrollment report, 26.6% were non-white, and 30.2% were low-income students. As seen in Table 2, these schools are not serving many low-income students relative to their counties' underlying populations. This discrepancy may have identified a pinch point in educational equity.

Figure 3. High school cohort with the highest growth in college acceleration courses by proportion enrolled. The legend lists schools from the highest slope to the lowest.



Accomplishments

Courses

61.4% of enrollments among degree-granting institutions were in general education. 30.4% were CTE, with 10.7% being classified as both general education and CTE. The remaining 8.3% were neither CTE nor general education.

The top enrolled general education subject areas were Social Science (21.0%), Composition (19.5%), and Quantitative Literacy (15.4%). These proportions were consistent across the five years examined.

Table 3. Top three enrolled classes for each general education category with the percentage of all college acceleration students enrolled in that course.

American Institutions	Composition	Fine Arts	Humanities	Life Science	Physical Science	Quantitative Literacy	Social Science
POLS 1100 (49.9%)	ENGL/WRTG 1010 (70.8%)	MUSC 1010 (25.6%)	COMM 2110 (33.0%)	BIOL 1010 (36.3%)	CHEM 1010 (40.3%)	MATH 1050 (54.0%)	FIN 1060 (24.2%)
HIST 1700 (44.7%)	ENGL/WRTG 2010 (29.2%)	ART 1010 (19.7%)	HUMA 1100 (21.2%)	NUTR 1020 (22.6%)	PHYS 1010 (17.9%)	MATH 1030 (18.9%)	PSY 1010 (22.6%)
ECON 1500 (2.1%)		ART 1020 (15.6%)	ENGL 2200 (15.2%)	BIOL 1610 (10.8%)	CHEM 1110 (11.3%)	MATH/STAT 1040 (17.1%)	CJ 1010 (8.6%)

If Math 1010 had been included, it would make up 21.5% of all math classes, but Math 1010 (Intermediate Algebra) is not classified as a quantitative literacy course. Other developmental math courses (numbered below 1000) were less than 0.1% in this group of students.

According to participation rates, the three most popular foreign language courses were SPAN 1020, SPAN 1010, and SPAN 2010. Enrollments in Spanish made up 59.9% of foreign language courses. French had 14.4% of the enrollments, and American Sign Language had 12.9%.

Credits Earned

By the time they graduate from high school, a student who takes college acceleration courses in high school will have earned a median of 6 credit hours. These credit hours are equivalent to two typical college courses. For the most part, the average number of credit hours earned has remained constant (see Figure 6).

Despite the median number of courses taken, 39.4% of high school students completed only one course. Students who tend to take more than one course tend to be female (56.2%), white (82.3%), and suburban (56.7%). Males, Black/African American, Latinx/Hispanic, and Native American students tended to complete one course. Students who participated in courses sponsored by technical colleges were more likely to take one college acceleration course. In comparison, students enrolled in courses sponsored by degree-granting institutions were more likely to take more than one college acceleration course.

70% OF COLLEGE ACCLERATION COURSES COMPLETED ARE GENERAL EDUCATION COURSES.

Awards

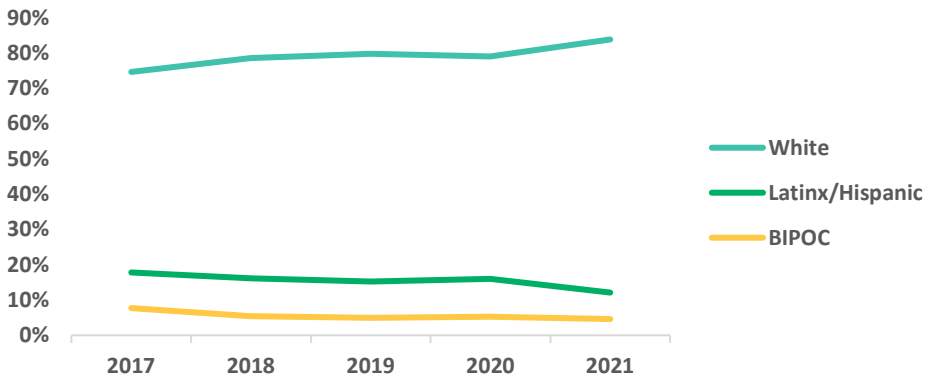
Only 5.4% of students earned awards, and only 1.0% of awards were associate degrees. Most (92.8%) of the awards earned were short-term certificates or those programs that required less than 900 hours of seat time. The remaining 6.2% were certificates that require 900 hours or more. Almost all (96.8%) certificates awarded came from technical colleges.

Table 4. Type of institutional awards earned by gender and race. Percentages are totaled by column.

	Certificate < 900 hours	Certificate ≥ 900 hours	Associate	Total
Female	75.3%	55.9%	56.9%	73.9%
Male	24.7%	44.1%	43.1%	26.1%
Asian American	0.7%	1.4%	5.4%	0.8%
Black/African American	0.8%	0.6%	-	0.8%
Latinx/Hispanic	15.1%	12.3%	17.9%	15.0%
Native American	0.5%	0.4%	0.3%	0.5%
Pacific Islander	0.8%	0.7%	0.3%	0.4%
White	74.6%	78.5%	79.8%	80.1%
Two or more	3.3%	2.6%	2.6%	2.4%

Female students earned a greater proportion of awards, which remained consistent across all five cohorts. However, aggregating awards earned by racial breakdown matches the proportion of students enrolled. The percentage of white students earning credentials consistently increased from 74.6% for the 2017 cohort to 83.8% for the 2021 cohort, while all other students earned fewer awards each year. The Latinx/Hispanic decreased from 17.8% (2017 cohort) to 12.1% (2021 cohort).

Figure 4. Award proportion breakdown by race/ethnicity over time.



While district schools accounted for 91.7% of students enrolled in college accelerated coursework, they supplied only 88.5% of students earning awards. Students from charter schools earned 7.1% of all credentials, consistent with the proportion of their enrollment. While less than 1% of all enrollments combined, private schools (2.1%) and the other category (2.3%) earned an oversized percentage of awards.

Table 5. Percent of high school enrollment and credentials earned by locale.

	High School Enrollment	Award Earned
City	19.3%	20.3%
Rural	5.3%	6.8%
Suburb	58.5%	47.7%
Town	16.9%	25.2%

As seen in Table 5, almost one-half of the awards were from students enrolled at suburban high schools, but less than the proportion of high school enrollment. Students from towns earned an oversized proportion of college credentials relative to their enrollment. Students in urban and rural areas earned credentials slightly higher relative to their enrollment. Town and rural high schools consist of approximately 10% of Utah's public high school students (USBE 2021) but comprise 32% of all college awards earned by the time they earn their high school diplomas. Two groups of students may be represented in these numbers. The first may be a segment of students attending small-town high schools who see college credentials as a means to enter the workforce immediately after high school. The second group of students, primarily from the suburbs, may be seeking a bachelor's degree without concern about earning an associate degree.

HIGH SCHOOL STUDENTS WHO TAKE COLLEGE ACCELERATION COURSES WERE 2.4 TIMES MORE LIKELY TO ENROLL AT A PUBLIC COLLEGE.

Most awards earned were certificates, both those requiring less than 900 clock hours (92.8%) and those requiring more than 900 clock hours (6.2%). Most certificates earned (77.9%) were in the health professions as certificates under 900 hours. When combined with the high percentage of women earning awards, these health profession awards may represent a large number of women enrolling and earning certified nursing assistant certifications. That the CNA certification only requires 100 clock hours may provide a pathway allowing entrance into the health professions immediately after graduation.

The most common ages for earning a certificate were 16 (27.4%) and 17 years old (59.8%). Some were as young as 14 or 15 years (8.8%). Far fewer were 18 (4.1%), which would indicate seniors are earning fewer certificates compared to sophomores or juniors.

Higher Education Enrollment

To evaluate how college acceleration courses affect attending a USHE institution, two groups of students were matched on gender, race, cohort year, and GPA. The first group completed college acceleration courses, and the second group did not. Students who participated in college acceleration courses were more likely to attend college than those who did not1. The odds of attending college were 2.4 times the odds for a similar student who did not take college accelerated courses.

[1] $B = 0.88$, SE = 0.01, p <0 .001, $X^2 = 4884.16$, AIC = 139235

Women are more likely to enroll in a USHE institution after high school graduation than men. While Asian Americans and whites comprise a larger proportion of college students, a significant percentage of Latinx/Hispanics also enroll.

Table 6. Enrollment at a USHE institution by gender and race according to high school cohort.

	2017	2018	2019	2020	2021
Female	67.6%	66.3%	62.1%	56.4%	60.2%
Male	32.4%	33.7%	37.9%	43.6%	39.8%
Asian American	2.5%	2.4%	2.0%	1.9%	2.3%
Black/African American	1.3%	0.8%	1.0%	1.0%	0.9%
Latinx/Hispanic	13.6%	13.2%	13.0%	12.0%	11.1%
Native American	0.6%	0.6%	0.7%	0.6%	0.5%
Pacific Islander	0.7%	0.6%	0.6%	0.6%	0.5%
White	75.3%	78.7	79.4%	79.9%	80.8%
Two or more	2.6%	3.0%	2.7%	3.3%	3.3%

When continuing higher education studies, far more students come from district schools than any other school. Students from other educational options also make up a greater proportion relative to high school enrollments, while private school students are proportional to their enrollments. Far fewer students who attended charter schools seek further higher education. The loss of charter school students may reflect a needs assessment of UCAC advisors at charter high schools. Also, this may reflect students choosing postsecondary options outside of USHE.

Table 7. Percent of high school students who enrolled in college acceleration courses in high school and continued to a USHE institution after matriculation.

	Enrolled in High School	Enrolled at USHE
Public	91.7%	93.4%
Charter	7.3%	5.8%
Private	0.6%	0.6%
Other	0.05%	0.2%

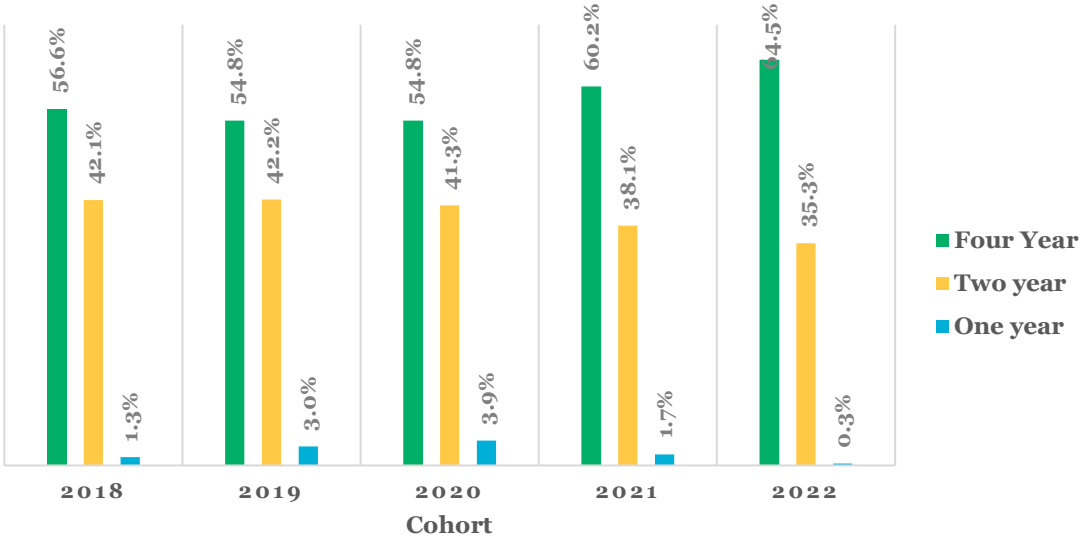
When looking at the locale of high school students enrolling in USHE institutions, most who do enroll after high school come from suburban high schools (62.3%). Far fewer come from cities (18.8%), towns (14.1%), and rural areas (4.8%) relative to their enrollment rates.

Enrollment Goals

Most college acceleration students who enroll at a USHE institution seek a four-year degree compared to one or two-year awards. The last two cohorts show an even greater interest in four-year degrees. As seen in Figure 4, the increase is in seeking four-year degrees with a decrease in students seeking one- and two-

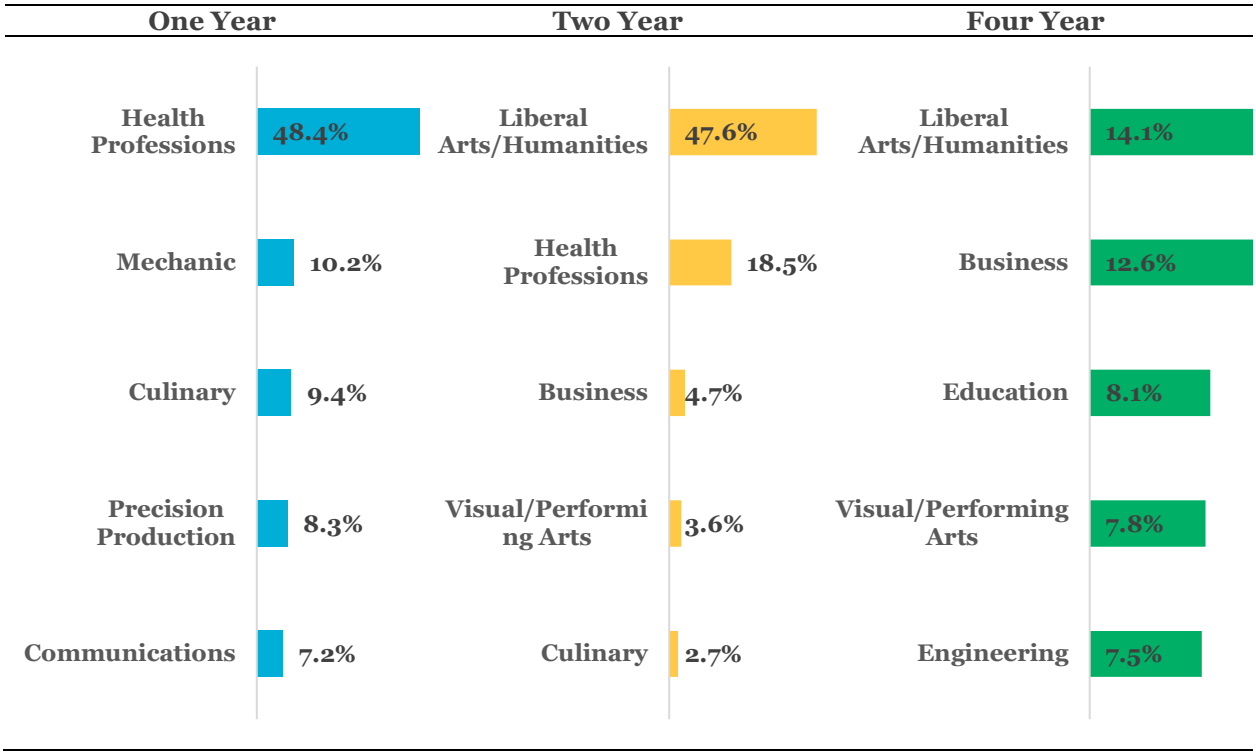
year credentials. One reason for the decline in certificate-seeking students may be that they are acquiring the skills they need for employment and moving into jobs without seeking additional education. Reports from technical colleges are that students are recruited for work before earning their credentials (USHE 2021). Students may no longer pursue associate degrees as they earn college credits in high school. After succeeding in college acceleration courses, they may perceive a four-year degree as an attainable goal (Jones 2014). Additional research is needed to identify if this is the case in Utah.

Figure 5. Award type sought by students and high school cohort.



Interests in specific industries were not consistent across the type of award sought. For one and two-year programs, the one consistent theme was the high percentage of students who sought credentials in the health professions. For two and four-year programs, common industries included business and visual and performing arts. Many students enrolled in two and four-year programs also sought degrees in liberal arts and humanities programs. One item to note is that students interested in four-year programs had a much more diverse interest. Only two industry families were greater than 10 percent, business, liberal arts, and humanities.

Figure 6. Top five CIP families by degree sought.



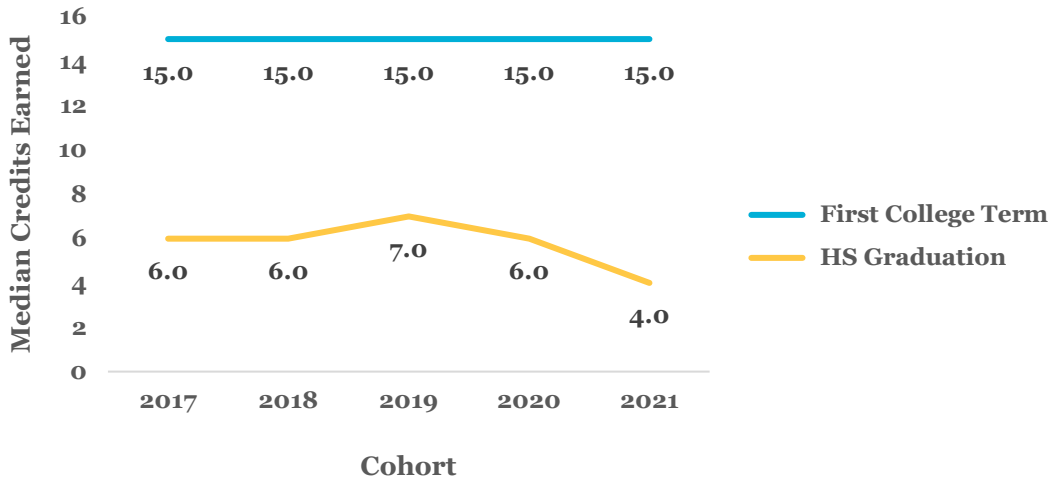
First College Term

Over the five years studied, the median number of credit hours earned from college acceleration courses was 6. The number of credits earned increased until it plateaued in 2020. These credits may provide students with a buffer during their first year at college (Allen, Thompson, & Martinez-Cosio 2019). Students reported to Allen and colleagues (2019) that college acceleration courses are a "safety net" in response to unforeseen circumstances. They may also provide flexibility in course selection or in changing their major.

After the first term at college, the median number of credit hours earned increased to 15. Logically, the total term credit hours earned were proportional to their accomplishments in high school. To graduate in four years, students must take 15 credits for two semesters each year or an equivalent. This low average may suggest that many students did not use prior earned credit as a buffer but as an opportunity to ease into higher education by taking fewer courses.

The range of students earning 30 credits in their first year at college was reported to be between 22.4% and 27.6% over the years analyzed in USHE's High School Feedback Reports (available here). This rate declined over the past four years. Several known factors contribute to the small number of students earning 30 credits a year, including high school graduates engaging in service-learning opportunities and students attending part-time because of financial strain or family responsibilities (Brock 2010; Cleveland-Innes 1994; De Brey 2021).

Figure 7. Median total credits earned at the end of high school and after the first college term. The first college term represents what was earned in high school plus credits earned after the first term in college.



Implications

In meeting the goals of the Utah Board of Higher Education strategic plan, college acceleration courses could provide a pathway to success. Increasing the number of underrepresented students enrolled at USHE institutions in college acceleration courses has not been adequately followed. Current efforts to support underrepresented students have impacted few. Three high schools (Utah County Academy of Sciences, NUAMES – Ogden, and Itineris Early College) have successfully recruited a more inclusive group of students into college acceleration courses. Additional research could examine how these schools developed recruitment and support practices that could be shared with other high schools.

Utah high school students who complete college acceleration courses are more likely to attend college. Based on the courses completed (Table 3), they focus on meeting their general education requirements. This would suggest most will pursue bachelor's degrees. This finding is consistent with prior research (Burns et al. 2019; Garcia et al. 2018; Karp et al. 2007). While the parameters of this project did not allow for tracking these students to completion, prior research suggests a majority will earn a bachelor's degree (Ison 2022). In line with earlier studies, college acceleration courses have benefited those high school students who were already college bound. The current Utah Board of Higher Education seeks to encourage a broader range of high school students to participate in college coursework while in high school.

Limitations

This data is restricted to students who enrolled in Utah's public institutions. Students who enrolled in private higher education institutions or attended college out-of-state are excluded. This prevents a comprehensive portrait of Utah's college-going students. Further, Utah's culture of religious service right

after high school tends to obscure the number of students attending university immediately after graduation. Postsecondary enrollment is undercounted.

A second limitation is that data about students who enrolled in Advanced Placement or International Baccalaureate courses are unavailable. One of the assumptions in this study is that students who did not enroll in college acceleration courses in high school probably enrolled in related courses such as Advanced Placement or International Baccalaureate.

Finally, study participants were limited to those who started college acceleration courses in high school between 2017 and 2021. Students in the later years include only those whose first college courses were as high school seniors. Younger students could not be included in analyses related to college enrollment. Additionally, students who participated in religious service between high school and college were probably missed in the college-going analysis with this narrow sampling frame.

Appendix

Methodology & Results

The study identified students by matching Utah State Board of Education high school records with the USHE enrollment database. The USBE graduation file was matched with degree-granting and technical college enrollment, plus certificate and AA/AS awards from both degree-granting and technical college institutions within the time frame.

Student Data

The final sample size was 186,608 students collected from 2017 to 2021. Of these students, 53.5% identified as female and 46.5% as male. Most students identified as white (79.8%), and 13.3% as Hispanic/Latinx. All other races/ethnicities comprised the remaining 6.9%. Student ages ranged from 13 to 21 years old. The logistic regression required an additional 52,476 students who did not enroll in college acceleration courses.

Course Data

Courses coded as general education were counted. Frequencies by year and general education are presented. Math 1010 was included, and though it is not considered Quantitative Literacy, it is coded as preparatory or as a developmental course. Courses from the Technical Colleges were not included in this part of the analysis.

Variables

Academic Year. The high school academic year begins in August. Any enrollment for the summer was not included until the student graduated from high school.

Award. Any college-level credential earned. Three credentials are included: a certificate requiring less than 900 clock hours, a certificate requiring more than 900 clock hours, and associate degrees.

Award Intent. The award or degree intent is identified by the amount of time expected to complete the credential requirements. Three options are available: one-year award, two-year award, and four-year award. The two-year award includes both certificates and associate degrees.

Charter Schools. A publicly-funded high school whose governing board is separate from a district but has the same accountability as district schools.

CIP Family. The name related to the first two digits of the six-digit Classification of Instructional Programs coding system from the U.S. Department of Education National Center for Educational Statistics.

Career and Technical Education (CTE). Course credits as part of an organized sequence of courses that prepare students for employment in a specific field.

College Acceleration Course. Any college course offered during high school, regardless of the funding source and whether students receive high school credit. Advanced Placement and International Baccalaureate classes were excluded.

District Schools. A publicly-funded high school that is administered by a local district and district board.

Earned Credit Hours. The total number of college-level credit hours earned by the student. Credit is documented as clock hours at the technical colleges. These were converted to credit hours by dividing by 30.

High School Growth. The rate of enrollment at the high school level. The rate was calculated as the slope of student participation over five years.

Locale. A high school geographic designation by the National Center for Educational Statistics of the type of area where a school is located. Locales may be designated as one of four categories: Rural, Town, Suburban, and City.

Low income. Free or Reduced Lunch recipients are used as a proxy for identifying low-income students.

General Education. Courses that provide broad knowledge and skills to prepare students to function in society. Credits are applied toward an associate or bachelor's degree.

Other Schools. An educational opportunity that is not governed by a district, charter, or private board. Many of these students are homeschooled.

School Growth. The calculated slope of the proportion of students enrolled in college courses relative to the total 10th through 12th-grade student population over the five years of data.

School Size. The student population of the school. Four categories were used. Small schools had a student population of less than 500; moderate-sized schools had between 500 and 1000 students; large schools had between 1001 and 1500 students; and very large schools had more than 1500 students. These delineations are based on Lee and Smith (1997) and Scott, Ingels, Shera, Taylor, and Jergovic (1996).

School Type. A category system that is identified by funding and governance. There are four school types: district, charter, private and other schools. The definition of each is included in this list.

Secondary Enrollment. A student enrolled at two USHE institutions in the same year. Institutions with a later start date were classified as secondary.

Underrepresented Student. Students identified by race or ethnicity whose presence in higher education is lower than state representation. For this study, underrepresented students include those who identified as Black/African American, Latinx/Hispanic, Native American/Alaskan Natives, Pacific Islander, and those who claim two or more races.

Methods

Most of the analyses were descriptive. Much of the data is presented in percentages to provide a standardized presentation. Analysis over time was evaluated with a repeated measures analysis of variance. Only significant interactions between time and the other variables are presented.

To predict the effects of college acceleration courses on students attending college, several logistic regression models were created. Two groups were created as a comparison; those who completed college acceleration courses and those who did not. To create an equivalent group of students as a comparison, students who enrolled in concurrent enrollment (CE) courses were matched with non-participating college students through propensity score matching. Propensity score matching strengthens causal inference over traditional quasi-experimental designs common in education research. This procedure identifies a "statistical twin" for each CE student from the comparison group based on multiple criteria (Hemelt et al., 2019). Matching was accomplished in the R package Matchit (Ho, Imai, King, Stuart, Whitworth, & Greifer, 2022). Both groups consisted of 52,823 students in either group or 105,646 high school graduates.

Results

Locale and school size repeated-measures analysis of variance

A repeated-measures analysis of variance was conducted with each community variable as the independent variable and cohort year as a repeated variable to explore the influence of community factors on students completing college acceleration courses. The analysis was conducted at the school level, with counts converted to percentages to provide a standardized comparison of category types. The two community variables were locale and school size. Because of empty cells between the two community variables, a mixed analysis of variance could not be conducted. Instead, two separate analyses were conducted.

Table A.1. Locale mean percentage by cohort year with standard deviations. The number of schools is in parentheses.

	Rural (n = 28)		Town (n = 29)		Suburb (n = 70)		City (n = 36)	
	M %	SD %	M %	SD %	M %	SD %	M %	SD %
2017	28.5	16.3	28.6	17.3	26.9	19.7	19.4	15.6
2018	28.6	17.3	26.9	17.7	25.7	19.8	22.9	22.0
2019	25.6	13.7	28.2	16.0	26.8	15.7	23.2	20.4
2020	24.7	10.6	30.5	16.8	30.0	18.3	26.6	23.0
2021	23.0	12.4	32.0	14.3	29.6	17.3	26.8	24.3

In examining the interaction between locale and cohort year, a significant interaction was found, $F_{(12, 596)} = 4.10$, $p < 0.001$, partial $\eta^2 = 0.07$. Schools within cities, or urban areas, enrolled a greater percentage of all students after 2017. Also, rural schools enrolled a smaller percentage of students than town, suburb, and city schools in the two most recent years. Means are presented in Table A.1. One significant main effect was found for cohort year ($F_{(4, 636)} = 4.65$, $p = 0.001$, partial $\eta^2 = 0.03$).

Table A.2. School size mean percentage by cohort year with standard deviations. The number of schools is in parentheses.

	Small (n = 59)		Moderate (n = 20)		Large (n = 28)		Very Large (n = 56)	
	M %	SD %	M %	SD %	M %	SD %	M %	SD %
2017	25.9	19.8	24.7	21.9	23.1	11.0	22.2	12.6
2018	27.8	23.2	29.5	28.1	23.	15.6	23.6	11.6
2019	25.3	19.8	28.7	22.2	27.1	13.1	25.4	11.5
2020	25.8	20.2	31.6	26.7	31.5	15.3	28.5	12.7
2021	25.1	20.6	32.8	24.6	32.3	14.3	28.0	13.2

The interaction between cohort year and school size was significant, $F_{(12, 596)} = 3.86$, $p < 0.001$, partial $\eta^2 = 0.07$. Moderate schools enrolled significantly more students than small, large, and very large schools after 2017. Means are available in Figure 4. The only significant main effect was cohort year ($F_{(4, 596)} = 12.99$, $p < 0.001$, partial $\eta 2 = 0.08$).

College Acceleration Courses Taken Chi-square

Differences between the number of college acceleration courses taken (one vs. more than one) by demographic and school variables were examined using chi-square tests of homogeneity. Chi-square is a non-parametric procedure appropriate for frequency counts. Each demographic or school variable was analyzed separately. The number of courses was dichotomous, one course and more than one course.

When examining gender, significant differences occurred between gender and the number of college acceleration courses, $\chi^2(1, n= 132,223) = 517.03$, $p < 0.001$. A larger proportion of men completed one course, while women were more likely to complete multiple courses. When looking at race, white students tended to take more than one course, while Black/African American, Latinx/Hispanic, and Native American students were more likely to take only one college acceleration course, $\chi^2(6, n= 132,511) = 297.89$, $p < 0.001$.

When investigating school type, a surprising relationship was identified. Students at charter schools were more likely to complete more than one college acceleration course, while students at Catholic and public district schools completed only one course $\chi^2(7, n= 132,511) = 813.86$, $p < 0.001$. Students who participated in courses sponsored by technical colleges were more likely to take one course, while students enrolled in courses sponsored by degree-granting institutions were more likely to take more than one college acceleration course, $\chi^2(1, n= 132,511) = 4234.05$, $p < 0.001$.

USHE Attendance Logit Models

Three logit models were created. The dependent variable was attending a USHE institution after high school. This model had only one dichotomous predictor, participation in college acceleration courses. Two groups were created through propensity score matching.

Table A.2. Binomial logistic regression model

Predictor	Estimate	St Error	z-score	p	AIC	odds-ratio
Intercept	-0.70	0.01	-76.01	<0.001	139,235	0.50
CAC	0.88	0.01	69.01	<0.001		2.41
X^2	4884.16					

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