

The Expanding Landscape of Online Education: Who Engages and How They Fare

A Research Brief

By Lisa Barrow, Wesley Morris, and Lauren Sartain*

This research brief summarizes findings and includes tables and figures from our full [paper](#).

The COVID-19 pandemic forced colleges and universities across the nation to switch the way they delivered instruction from primarily in-person course formats to exclusively online. Now, with campuses back to regular business, online and hybrid course formats are here to stay with most colleges continuing to offer courses in a variety of modalities to meet student demand. Offering courses online may give students greater flexibility and freedom over their schedules, especially for students who may be juggling work and/or family responsibilities. On the other hand, students may struggle more in online courses than in their in-person courses if the quality of instruction is lower or if connections with faculty or peers are more limited.

In this brief, we highlight findings from our paper, “The Expanding Landscape of Online Education: Who Engages and How They Fare,” which describes patterns in online course taking among undergraduate students enrolled in any University of North Carolina System institution from Fall 2012 to Spring 2020. Specifically, we found the following:

1. In Fall 2019, nearly 40 percent of UNC System undergraduate students enrolled in at least one course online. Online education was expanding, even before the pandemic, and student enrollment in online courses varied greatly across institutions and departments.
2. Female students, older students, and students with lower high school test scores and GPA were more likely to enroll in online courses than their peers.
3. In online courses, students earned both higher and lower grades than in their in-person courses, though GPAs were higher when students took at least one course online than when they took all courses in person.
4. Students who took a higher share of credits online were more likely to attain a Bachelor’s degree within four or six years compared to similar students who took fewer credits online.

Question 1: How Common Was Online Course Taking Among Undergraduate Students?

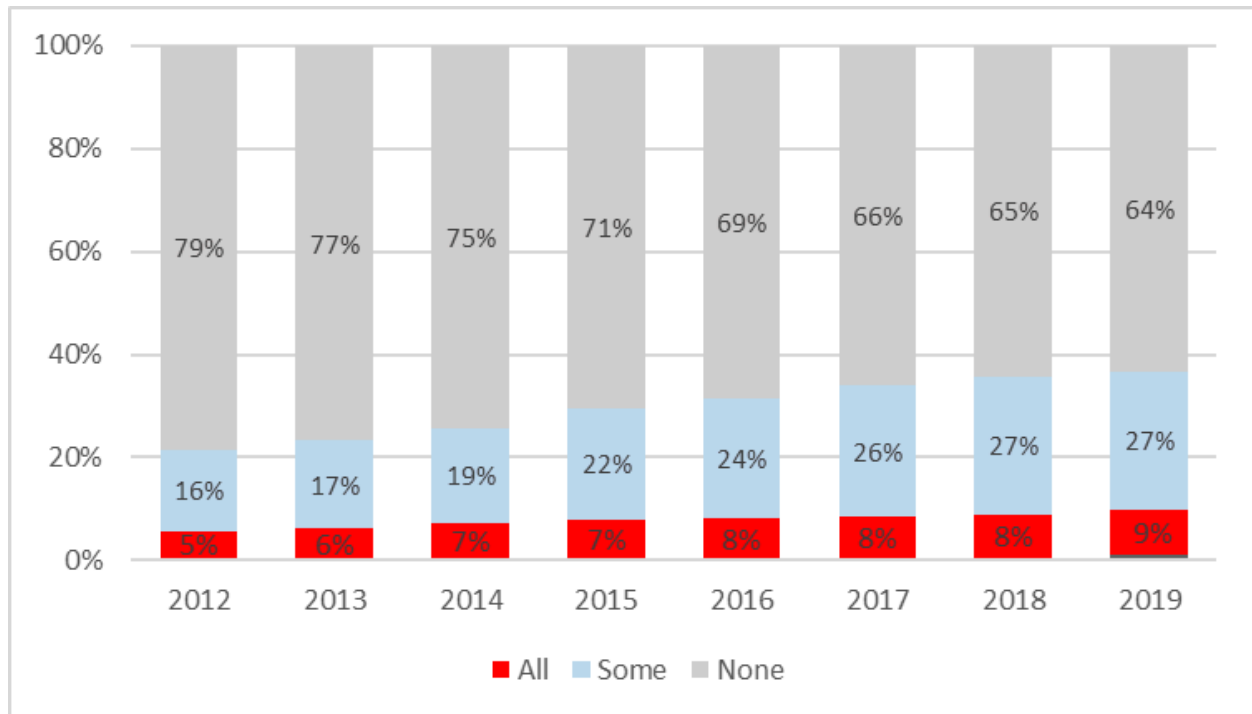
Takeaways: Online course taking had risen rapidly in the years leading up to the pandemic with around 2 in 5 undergraduate students enrolled in at least one online course in Fall 2019. The typical student took a mix of online and face-to-face courses - rather than all of their courses in one modality.

Prior to the pandemic, online course taking was becoming increasingly common. In the 2019-20 academic year, nearly 40 percent of UNC System undergraduate students were enrolled in at least one online course (Figure 1 Panel A). In fact, the percentage of students enrolled in at least one online course nearly doubled between 2012 and 2019. Notably, online course enrollment was much higher during the summer terms than in the academic year. In 2019, about two-thirds of students took at least one class online in Summer 2019 (Figure 1 Panel B) compared to 36 percent of students during the same academic year.

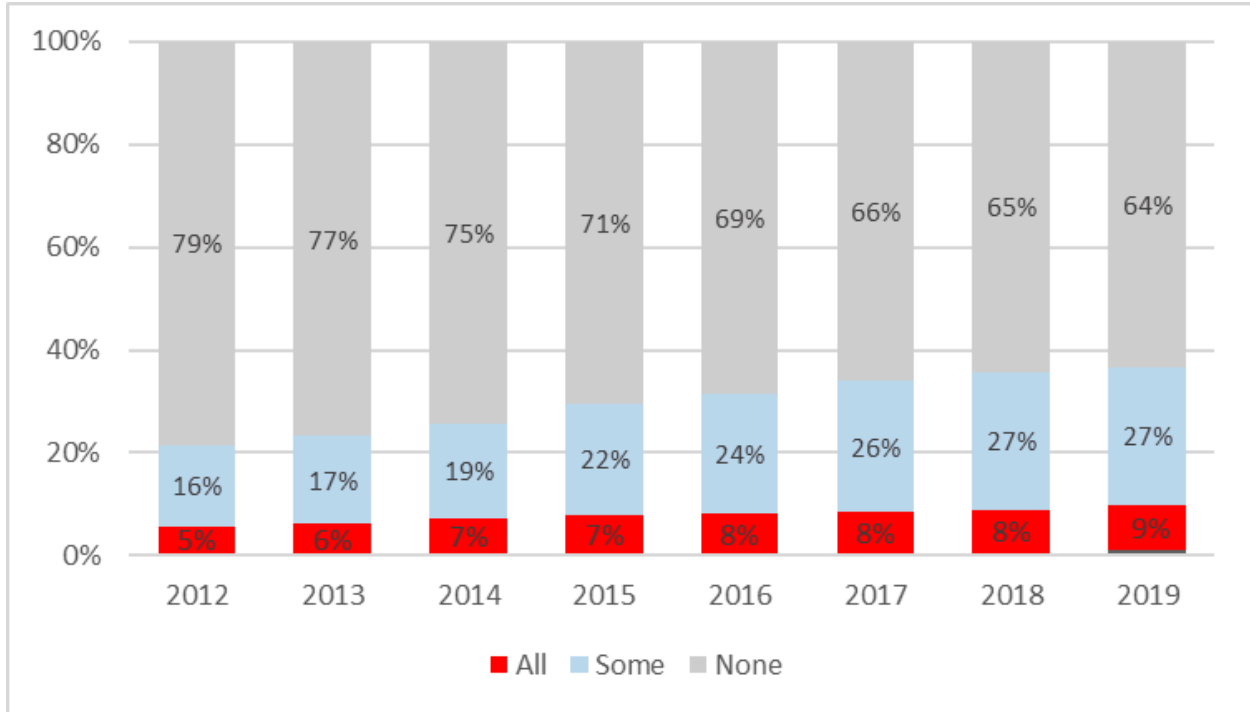
Figure 1. The percent of students who took any online courses doubled between 2012-13 and 2019-20

Percentage of UNC System undergraduate students taking online courses over time

Panel A. Academic year terms



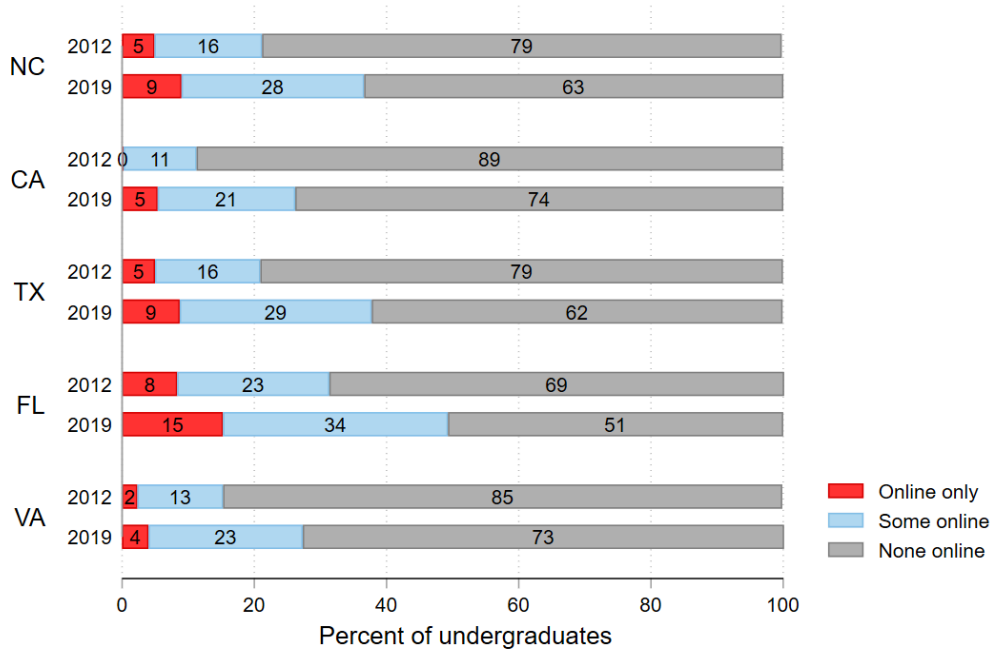
Panel B. Summer terms



Notes. Figure taken from Barrow et al. (2024).

This growth in online course taking was not unique to undergraduate students in North Carolina. Across the nation, the percentage of students enrolled in at least one online course during their postsecondary career rose by nearly ten percentage points from 2012 to 2018. There were similar trends in other states with large public college and university systems (see Figure 2). While the rate of online enrollment in these states in 2012 varied, each university system experienced sizable increases in the percentage of students enrolling in online courses.

Figure 2. Online course taking has increased in college systems nationwide
 Percentage of students by online enrollment across states and over time



Notes. Figure taken from Barrow et al. (2024).

Another interesting online course-taking pattern emerged from the data. While we may think of students as being either exclusively “online” or “in-person,” most UNC System undergraduate students who took classes online tended to take a mix of both online and in-person courses.

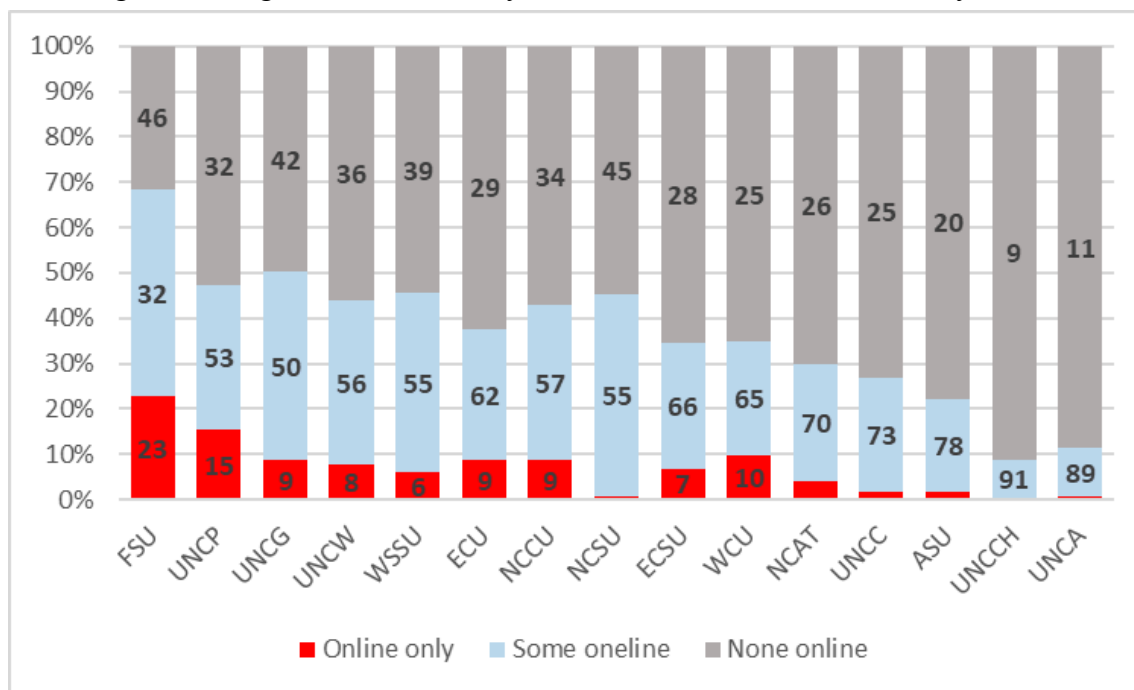
Question 2: What Settings Had the Highest Rates of Online Course Enrollment?

Takeaways: Online course enrollments varied considerably across UNC System institutions and departments. Across institutions, the percent of students who took at least one course online in Fall 2019 ranged from about 70 percent to about 10 percent. Across institutions, students were more likely to take courses online in professional schools (e.g., education, health) than in other departments.

Most UNC System campuses had a considerable portion of students enrolling in all or some of their courses online, though students' access to, and enrollment in, online courses varied greatly across institutions (see Figure 3). For example, nearly 70 percent of students at Fayetteville State University (FSU) took at least one course online in Fall 2019. At the same time, there were campuses, such as UNC Chapel Hill and UNC Asheville, where enrollment in an online course was still relatively rare at about 10 percent of students.

Figure 3. Online course taking rates varied widely across UNC institutions

Percentage of undergraduate students by online enrollment at each UNC System institution



Notes. Figure taken from Barrow et al. (2024). Data shown are for the Fall 2019 semester. Bars are sorted left to right by the institution's admission rate (highest to lowest).

We also found that university departments varied widely in terms of the share of course enrollments that were online (see Table 2). Generally, STEM departments had lower levels of undergraduate online course taking (6 percent in the 2018-19 academic year), while professional

schools had a higher share of undergraduate online course enrollments (e.g., 27 percent of course enrollments in the health professions were online).

Table 2. Students were most likely to take courses in professional schools online compared to other departments

Online course enrollment by department

	<u>Percent of Course Enrollments That Are Online</u>			
	AY 12-13	AY 18-19	Summer 13	Summer 19
STEM	4%	7%	15%	37%
<i>Physical Sciences</i>	2%	3%	7%	23%
<i>Biological Sciences</i>	4%	6%	13%	30%
<i>Mathematics</i>	3%	7%	12%	41%
<i>Engineering</i>	2%	5%	7%	13%
<i>Computer Sciences and IT</i>	12%	14%	61%	75%
Fine Arts and Humanities	6%	11%	35%	65%
Social Sciences	8%	15%	47%	75%
Business and Marketing	10%	18%	41%	70%
Education	16%	24%	57%	82%
Health Professions	15%	27%	40%	71%
All Other Courses	8%	14%	35%	61%

Notes. Departments were identified by the two-digit CIP codes assigned to each course. We constructed these groupings of departments based roughly on how universities organize departments into colleges and schools.

Question 3: Which Students Were Most Likely to Take Course Credits Online?

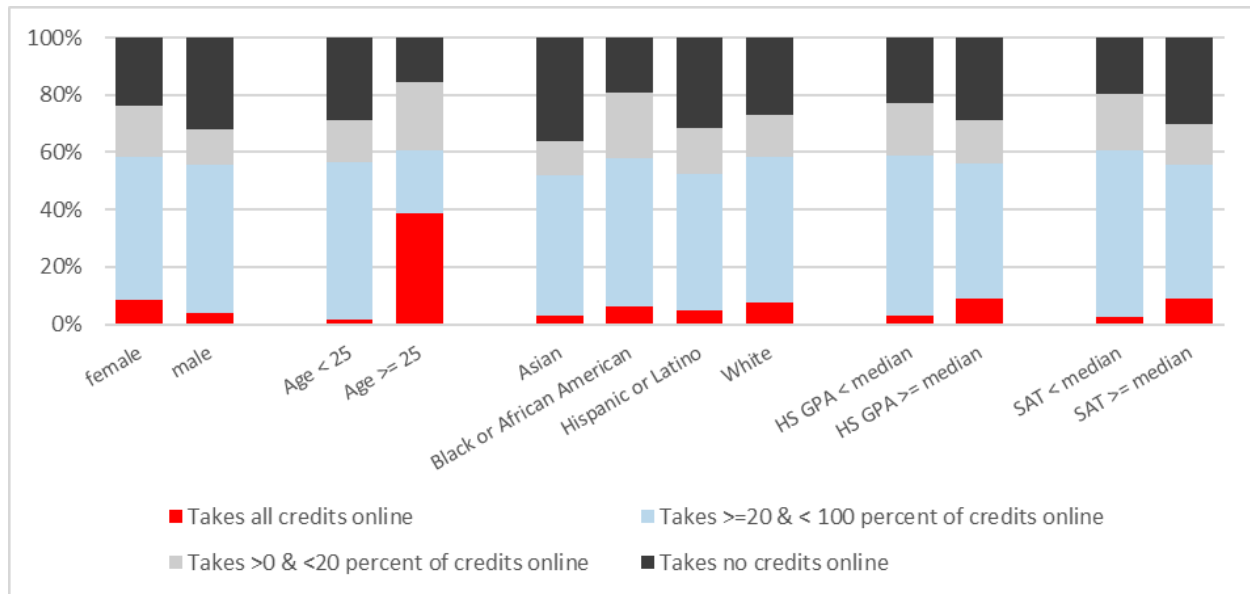
Takeaways: Female students, older students, and students with lower academic qualifications were more likely to take online courses compared to their peers.

Across the UNC System, some groups of students were much more likely to take courses online relative to their peers (see Figure 4). Specifically, we find that:

- **Female students** were more likely than male students to take online courses. Students who took no courses online were roughly evenly split between male and female students, whereas 70 percent of students taking at least 20 percent of credits online were female.
- Students who took classes solely online were about **8 years older on average** compared to students who took at least some classes in person.
- **Black students** are somewhat more likely to take between 20 and 100 percent of courses online, and **white students** are somewhat more likely to take all courses online.
- Students who took more classes online tended to have somewhat **lower academic qualifications** (i.e., SAT/ACT test scores and GPA) than those who took no or fewer courses online.

Figure 4. Online course taking rates were generally similar across different groups of students; older students were the most likely to take all of their courses online

Modality of course enrollment for different student groups



Notes. Data shown are for the Fall 2019 semester.

Question 4: Was Online Course Taking Associated with Better Student Outcomes?

Takeaways: Students who took more credits online had a higher likelihood of attaining a degree in the UNC System compared to similar students who took fewer online credits. In addition, students had higher GPAs across all their courses in terms when they took at least one course online relative to no courses online. However, students were more likely to fail online courses than their in-person classes.

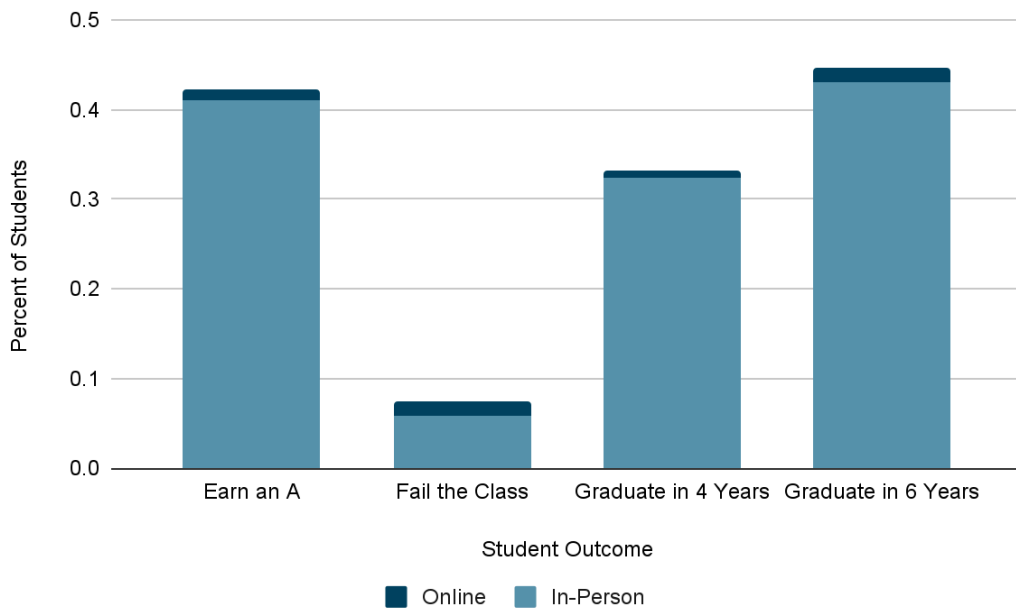
While online courses have the potential to increase students' access to higher education, understanding the degree to which these courses enhanced or impeded students' academic achievement and degree completion is a question we can answer.

More A's were awarded in online courses than in in-person courses, but students were also more likely to fail their online courses relative to in-person classes (Figure 6). Despite the increased odds of failing an online course, students still had higher GPAs, on average, in terms when they engaged in at least some online course taking.

We found that taking a higher share of credits online was associated with enrolling in more terms and attempting more credits. *Importantly, taking higher shares of courses online was associated with increased degree completion with the largest benefits for younger students and male students.*

Figure 5. Taking course credits online was associated with small increases in attaining a degree attainment and earning as but also in failing a class

Regression-estimated changes in student outcomes associated with online course taking



Notes. Observed means shown in light blue for 1) the likelihood of receiving a specific grade in an in-person course (earn an A; fail the class) and 2) the likelihood of graduation if a student took zero hours online (graduate in 4 and 6 years). Dark blue shows the regression-adjusted impact associated with taking a course online (grades outcomes) or taking the median number of hours online (graduation outcomes).

Box. Estimating the Impact of Online Course Taking on Student Outcomes

We used two strategies for estimating the causal effect of online course taking on student outcomes:

1. **Fixed-effects approach:** For outcomes at the course or term level, estimates include a number of fixed-effect controls (student, institution, and entry cohort). These fixed effects control for unobserved, time-invariant factors that may have been related to student outcomes. For example, the inclusion of student fixed effects restricted the comparison of an individual's own performance in online courses relative to their own performance in their in-person classes.
2. **Control-function approach:** We also used a control-function approach for individual course outcomes, term outcomes, and, importantly, academic career outcomes for which there is only one observation per student. In particular, in addition to individual student characteristics, we also included mean characteristics for students at the major-by-institution-by-term level.

Altonji & Mansfield (2018) showed how this group-level control-function approach

addresses selection into a group on unobservables. In our case, we were concerned about student major choice, which probably influenced the likelihood of taking courses online because different majors offer courses online at different rates. Each undergraduate student (at a given institution in a given entry cohort) chose a major, and those majors differed in the extent to which courses were offered online. For this reason, we needed to account for student selection into different majors and, thus, different levels of exposure to online courses.

More details about the data, the analytic approaches, and findings are available [here](#).

Policy and Practice Considerations

Online course offerings are an important part of many students' college careers. We found that there was high student demand for online course options. Specifically, prior to the pandemic in Fall 2019, about 2 of every 5 UNC System undergraduates took at least one of their courses online, and we suspect that this demand has increased since the pandemic. This pattern is not unique to public universities in North Carolina, as online course enrollments are high and have been increasing in other large public systems as well. In addition, students who took classes online tended to mix them in with their in-person classes during a single term. Among students who took at least one course online in their UNC career, only one of four students took all of their classes online.

We also found evidence that course performance was higher in online classes (after adjusting for differences in the characteristics of students who opt in and out of online courses). On top of that, taking a higher share of credits online was associated with a small increase in a student's chances of completing their degree program. We suspect that online course taking allows students to improve the way they use their time given all the competing demands they face (e.g., class attendance, coursework and studying, work, family responsibilities).

All of this evidence suggests that the flexibility of taking online courses is likely important for some undergraduate students, raising questions about how universities should continue to develop and offer high-quality online options. Academic advisors can encourage students to consider online course offerings as a good option for completing coursework, particularly in terms when students are juggling many responsibilities. Because students were most likely to take online courses during the summer term, academic advisors may recommend summer online course taking as a way to help students continue to accumulate hours toward their degree. Teaching and learning in an online format should look very different from a traditional face-to-face classroom environment. Universities may want to provide additional support for faculty to design or modify courses specifically for the online modality. Online course environments should include opportunities for authentic interaction between instructors and

students and among peers. Further, students who enroll in lots of online courses may need additional support connecting with their peer community and in ensuring that they stay on track to graduate from college.

Finally, we want to address the fact that our paper uses pre-pandemic data and acknowledge that our world is forever changed. As we enter a post-pandemic era in higher education, we think our findings provide lessons to support students who both need access to online education and also need support to thrive in that environment.