Student Device Preferences for Online Course Access and Multimedia Learning

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ACKNOWLEDGEMENTS

This study originated from our multimedia development team at Oregon State University Ecampus. One of our developers was interested in exploring what devices students are using to engage with their online classes and what drives their choices. This research interest stemmed from a broader organizational question of how much time and resources to devote to the development of online materials for the mobile environment. Thus, a focal point for this research study was the question: Are students who take our online courses using their mobile devices to access their online courses and multimedia course materials?

In spring 2017, the Ecampus Research Unit surveyed students who had taken one or more online courses in the current or previous term to learn more about what types of devices they owned, what they preferred to use to access their course materials, and why they preferred those devices.

We very much appreciate the over 2,000 students who took the time to answer the survey and share their preferences and perspectives with us. We wish to thank Mike Miller for proposing the initial study idea and for his collaboration on the survey design and study recruitment. Many thanks to Amy Donley for her amazing abilities with data visualization for this report.

Finally, we express gratitude to Oregon State Ecampus for funding this study.

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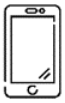
DEFINITIONS

Desktop: desktop PC, desktop Mac

Laptop: laptop PC, laptop Mac



Smartphone: iPhone, Android phone, other smartphones

Tablet: iPad, Android tablet, Windows tablet, other tablets

KEY FINDINGS

Student Device Ownership

- Smartphone and laptop ownership among students is pervasive. All but two of the 2,035 students in this study reported owning a smartphone, and over 99% owned laptops. Just over half of respondents owned some form of tablet. However, only 35% owned a desktop computer.

- Very few students were borrowing devices, by comparison. In this study, desktop computers were borrowed by 8% of respondents, with just over 5% borrowing laptops. Less than 5% reported borrowing tablets, and less than 2% borrowed smartphones.

Device Preferences for Different Purposes

- Student respondents overwhelmingly preferred laptops for accessing their learning management system (LMS) homepage (73%). The majority preferred laptops for viewing video content (68%) and for learning with simulations and games (59%).

- Less than 10% of students preferred smartphones and tablets for viewing video and for learning with simulations and games.

- In the majority of cases, students viewed their *preferred* devices (laptops and desktops) as also the *ideal* devices to use when viewing video and learning with simulations and games.

Reasons for Choosing Preferred Devices

- Overall, regardless of what device they preferred, convenience, ease of use, and effectiveness were all important reasons for students' choices of preferred devices.

- Across all four device types about the same percentage of students indicated that their preferred devices were easy to use for accessing the LMS and viewing video. However, for learning with simulations and games, ease of use was a more frequent reason for preferring tablets.

- The majority of student respondents indicated that desktops and laptops were preferred for accessing the LMS, viewing video content and learning with simulations and games because these devices were the most effective.

- Of the four devices, smartphones were least likely to be chosen as effective for accessing the LMS, viewing videos, and learning with simulations and games.

New Device Purchasing for Educational Purposes

- Three-quarters of students (74.8%) would consider buying a new device if they thought it would benefit their education.

- About one-quarter of students (26.9%) indicated they would purchase a new device to benefit their education, if they could afford it.

RESULTS

The goal of this study was to gather information from students taking online courses at Oregon State University to determine their preferred devices to view and interact with multimedia for the purpose of their education. In particular, we were interested in exploring why students are using a particular device to engage in online learning and if that device is actually their preferred and/or ideal device.

When designing this project, we were guided by the following research questions:

1. What are the range of devices that students use to access their online courses and to view video and other multimedia?

2. Why do students use certain devices to access their online courses and to view video and other multimedia?

3. Are the devices that students *currently* use the same as what they would consider to be the *ideal* devices for viewing video and multimedia?

Oregon State University Ecampus comprises online students from all 50 states and over 50 countries. The 2,035 respondents in this study reported taking an average of 4.9 online classes in the past year (SD=4.1). The respondents were found be demographically similar to the student population who were currently enrolled in one or more Ecampus courses at the time of data collection. For more information on the study methodology and a description of participant demographics, see pp. 24-27.

The results of the study are discussed in the following sections: student device ownership, device preferences for different purposes, reasons for choosing preferred devices, new device purchasing for educational purposes, age group comparisons, and virtual reality.

Student Device Ownership

Nearly 100% of the respondents owned some form of a smartphone (only two reported they did not). The largest number of respondents 1,249 (61.4%) owned iPhones, an additional 783 (36.3%) owned Android phones, and 45 (2.2%) owned other smartphones (see Figure 1). Laptop ownership outweighed desktop ownership among the respondents. More than half, 1,172 (57.6%) owned PC laptops, and 845 (41.5%) owned Mac laptops. Overall, 99% of respondents owned some type of laptop.

The percentage of desktop computer owners was smaller with 553 (27.2%) of the respondents owning PC desktops, and only 157 (7.7%) owning Mac desktops for a total of nearly 35% desktop computer ownership. Ownership of tablets was slightly higher with a total of 1,145 respondents (56.3%) owning tablets. The largest number owned iPads (661, 32.5%), 329

(16.2%) owned Android tablets, and 155 (7.6%) owned Windows tablets. An additional 95 respondents (4.7%) indicated they owned other devices; 32 of these devices were e-readers and 21 were Chromebooks. Eight respondents mentioned Linux desktops or laptops.

Respondents were also asked about devices that they borrow (see Figure 1). The largest number of respondents (224 or 11.0%) indicated they borrowed desktops, 113 (5.6%) borrowed laptops, 88 (4.4%) borrowed tablets, and 30 (1.4%) borrowed smartphones.

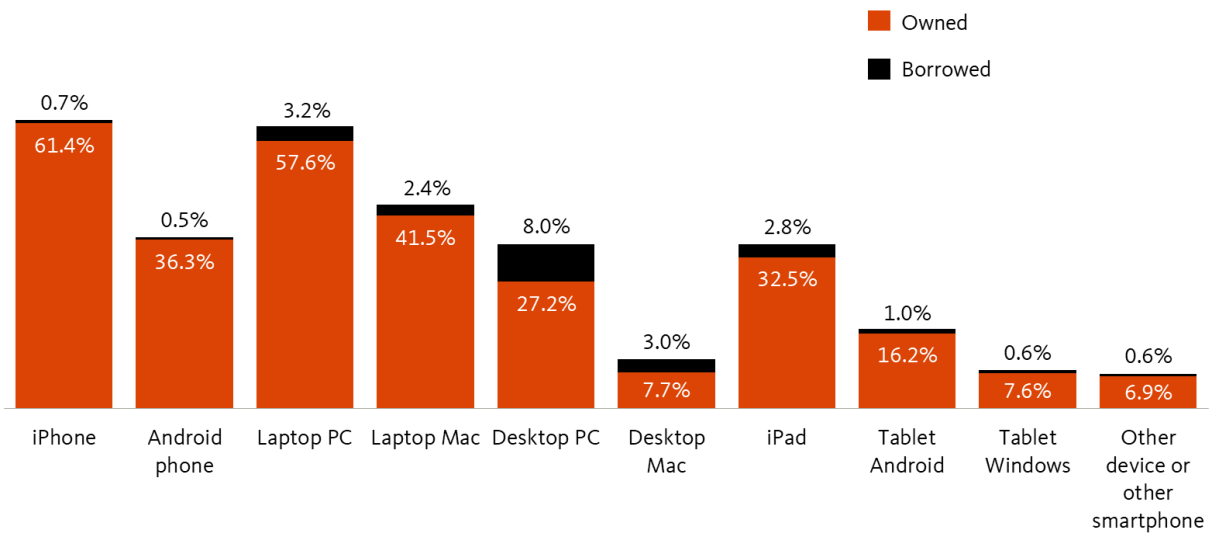


Figure 1: Percentage of students who owned and borrowed different electronic devices

Device Preferences for Different Purposes

All Ecampus students are required to access their online courses through the Canvas learning management system (LMS). Students overwhelmingly preferred laptops for accessing their LMS homepage with a total of 1,488 respondents (73.1%) preferring laptops (see Figure 2). A total of 399 respondents (19.6%) preferred desktop computers with desktop PCs preferred by 338 (16.6%) and only 61 (3%) preferring desktop Macs. Only 89 (4.3%) preferred their smartphones for accessing the LMS. There were very small numbers of students preferring iPads (28, 1.4%) and other tablets (31, 1.5%) to access the LMS course homepage.

We were interested in students' input on what devices they preferred for viewing video content in their online courses. In addition, we asked what students thought was their ideal platform for viewing video content, regardless of whether they currently used that device or not.

Given that almost all of the students owned laptops, it is perhaps not surprising that a large number of respondents (1,376, 67.6%) reported the laptop as the preferred device for viewing video (see Figure 3). A much smaller number (387, 19%) indicated that desktops were

preferred, while 132 (6.5%) identified tablets and 112 (5.5%) identified smartphones as preferred for viewing video. Twenty-eight respondents (1.4%) did not answer this question.

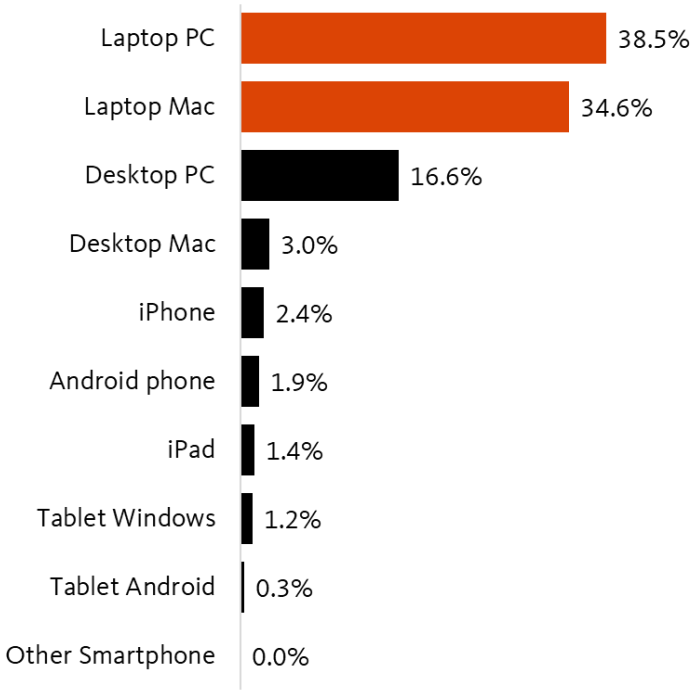


Figure 2: Student device preferences for accessing the LMS homepage

When students were asked about which devices were ideal for viewing video content (whether or not they used that device), the largest number of respondents (1,224, 60.1%) indicated laptops were ideal, which is similar to the number who chose laptops as preferred. Compared to the number who preferred desktops (387, 19%), a slightly larger number (488, 24%) indicated that desktops were ideal for viewing video. Further, a slightly larger number (184, 9%) indicated that tablets were ideal for viewing video compared to those who preferred tablets (132).

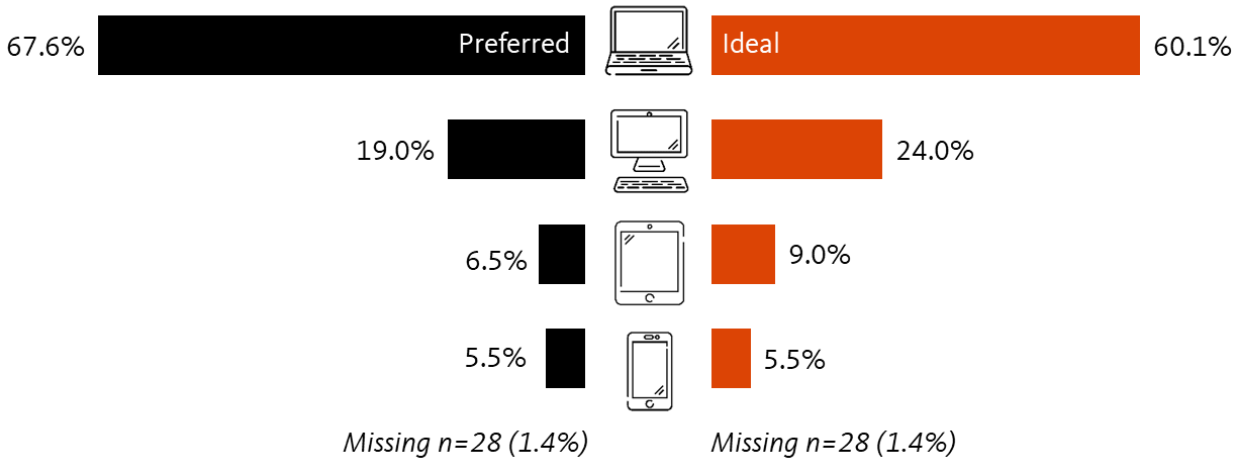


Figure 3: Percentage of students indicating devices that are preferred and devices that are ideal for viewing video content

Finally, 111 (5.5%) respondents indicated that smartphones were ideal for viewing video, which is exactly the same percentage who indicated smartphones were preferred. Twenty-eight (1.4%) respondents did not answer this question.

Similarly, we were interested in students' input on what devices they preferred when learning with simulations and games, and what devices they thought were ideal for learning with simulations and games.

Again, laptops were preferred by 1,201 respondents (59%) when learning with simulations and games (see Figure 4). More than one-quarter (569, 28%) preferred desktop computers, while smaller numbers chose tablets (107, 5.3%) and smartphones (130, 6.4%) as preferred devices. Twenty-eight respondents (1.4%) did not answer this question.

Laptops were chosen as ideal for learning with simulations and games by 1,103 respondents (54.2%), which is similar to the percentage who preferred laptops. Nearly one-third (628, 30.9%), chose desktops as ideal devices. A much smaller number (139, 6.8%) chose tablets as ideal, and only 121 (6%) chose smartphones as ideal for learning with simulations and games. These percentages were similar to the percentages who indicated that these same devices were preferred for learning with simulations and games. Forty-four (2.2%) respondents did not answer this question.

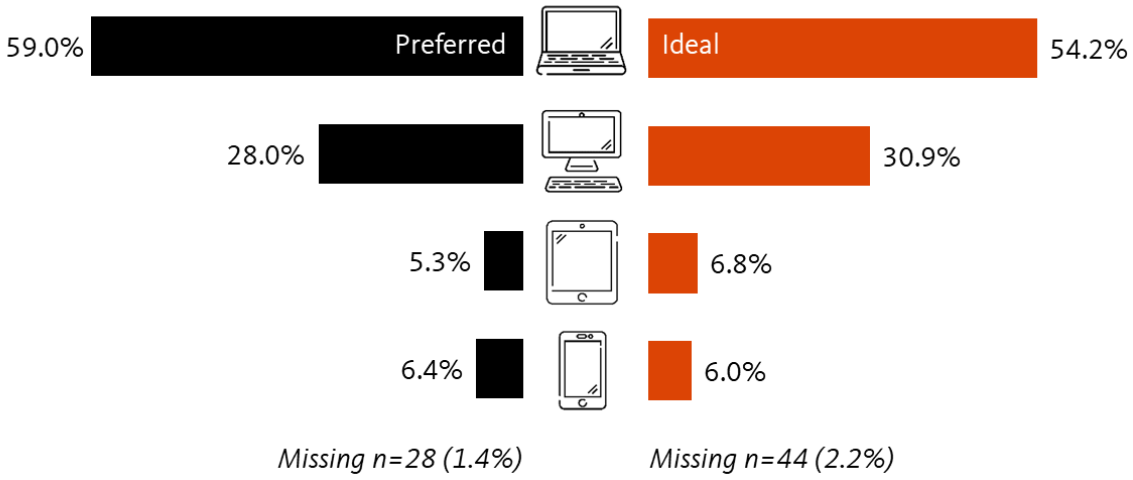


Figure 4: Percentage of students indicating devices that are preferred and devices that are ideal when learning with simulations and games

Considering the results of device ownership and the results of the preferred devices together suggests that students own laptops and prefer laptops for video, and learning with simulations and games. However, results of their ideal device choices suggest that small percentages of the respondents may prefer to use desktops and tablets for these purposes instead of their laptops.

Reasons for Choosing Preferred Devices

We also asked respondents about their reasons for choosing their preferred devices. The survey focused on four main reasons: convenience, ease of use, effectiveness for the type of content, and whether students did not have access to a better device option. Students were asked why they chose a particular device for accessing their LMS homepage, for viewing videos, and for learning with simulations and games.

The results showed that overall, regardless of what they chose as a preferred device, convenience, ease of use, and effectiveness were all important reasons for their choices (see Figure 5). A total of 1,437 respondents (70.6%) indicated that their preferred device was the most effective for accessing their LMS home page, 1,379 (67.8%) indicated that their preferred device was the most effective for viewing videos, and 1,344 (66%) indicated that their preferred device was the most effective for learning with simulations and games.

Similarly, at least half of the students indicated that their preferred device was convenient for accessing the LMS (1,127, 55.5%), convenient for viewing video (1,070, 52.6%) and convenient for learning with simulations and games (1,012, 49.7%). Finally, 1,118 (54.9%) indicated that their preferred device was easy to use with their LMS homepage, 991 (48.7%) indicated it was easy to use for viewing video, and 1,113 (54.7%) indicated it was easy to use to learn with simulations and games. Smaller numbers indicated that they did not have a better option for accessing their LMS homepage (104, 5.1%), viewing video (106, 5.2%) or learning with simulations and games (106, 5.2%).

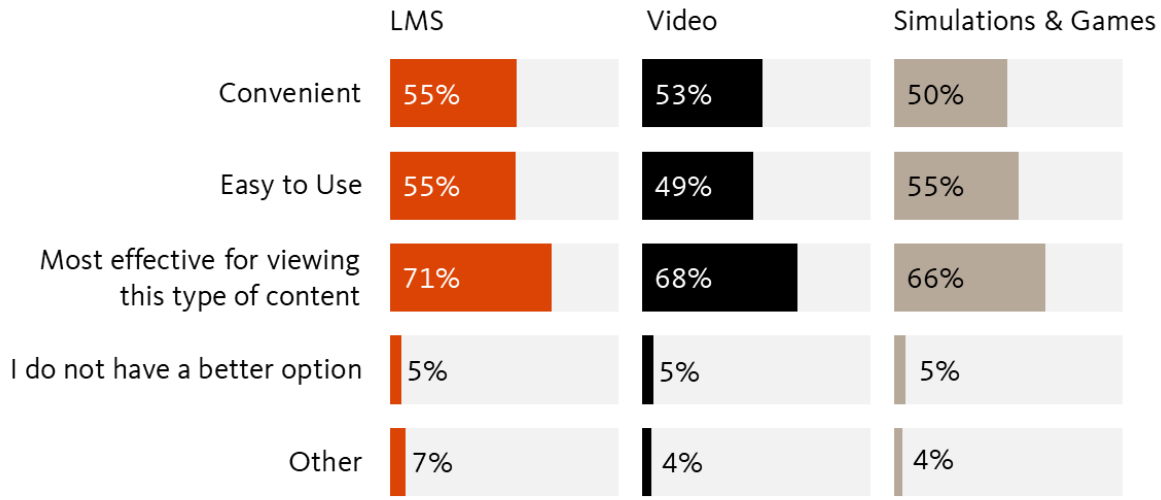


Figure 5: Reasons why students chose particular devices for accessing the LMS homepage, viewing videos, and learning with simulations and games

Smaller numbers of respondents (143, 7.0%) indicated they had other reasons for choosing their preferred device for accessing the LMS and for viewing videos (83, 4.1%). The majority of these respondents commented about their desktops and laptops. Many indicated that their desktops were preferred for both purposes because of larger monitors or dual screens. Those who commented about their preference for laptops also commented on screen sizes. A few

mentioned that their laptop screen size was preferred over their tablets and phones. A number of other comments related to problems with the LMS app for smartphones and tablets, such as it was difficult to navigate, content was not visible, and that the app needed improvement.

Some of the 82 respondents (4.0%) who indicated they had other reasons for choosing their preferred device for learning with simulations and games also commented on the larger screen size of desktops and laptops. Several also commented that desktops were preferred because they have more power and processing speed. A few commented that they had not encountered simulations or games in their course content.

Reasons for preferred device for accessing the LMS

The reasons students chose a particular device to access the LMS homepage varied by the device. Figure 6 shows that of those who chose a desktop as their preferred device (n=399), the vast majority (325, 81.5%) indicated that the desktop was most effective for viewing the LMS homepage. Many chose convenience (164, 41.1%) and ease of use (187, 46.9%) as reasons for preferring desktops. Only nine (2.3%) indicated they did not have a better option. Forty-five (11.3%) provided other reasons for preferring desktops such as the larger screens of desktops, the ability to use two screens, and faster processing speeds.

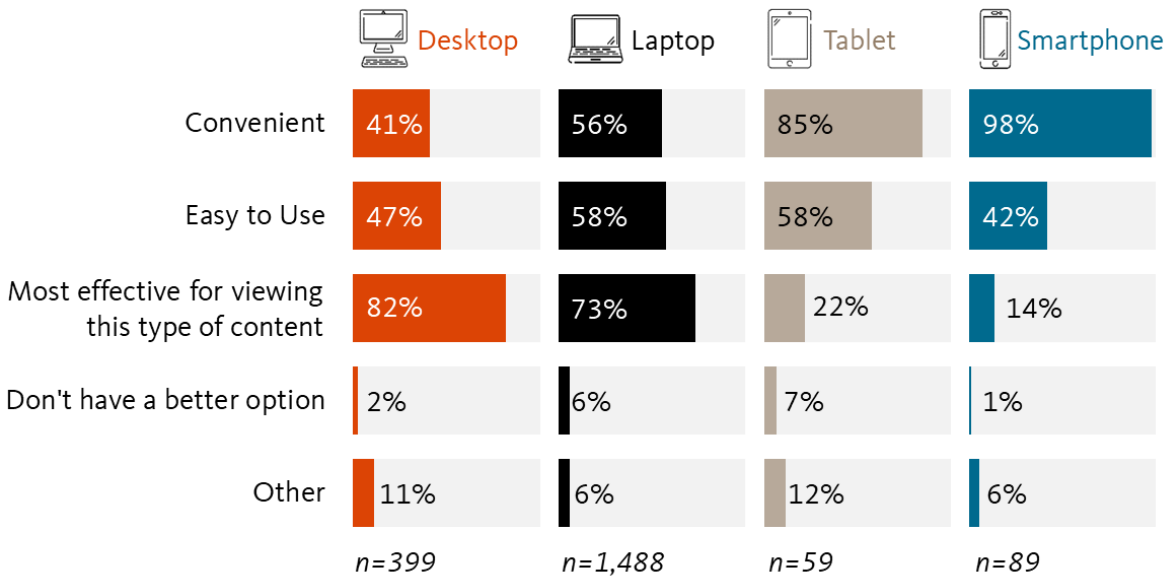


Figure 6: Reasons why students preferred different device types for accessing the LMS

The pattern of responses was similar for those preferring laptops (n=1,488), with 1,087 (73.1%) respondents choosing the laptop as most effective for viewing the LMS homepage, while more than half (826, 55.5%) indicated they preferred the laptop for convenience, and 860 (57.8%) preferred it for ease of use. A smaller number (90, 6.0%) did not have a better option. Eighty-six (5.8%) provided other reasons for preferring laptops such as laptops having larger screens and being easier to use compared with smaller devices (tablets and phones), and problems with the functionality of the LMS app on other devices such as tablets and phones.

Of those respondents who chose tablets (n=59) as their preferred device for accessing the LMS homepage, 50 (85%) preferred it for convenience, while 34 (58%) preferred it for its ease of use, and 13 (22%) for its effectiveness for viewing the LMS homepage. Only four (6.8%) did not have a better option. Seven respondents (11.9%) provided other reasons for preferring tablets, such as the portability of tablets and compatibility issues.

Finally, of those who chose smartphones (n=80) as their preferred device for accessing the LMS homepage, 87 respondents (97.8%) indicated their reason was convenience, while 37 (42.4%) preferred it for ease of use. Twelve (13.5%) said that smartphones were preferred because they were most effective for accessing the LMS, and only one (1.1%) did not have a better option. Five (5.6%) respondents provided other reasons for preferring smartphones, such as the convenience of always having a phone.

These results suggest that laptops and desktops are preferred devices because they are most effective for accessing the LMS. However, tablets and smartphones are preferred for their convenience. Across all four device types, laptops and tablets were preferred slightly more for their ease of use.

Reasons for preferred device for viewing videos

The reasons students chose a particular device for viewing videos varied by the device. As shown in Figure 7, of those who chose a desktop computer (n=387) as their preferred device, a majority of respondents (317, 81.9%) indicated that desktops were the most effective for viewing video, while many chose convenience (157, 40.6%) and ease of use (163, 42.1%) as reasons for preferring desktops.

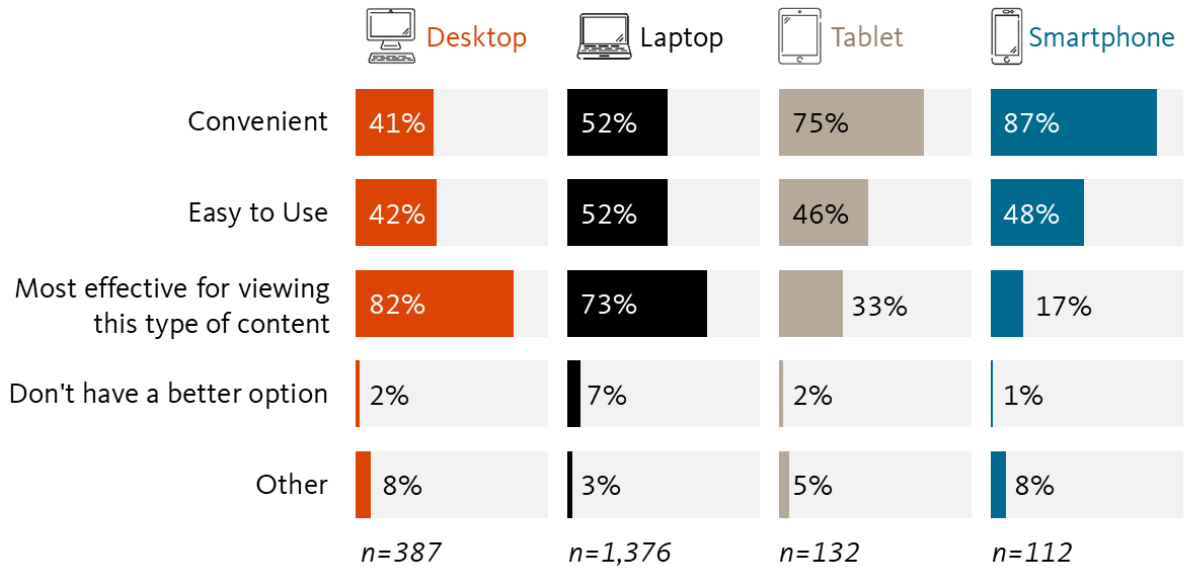


Figure 7: Reasons why students preferred different device types for viewing video content

Very few respondents (8, 2.1%) indicated they did not have a better option. Thirty (7.8%) provided other reasons preferring desktops. Most of the reasons related to the larger screen size and the ability to have dual screens, which made the videos easier to see.

The pattern of responses was somewhat similar for those who chose laptops (n=1,376) as their preferred device. A large number of respondents (999, 72.6%) indicated that laptops were most effective for viewing video, while over half chose convenience (717, 52.1%) and ease of use (713, 51.8%) as reasons for preferring laptops. Fewer indicated they did not have a better option (94, 6.8%). Finally, 37 respondents (2.7%) provided other reasons for preferring laptops such as portability and the ability to connect to larger screens.

For those who chose tablets (n=132) as their preferred device for viewing video, three-quarters of respondents (99, 75.0%) chose convenience as their reason for preferring the device and 61 (46.2%) indicated it was preferred for ease of use. A smaller number (44, 33.3%) preferred the tablet because it was the most effective for viewing video. Only three (2.2%) said they did not have a better option. Seven (5.3%) respondents provided other reasons for preferring tablets, with four of those responses relating to the portability of tablets.

Finally, of those who chose smartphones (n=112) as their preferred device for viewing video, the overwhelming majority of respondents (97, 86.6%) indicated that convenience was the reason they preferred this device. Nearly half (54, 48%) indicated they preferred smartphones for ease of use. However, only 19 (17.0%) indicated that smartphones were preferred because they were most effective for viewing video, and only one (.9%) indicated they did not have a better option. Nine (8.0%) respondents provided other reasons and, of those, three were related to portability.

These results suggest that desktops and laptops are preferred devices because they are seen as most effective for viewing videos. Similar to the results for the LMS, tablets and smartphones are preferred for video viewing because of convenience. Across all four device types approximately the same percentage of students indicated that their preferred devices were easy to use, with a range of between 42% and 52% of respondents selecting that reason. Of the four devices, smartphones were least likely to be chosen as effective for viewing videos.

Reasons for preferred device for learning with simulations and games

The reasons students chose a particular device for learning with simulation and games also varied by device (see Figure 8). Of those students who chose a desktop computer (n=569) as their preferred device, more than three-quarters (454, 79.8%) indicated that desktops were the most effective for learning with simulations and games, while half chose ease of use (285, 50.5%) and 227 (39.9%) chose convenience as reasons for preferring desktops. Few (13, 2.3%) indicated they did not have a better option. A slightly larger number (36, 6.3%) provided other reasons for preferring the desktop. The most frequent other reasons were a preference for larger screens and the processing power and speed of desktop computers.

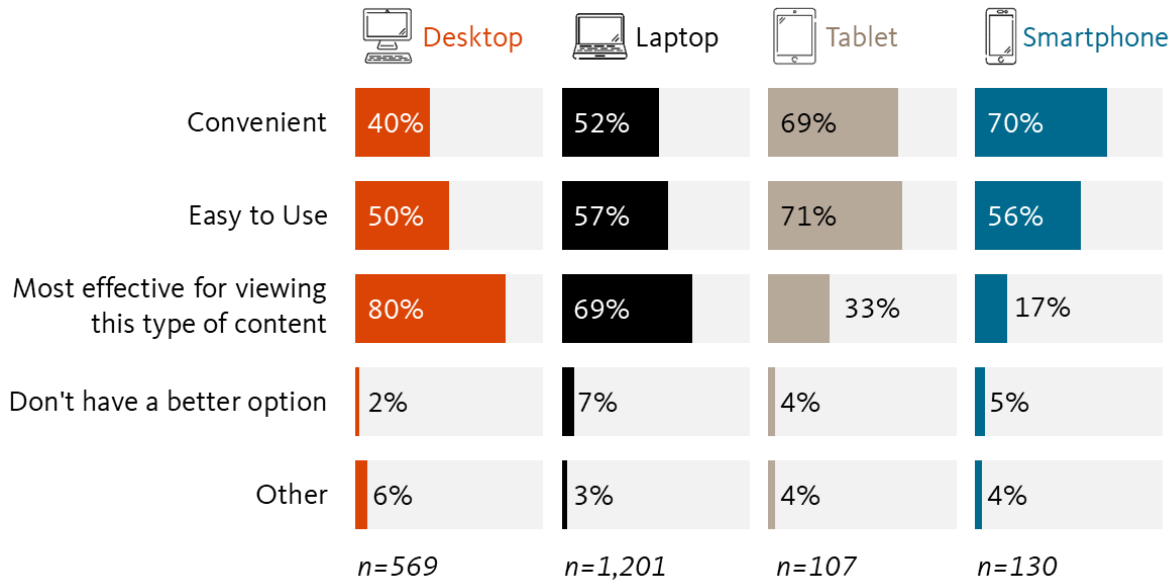


Figure 8: Reasons why students preferred different device types for learning with simulations and games

The pattern of responses was similar for those who chose laptops as their preferred device (n=1,201). The largest number of respondents (833, 69%) indicated that laptops were most effective for viewing simulations and games, while more than half chose ease of use (679, 57%) and convenience (620, 51.6%) as their reasons for choosing this device. Further, 82 (6.8%) indicated they did not have a better option. Finally, 37 (3.1%) provided other reasons for preferring laptops. Again, the most common other reason was that laptops had a larger screen size relative to tablets and phones. A few respondents commented that they had not encountered simulations and games in their courses.

The patterns of responses for tablets and smartphones as preferred devices for learning with simulations and games were somewhat different. Of those who preferred tablets (n=107), more than two-thirds of students indicated that they chose tablets for ease of use (76, 71%) and convenience (74, 69.2%), while only 35 (32.7%) indicated that they chose tablets because they were the most effective for learning with simulations and games. Only four respondents (3.7%) indicated they did not have a better option. Four (3.7%) provided other reasons for preferring tablets, and three of those reasons were about portability.

Of those who preferred smartphones (n=130), the majority of respondents (91, 70%) indicated they chose that device for convenience, and more than half (73, 56.2%) chose it for ease of use. A much smaller number (22, 16.9%) indicated they chose smartphones because they were most effective for learning with simulations and games. Only seven (5.4%) reported they did not have a better option. Finally, five (3.8%) provided other reasons, which varied from portability to the preference for a touch screen.

Similar to the reasons endorsed for viewing video, the results for learning with simulations and games suggest that desktops and laptops were preferred devices because they are most

effective for this type of use. However, tablets and smartphones were preferred by some for their convenience. In addition, tablets were preferred by many for their ease of use. For the other three device types, about the same percentage of students indicated that their preferred devices were easy to use, ranging between 50% and 57% selecting that reason. Of the four devices, smartphones were least likely to be chosen as effective for viewing simulations and games, however they were most likely to be chosen for convenience.

New Device Purchasing for Educational Purposes

When student respondents were asked about the purposes for which they would purchase a new device, the largest number (799, 39.3%) indicated that they would be most likely to purchase a new device for education (see Figure 9). Only slightly fewer (722, 35.5%) indicated they would most likely purchase a new device for their job or work. A smaller number (298, 14.6%) would be most likely to purchase a new device for games/entertainment, and 99 (4.9%) would most likely purchase a new device for communication purposes.

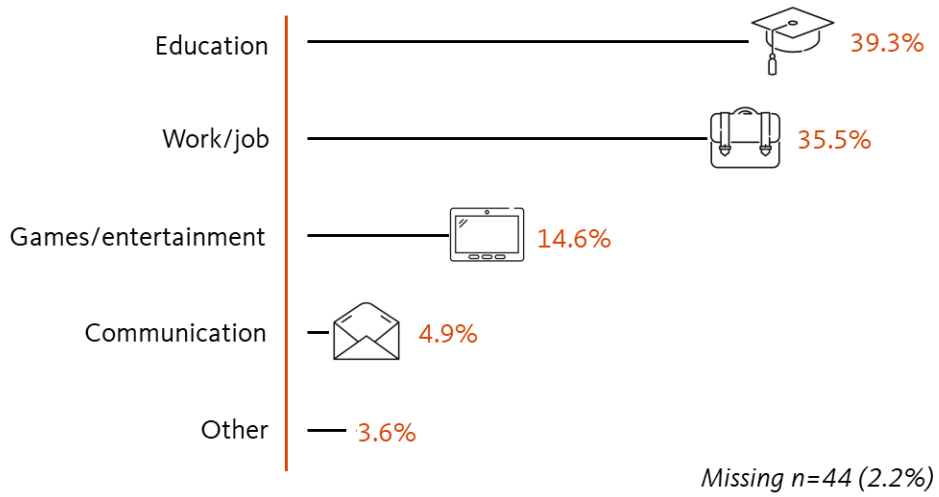


Figure 9: Purposes for which students would most likely purchase a new device

The remaining 73 respondents (3.6%) chose other purposes. One-third (24) of respondents who chose other indicated they would buy a new device to upgrade an older or broken device. More than a dozen respondents indicated that they would purchase a device for more than one or all of the purposes listed in the question. A few others indicated they would buy a new device for travel or personal use. Forty-four respondents (2.2%) did not answer this question.

The respondents were asked if they would consider buying a new device if they thought it would benefit their education. The majority of respondents (1,552, 74.8%) said yes, 349 (17.1%) were not sure, and 120 (5.9%) said no (see Figure 10). Forty-four respondents (2.2%) did not answer this question.

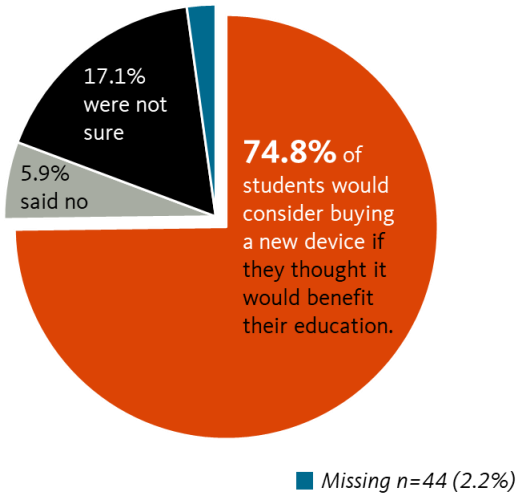


Figure 10: Percentage of students who would consider buying a new device if they thought it would benefit their education

A follow-up question asked students about spending money on a new device to benefit their education (see Table 1). A total of 548 (26.9%) respondents indicated that they would purchase a new device if they could afford it, while 116 (5.7%) indicated that they would not purchase a device for this reason. One quarter (514, 25.3%) indicated they would spend between $400 and $999, and slightly fewer (448, 22%) would spend between $100 and $399. A smaller number (261, 12.8%) would spend $1,000 or more, and only 104 (5.1%) would spend $99 or less. Forty-four (2.2%) respondents did not answer this question.

Response options	Percentage
Would not purchase for this reason	5.7%
Would purchase if I could afford it	**26.9%**
$0-$99	5.1%
$100-$399	22.0%
$400-$999	**25.3%**
$1,000 or more	12.8%

Missing n=44 (2.2%)

Table 1: Students' willingness to spend money on a new device to benefit education

Age Group Comparisons

To determine if there were age-related response differences, the results were also analyzed using the following age categories: 18-24 years, 25-34 years, and 35 years and older. The following is a summary of the results of this age-group analysis.

Student respondents in the 25-34 and 35+ age groups were more likely to own desktops (PC and Mac) compared to those in the 18-24 age group (see Table 2). Over half of the students in each age group owned PC laptops. However, for those over 35, the percentage who owned PC laptops is significantly higher (69.2%) than the other age groups. Respondents in the 18-24

age group were more likely to own Mac laptops (46.9%) compared to those in the 25-34 and 35+ age groups.

Device owned	Age group		
	18-24	25-34	35+
PC desktop	17.4%	33.3%	42.5%
Mac desktop	5.0%	9.0%	13.5%
PC laptop	51.6%	58.3%	69.2%
Mac laptop	46.9%	40.0%	32.1%
Total n	*967*	*568*	*386*

Table 2: Percentage of students who owned desktops and laptops by age group

In all age groups, laptops were preferred for accessing the LMS by the majority of students (see Table 3). However, the preference was overwhelming for the 18-24 age group (81.8%). While the overall preference for desktops was low for the three age groups, students who were in the 24-35 and 35+ age groups were more likely to prefer desktops for accessing the LMS compared to those who were 18-24 years old (10.8%).

Preferred device for accessing LMS	Age group		
	18-24	25-34	35+
Desktop	10.8%	28.2%	28.8%
Laptop	81.8%	63.9%	65.3%
Tablet	2.2%	3.5%	3.1%
Smartphone	5.3%	4.4%	2.8%
Total n	*967*	*568*	*386*

Table 3: Percentage of students who preferred each device for accessing the LMS by age group

Across the age groups, the majority of the student respondents preferred laptops for viewing video (see Table 4). However, the preference for laptops was highest for the 18-24-year-old group (78.5%). Students who were in the 24-35 and 35+ age groups were more likely to prefer desktops for viewing video compared to those who were 18-24 years-old (11.6%).

Preferred device for viewing video	Age group		
	18-24	25-34	35+
Desktop	11.6%	25.4%	28.9%
Laptop	78.5%	60.3%	57.5%
Tablet	4.8%	7.7%	9.2%
Smartphone	5.0%	6.6%	4.5%
Total n	*954*	*559*	*381*

Table 4: Percentage of students who preferred each device for viewing video content by age group

The majority of students in all three age groups preferred laptops for learning with simulations and games (see Table 5). However, the preference for laptops was highest for those in the 18-24-year-old group (65.4%). Students in the 24-35 and 35+ age groups were somewhat more likely to prefer desktops for learning with simulations and games compared to the 18-24 age group.

Preferred device for simulations and games	Age group		
	18-24	25-34	35+
Desktop	21.9%	36.3%	32.3%
Laptop	65.4%	54.4%	54.1%
Tablet	5.1%	4.5%	7.3%
Smartphone	7.5%	4.8%	6.3%
Total n	*954*	*559*	*381*

Table 5: Percentage of students who preferred each device for learning with simulations and games by age group

Across all three age groups, small percentages indicated they would purchase a new device for games/entertainment purposes (see Table 6). Students in the 35+ age group were the least likely to purchase a new device for games/entertainment (9.7%). Students in the 35+ age group were slightly more likely to purchase a new device for education purposes (45.8%) compared to the other age groups.

Purchase a new device for:	Age group		
	18-24	25-34	35+
Games/entertainment	16.8%	17.0%	9.7%
Education	37.4%	39.9%	45.8%
Total n	*949*	*552*	*380*

Table 6: Percentage of students who would purchase a new device for games/entertainment and education by age group

Virtual Reality

As we continue to explore new technologies in online education, we wanted to get a sense of what students who take online courses thought about the relevance of virtual reality (VR) in the future of online education.

When asked, about one-quarter of respondents (501, 24.6%) indicated that it was too early to tell if VR is a relevant tool for the future of online education (see Figure 11). A similar number (449, 22.1%) said yes, it was a relevant tool. A smaller number (372, 18.3%) did not know enough to comment, and 241 (11.8%) said no, it was not a relevant tool. Forty-four (2.2%) respondents chose not to answer this question.

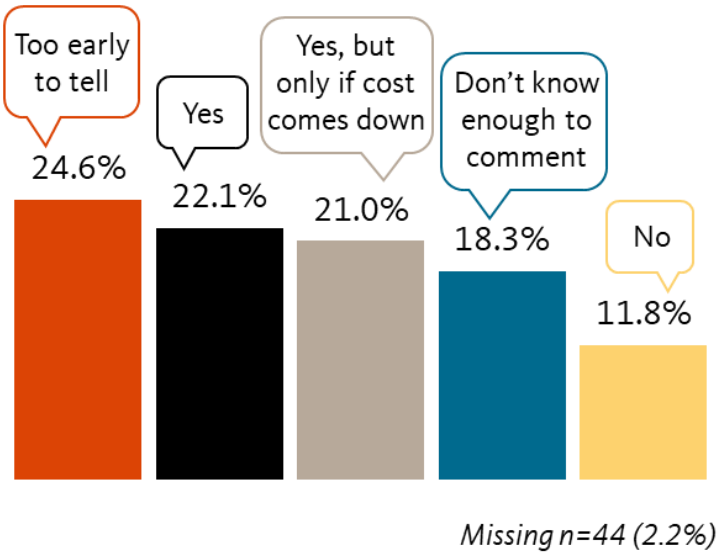


Figure 11: Students' perspectives on virtual reality as a relevant tool for the future of online education

Age group comparison

Responses to this question varied by age group (see Table 7). The percentage of respondents who replied yes, VR is a relevant tool for the future of online education was higher for the 35+ age group (31.6%) compared to the other two age groups. In contrast, the percentage of respondents who replied no was higher for the 18-24-year-old group (15.4%) compared to the other two groups. In addition, the percentage of respondents who indicated *yes, but only if the costs come down* was highest for the 18-24-year-old group (24.2%) and lowest for the 35+ age group (14.5%).

VR relevant tool?	Age group		
	18-24	25-34	35+
Yes	19.5%	21.4%	31.6%
No	15.4%	10.9%	6.1%
Too early to tell	23.2%	27.7%	26.6%
Don't know enough to comment	17.7%	18.5%	21.3%
Yes, but only if the costs come down	24.2%	21.6%	14.5%
Total n	*949*	*552*	*380*

Table 7: Students' perspectives on virtual reality as a relevant tool for the future of online education by age group

CONCLUSION

Future Directions and Additional Research

The current study arose from the question: Do we need to develop our courses and multimedia for every device type? As multimedia development efforts become increasingly important to technology integration in the higher education classroom, and to blended and online learning, gathering data regarding student preferences helps us learn more about how to focus development efforts where they are needed most. Mobile development, in particular, is a growing trend that can be time consuming and expensive. The results of this study inform our discussions of the development of multimedia for different devices, and ultimately help us to better serve learners in higher education.

The results of this study show a wide range and variety of usage of the four main device types: desktops, laptops, tablets, and smartphones. However, the students in this study overwhelmingly owned laptops and preferred to use those devices to access their online courses and engage with videos and other multimedia. While this study showed that some students were using tablets and smartphones to access their course materials, they were rarely preferred, although they were used for convenience.

The results of this study provide some data to assist in leveraging our staffing resources, particularly those resources related to multimedia design. For example, since this study suggests that a large number of students are less likely to own or prefer to use tablets for accessing their online courses and engaging with multimedia, the question is raised about whether we should focus less of our educational multimedia designers' time on developing for those devices.

Importantly, this study did not explore the impact of ability on the preference for student devices. Future studies could examine if there are differences in the preferred and ideal devices for students with disabilities compared to students without disabilities.

Additionally, repeating this study in the coming years will be an important step in understanding how student device preferences are changing over time. As technology continues to evolve, it may be that ease of use, convenience, and other rationales for device preferences evolve as well.

METHODOLOGY

Ecampus students who had been enrolled in at least one fully online course at Oregon State University within winter 2017 and/or spring 2017 terms were recruited via email to complete the student device preferences survey. The survey was administered online. Data collection occurred over a three-week period in April of 2017. Recruitment emails were sent to 15,704 students. The response rate for the survey was 13%. Upon completing the survey, respondents were given the opportunity to enter a drawing for one of ten $25 Amazon gift cards. The online survey included 20 closed-ended questions to measure device use, perceptions of preferred and ideal devices used for different purposes, reasons for preferred devices, and questions about purchasing new devices.

Data analysis

Descriptive analyses were conducted using SPSS. Open-ended responses were analyzed using content analysis and induction. Subgroup analyses were conducted for the age variable. After data cleaning, there were 2,035 responses that were used for data analysis. The demographics of survey respondents were compared to the demographics of the population of Ecampus students taking one or more fully online courses (11,612 students), at the time the survey was administered in spring term of 2017.

DESCRIPTION OF RESPONDENTS

Overall GPA

A total of 1,984 student respondents provided their overall GPA. The average GPA was 3.39 (SD=.48) with a range of .58 to 4.65.

Class Level

Three-quarters of the respondents (1,598, 78.5%) were undergraduate students. Graduate students made up 164 (8.1%) of the respondents. The remaining 273 (13.4%) students did not fit the undergraduate or graduate categories. The majority of these other students were post-baccalaureate students or individuals pursuing second degrees (see Figure 12). Comparing the class-level distribution of survey respondents to the distribution for all Ecampus students shows that the survey sample resembles the distribution of class levels of the Ecampus population during the term of data collection (spring 2017). However, the survey sample included a smaller percentage of seniors (36% compared to 42.9%) and slightly larger percentages of juniors, sophomores, and freshmen than the overall Ecampus population.

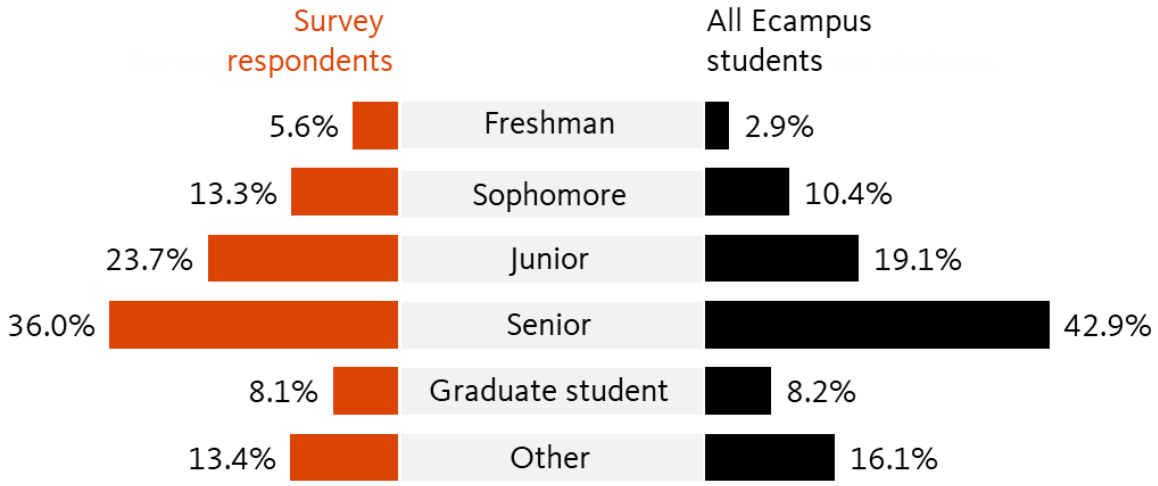


Figure 12: Class level of survey respondents and all Ecampus students

College affiliation

Student respondents' self-reported majors were collapsed into the colleges that house those majors. Figure 13 shows the college affiliations of the respondents who provided a major (N=2,010; 25 students did not provide a major). The largest percentage of students reported majors in the College of Engineering (477, 23.7%) and Liberal Arts (389, 19.4%), which are the colleges with the largest enrollments of the Ecampus student population. The category of other included the responses of undecided, non-degree seeking, and unknown.

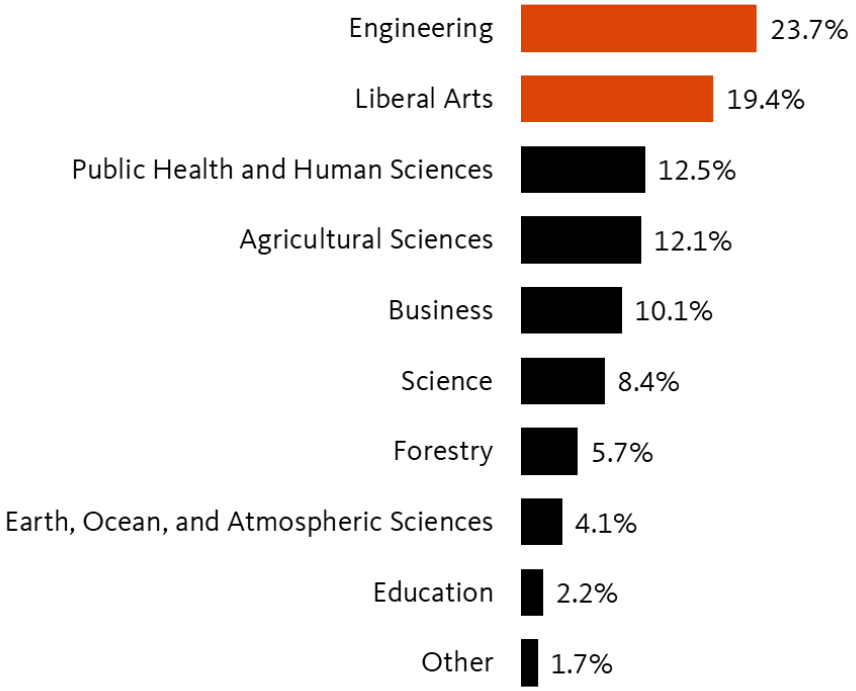


Figure 13: College affiliation of student respondents

Gender

The majority of the survey respondents self-identified as female (1,252, 61.5%), and 731 (35.9%) identified as male. Thirty-eight (1.9%) identified as other gender identities (trans male/trans female, genderqueer, different identities), 11 (<1%) chose not to identify, and three (<1%) chose not to respond. In the population of overall Ecampus students, 52.1% identify as female, 46.5% as male and 1.5% as other or chose not to identify. Thus, the survey respondents were slightly more likely to be female when compared to the population of Ecampus students.

Race/Ethnicity

The majority of the survey respondents self-identified as White (1,595, 78.4%), which is slightly higher than the percentage of all Ecampus students who identified as White (65.7%)

(see Table 8). The next largest number was 158 respondents (7.8%) who identified as Asian; which is higher than the 6.2% who identified as Asian in the overall Ecampus population. The 130 respondents (6.4%) who identified as two or more races closely matched the 6.6% who similarly identified in the population. The 88 (4.3%) respondents who identified as Hispanic/ Latino represented a much smaller percentage than those who identified as Hispanic/Latino in the population (8.7%).

Race/ethnicity	Survey respondents	All Ecampus students
American Indian or Alaskan Native	0.9%	0.6%
Asian	7.8%	6.2%
Black or African American	0.9%	1.8%
Hispanic/Latino	4.3%	8.7%
Native Hawaiian or Other Pacific Islander	0.7%	0.4%
White	78.4%	65.7%
Two or More Races	6.4%	6.6%
Other	0%	6.7%*
Missing/Unknown	0.6%	3.2%

**Other = Non-resident alien*

Table 8: Race/ethnicity categories for survey respondents and all Ecampus students

Age

The average age of the survey respondents was 28 years (SD=9.1) with a range of 18-66 years old. The largest number 967 (47.5%) were between the ages of 18-24. Over one-quarter (568, 27.9%) were between 25 and 34, and the remaining 386 (18.9%) were 35 years-old or older. A total of 114 (5.6%) did not provide valid age data in the form of birthdate. Table 9 compares the distribution of age categories for the survey respondents and the population of all Ecampus students (average age=26). The survey sample contained a smaller percentage of students aged 18-24 and a slightly larger percentage of students who were 35 years-old or older compared to the population of Ecampus students.

Age	Survey respondents	All Ecampus students
18-24	47.5%	58.4%
25-34	27.9%	28.2%
35+	18.9%	13.2%
Missing	5.6%	N/A

Table 9: Age categories of survey respondents and all Ecampus students

APPENDIX A: SURVEY INSTRUMENT

Explanation of Research Study

Oregon State University is collecting data for a research project that explores what devices students are using for their online classes and what drives their choices. This study has been approved by Oregon State University's IRB.

If you choose to participate, you will be asked to complete a survey that should take approximately 10 minutes.

You will have the option at the end of the survey to provide your email if you would like to be entered into a drawing for one of ten $25 Amazon gift cards.

Your participation in this survey is completely voluntary and your answers will be reported only in the aggregate. You may choose to leave the survey at any time. Your decision to take part or not take part in this study will not affect your grades, your relationship with your professors, or your standing at Oregon State University.

Because this study involves web-based research, there is a possibility of a breach of confidentiality. The research team has attempted to minimize risk to the study participants. All records and data collected as part of this study will be kept in a confidential environment.

There are no anticipated benefits that you will experience from the study.

If you have questions about this research, you can contact Michael Miller, Media Developer for Ecampus at Oregon State University (mike.miller@oregonstate.edu).

If you have any questions about your rights as a research subject, you may contact the Oregon State University Human Research Protection Program at 541-737-8008 or irb@oregonstate.edu

Thank you for taking the time to respond to our Survey on student device usage for online classes.

Do you consent to this research?

- Yes
- No

Are you considered an adult in the state in which you reside?

- Yes
- No

Are you currently incarcerated?

- Yes
- No

What year are you?

- Freshman
- Sophomore
- Junior
- Senior
- Graduate Student
- Other (please describe) _____

What is your major? _____

With which gender do you identify?

- Male
- Female
- Trans male/Trans man
- Trans female/Trans woman
- Genderqueer/Gender non-conforming
- Different Identity (please state) _____
- Prefer not to identify

When is your birthday? _____

With which race/ethnicity do you identify?

- ○ American Indian or Alaskan Native
- ○ Asian
- ○ Black or African American
- ○ Hispanic/Latino
- ○ Native Hawaiian or Other Pacific Islander
- ○ White
- ○ Two or More Races

What is your overall GPA? _____

How many online classes have you taken in the past year (including those you are currently enrolled in)? _____

Which of these devices do you own or borrow? (select all that apply)

	Own	Borrow	N/A
Desktop PC	○	○	○
Desktop Mac	○	○	○
Laptop PC	○	○	○
Laptop Mac	○	○	○
IPad	○	○	○
Tablet Windows	○	○	○
Tablet Android	○	○	○
IPhone	○	○	○
Android Phone	○	○	○
Other Smartphone	○	○	○
Other (please describe)	○	○	○

Overall, what device do you prefer to use when accessing your Canvas homepage?

- Desktop PC
- Desktop Mac
- Laptop PC
- Laptop Mac
- IPad
- Tablet Windows
- Tablet Android
- IPhone
- Android phone
- Other Smartphone

What reason best describes why you prefer that device? (check all that apply)

- ☐ Convenient
- ☐ Easy to use
- ☐ Most effective for viewing this type of content
- ☐ Don't have a better option
- ☐ Other (please describe) _____

What device do you prefer to use when viewing video content?

- Desktop PC
- Desktop Mac
- Laptop PC
- Laptop Mac
- IPad
- Tablet Windows
- Tablet Android
- IPhone
- Android phone
- Other Smartphone

What reason best describes why you prefer that device? (check all that apply)

- □ Convenient
- □ Easy to use
- □ Most effective for viewing this type of content
- □ Don't have a better option
- □ Other (please describe) _____

Of the following options, what is your ideal platform for viewing video content (whether you currently use the option or not)?

- ○ Desktop PC
- ○ Desktop Mac
- ○ Laptop PC
- ○ Laptop Mac
- ○ IPad
- ○ Tablet Windows
- ○ Tablet Android
- ○ IPhone
- ○ Android phone
- ○ Other Smartphone

What device do you prefer to use when learning with simulations and games?

- ○ Desktop PC
- ○ Desktop Mac
- ○ Laptop PC
- ○ Laptop Mac
- ○ IPad
- ○ Tablet Windows
- ○ Tablet Android
- ○ IPhone
- ○ Android phone
- ○ Other Smartphone

What reason best describes why you prefer that device? (check all that apply)

- □ Convenient
- □ Easy to use
- □ Most effective for viewing this type of content
- □ Don't have a better option
- □ Other (please describe) _____

Of the following options, what is your ideal platform for learning with simulations and games (whether you currently use the option or not)?

- ○ Desktop PC
- ○ Desktop Mac
- ○ Laptop PC
- ○ Laptop Mac
- ○ IPad
- ○ Tablet Windows
- ○ Tablet Android
- ○ IPhone
- ○ Android phone
- ○ Other Smartphone

For which of these purposes would you be most likely to purchase a new device?

- ○ Games/entertainment
- ○ Education
- ○ Communication
- ○ Work/job
- ○ Other (please describe) _____

Would you consider buying a new device if you thought it would benefit your education?

- ○ Yes
- ○ No
- ○ Not sure

If so, how much would you be willing to spend?

- I would not purchase a new device for this person
- I would spend $0 - $99
- I would spend $100 - $399
- I would spend $400 - $999
- I would spend $1000 or more
- I would purchase a new device if I could afford it

Do you think Virtual Reality is a relevant tool for the future of online education?

- Yes
- No
- Yes, but only if the cost comes down
- Too early to tell
- Don't know enough to comment

We appreciate your willingness to provide your input, however you are ineligible to be a participant in this study. Thank you for considering this research.

APPENDIX B: DATA TABLES

What year are you?

	Frequency	Percent
Freshman	113	5.6%
Sophomore	270	13.3%
Junior	482	23.7%
Senior	733	36.0%
Graduate Student	164	8.1%
Other (please describe)	273	13.4%
Total	2035	100.0%

With which gender do you identify?

	Frequency	Percent
Male	731	35.9%
Female	1252	61.5%
Trans male/Trans man	7	.3%
Trans female/Trans woman	4	.2%
Genderqueer/Gender non-conforming	14	.7%
Different Identity (please state)	13	.6%
Prefer not to identify	11	.5%
Missing	3	.1%
Total	2035	100.0%

With which race/ethnicity do you identify?

	Frequency	Percent
American Indian or Alaskan Native	19	.9%
Asian	158	7.8%
Black or African American	19	.9%
Hispanic/Latino	88	4.3%
Native Hawaiian or Other Pacific Islander	14	.7%
White	1595	78.4%
Two or More Races	130	6.4%
Missing	12	.6%
Total	2035	100.0%

Which of these devices do you own or borrow? Desktop PC.

	Frequency	Percent
Own	553	27.2%
Borrow	162	8.0%
N/A	1320	64.9%
Total	2035	100.0%

Which of these devices do you own or borrow? Desktop Mac.

	Frequency	Percent
Own	157	7.7%
Borrow	62	3.0%
N/A	1816	89.2%
Total	2035	100.0%

Which of these devices do you own or borrow? Laptop PC.

	Frequency	Percent
Own	1172	57.6%
Borrow	65	3.2%
N/A	798	39.2%
Total	2035	100.0%

Which of these devices do you own or borrow? Laptop Mac.

	Frequency	Percent
Own	845	41.5%
Borrow	48	2.4%
N/A	1142	56.1%
Total	2035	100.0%

Which of these devices do you own or borrow? iPad.

	Frequency	Percent
Own	661	32.5%
Borrow	56	2.8%
N/A	1318	64.8%
Total	2035	100.0%

Which of these devices do you own or borrow? Tablet Windows.

	Frequency	Percent
Own	155	7.6%
Borrow	12	.6%
N/A	1868	91.8%
Total	2035	100.0%

Which of these devices do you own or borrow? Tablet Android.

	Frequency	Percent
Own	329	16.2%
Borrow	20	1.0%
N/A	1686	82.9%
Total	2035	100.0%

Which of these devices do you own or borrow? iPhone.

	Frequency	Percent
Own	1249	61.4%
Borrow	14	.7%
N/A	772	37.9%
Total	2035	100.0%

Which of these devices do you own or borrow? Android Phone.

	Frequency	Percent
Own	738	36.3%
Borrow	11	.5%
N/A	1286	63.2%
Total	2035	100.0%

Which of these devices do you own or borrow? Other Smartphone.

	Frequency	Percent
Own	45	2.2%
Borrow	5	.2%
N/A	1985	97.5%
Total	2035	100.0%

Which of these devices do you own or borrow? Other (please describe).

	Frequency	Percent
Own	95	4.7%
Borrow	8	.4%
N/A	1932	94.9%
Total	2035	100.0%

Overall, what device do you prefer to use when accessing your Canvas homepage?

	Frequency	Percent
Desktop PC	338	16.6%
Desktop Mac	61	3.0%
Laptop PC	783	38.5%
Laptop Mac	705	34.6%
IPad	28	1.4%
Tablet Windows	25	1.2%
Tablet Android	6	.3%
IPhone	49	2.4%
Android phone	39	1.9%
Other Smartphone	1	.0%
Total	2035	100.0%

Canvas: What reason best describes why you prefer that device? Convenient.

	Frequency	Percent
Convenient	1127	55.4%
Not selected	908	44.6%
Total	2035	100.0%

Canvas: What reason best describes why you prefer that device? Easy to use.

	Frequency	Percent
Easy to use	1118	54.9%
Not selected	917	45.1%
Total	2035	100.0%

Canvas: What reason best describes why you prefer that device? Most effective for viewing this type of content.

	Frequency	Percent
Most effective for viewing this type of content	1437	70.6%
Not selected	598	29.4%
Total	2035	100.0%

Canvas: What reason best describes why you prefer that device? Don't have a better option.

	Frequency	Percent
Don't have a better option	104	5.1%
Not selected	1931	94.9%
Total	2035	100.0%

Canvas: What reason best describes why you prefer that device? Other (please describe).

	Frequency	Percent
Other (please describe)	143	7.0%
Not selected	1892	93.0%
Total	2035	100.0%

What device do you prefer to use when viewing video content?

	Frequency	Percent
Desktop PC	326	16.0%
Desktop Mac	61	3.0%
Laptop PC	731	35.9%
Laptop Mac	645	31.7%
IPad	84	4.1%
Tablet Windows	32	1.6%
Tablet Android	16	.8%
IPhone	62	3.0%
Android phone	47	2.3%
Other Smartphone	3	.1%
Missing	28	1.4%
Total	2035	100.0%

Video content: What reason best describes why you prefer that device? Convenient.

	Frequency	Percent
Convenient	1070	52.6%
Not selected	965	47.4%
Total	2035	100.0%

Video content: What reason best describes why you prefer that device? Easy to use.

	Frequency	Percent
Easy to use	991	48.7%
Not selected	1044	51.3%
Total	2035	100.0%

Video content: What reason best describes why you prefer that device? Most effective for viewing this type of content.

	Frequency	Percent
Most effective for viewing this type of content	1379	67.8%
Not selected	656	32.2%
Total	2035	100.0%

Video content: What reason best describes why you prefer that device? Don't have a better option.

	Frequency	Percent
Don't have a better option	106	5.2%
Not selected	1929	94.8%
Total	2035	100.0%

Video content: What reason best describes why you prefer that device? Other (please describe).

	Frequency	Percent
Other (please describe)	83	4.1%
Not selected	1952	95.9%
Total	2035	100.0%

Of the following options, what is your ideal platform for viewing video content (whether you currently use the option or not)?

	Frequency	Percent
Desktop PC	386	19.0%
Desktop Mac	102	5.0%
Laptop PC	630	31.0%
Laptop Mac	594	29.2%
IPad	137	6.7%
Tablet Windows	25	1.2%
Tablet Android	22	1.1%
IPhone	62	3.0%
Android phone	44	2.2%
Other Smartphone	5	.2%
Missing	28	1.4%
Total	2035	100.0%

What device do you prefer to use when learning with simulations and games?

	Frequency	Percent
Desktop PC	478	23.5%
Desktop Mac	91	4.5%
Laptop PC	633	31.1%
Laptop Mac	568	27.9%
IPad	76	3.7%
Tablet Windows	18	.9%
Tablet Android	13	.6%
IPhone	96	4.7%
Android phone	34	1.7%
Missing	28	1.4%
Total	2035	100.0%

Simulation and games: What reason best describes why you prefer that device? Convenient.

	Frequency	Percent
Convenient	1012	49.7%
Not selected	1023	50.3%
Total	2035	100.0%

Simulation and games: What reason best describes why you prefer that device? Easy to use.

	Frequency	Percent
Easy to use	1113	54.7%
Not selected	922	45.3%
Total	2035	100.0%

Simulation and games: What reason best describes why you prefer that device? Most effective for viewing this type of content.

	Frequency	Percent
Most effective for viewing this type of content	1344	66.0%
Not selected	691	34.0%
Total	2035	100.0%

Simulation and games: What reason best describes why you prefer that device? Don’t have a better option.

	Frequency	Percent
Don't have a better option	106	5.2%
Not selected	1929	94.8%
Total	2035	100.0%

Simulation and games: What reason best describes why you prefer that device? Other (please describe).

	Frequency	Percent
Other (please describe)	82	4.0%
Not selected	1953	96.0%
Total	2035	100.0%

Of the following options, what is your ideal platform for learning with simulations and games (whether you currently use the option or not)?

	Frequency	Percent
Desktop PC	525	25.8%
Desktop Mac	103	5.1%
Laptop PC	572	28.1%
Laptop Mac	531	26.1%
IPad	98	4.8%
Tablet Windows	21	1.0%
Tablet Android	20	1.0%
IPhone	83	4.1%
Android phone	36	1.8%
Other Smartphone	2	.1%
Missing	44	2.2%
Total	2035	100.0%

For which of these purposes would you be most likely to purchase a new device?

	Frequency	Percent
Games/entertainment	298	14.6%
Education	799	39.3%
Communication	99	4.9%
Work/job	722	35.5%
Other (please describe)	73	3.6%
Missing	44	2.2%
Total	2035	100.0%

Would you consider buying a new device if you thought it would benefit your education?

	Frequency	Percent
Yes	1522	74.8%
No	120	5.9%
Not sure	349	17.1%
Missing	44	2.2%
Total	2035	100.0%

If so, how much would you be willing to spend?

	Frequency	Percent
I would not purchase a new device for this person	116	5.7%
I would spend $0 - $99	104	5.1%
I would spend $100 - $399	448	22.0%
I would spend $400 - $999	514	25.3%
I would spend $1000 or more	261	12.8%
I would purchase a new device if I could afford it	548	26.9%
Missing	44	2.2%
Total	2035	100.0%

Do you think Virtual Reality is a relevant tool for the future of online education?

	Frequency	Percent
Yes	449	22.1%
No	241	11.8%
Too early to tell	501	24.6%
Don't know enough to comment	372	18.3%
Yes, but only if the cost comes down	428	21.0%
Missing	44	2.2%
Total	2035	100.0%

About the Research Unit at Oregon State University Ecampus

Vision

The Ecampus Research Unit supports Oregon State University's mission and vision by conducting world-class research on online education that develops knowledge, serves our students and contributes to the economic, social, cultural and environmental progress of Oregonians, as well as national and international communities of teachers and learners.

Mission

The Ecampus Research Unit (ECRU) makes research actionable through the creation of evidence-based resources related to effective online teaching, learning and program administration toward the fulfillment of the goals of Oregon State's mission.

Specifically, the research unit conducts original research, creates and validates instruments, supports full-cycle assessment loops for internal programs, and provides resources to encourage faculty research and external grant applications related to online teaching and learning.

Contact us

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@ecresearchunit

Research Priorities

With nationally ranked online programs delivered by Oregon State Ecampus, the Ecampus Research Unit contributes to the field of online teaching and learning research in the following four areas:

- Access
- Quality
- Administrative Excellence
- Adult Learners

The ECRU prioritizes research that crosses multiple of these areas.

"Research in Action" podcast

The Ecampus Research Unit, in collaboration with the Ecampus multimedia team, produces a weekly podcast that focuses on topics and issues related to research in higher education.

Learn more by visiting ecampus.oregonstate.edu/podcast.

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