2021

Summer Academe

A Journal of Higher Education

Article

summeracademe.org

Condensed and Uploaded: Comparing Student Learning Outcomes in a Condensed, Online Summer Class with Outcomes in a Full-Semester, Face-to-Face Class

Jessica R. Welch
Embry-Riddle Aeronautical University

Christopher R. Roland
University of Central Arkansas

Josh Boyd
Purdue University

Abstract

With the significant cost of higher education and the uncertainty surrounding the COVID-19 pandemic, college students are increasingly seeking alternatives to traditional, face-to-face learning. However, concerns arise regarding whether condensed, online classes offer a comparable experience to their full-length, face-to-face counterparts. Using a pretest/posttest design, this study compares the achievement of learning outcomes and student satisfaction between a course offered in a full-semester, face-to-face format and the same course taught by the same professor in a condensed, online format. Results indicate that, although online students in the condensed course achieved more of their anticipated learning outcomes, they were less satisfied with their instructor. We offer potential explanations, practical implications, and guidelines.

Introduction

The 21st century has witnessed an array of new delivery methods for university courses. In addition to traditional delivery on residential campuses for semesters or quarters, options include short and long summer terms, winter terms, and even spring break classes. In almost all of these conventional and condensed terms, distance learning is a delivery option as well. And during the extraordinary circumstances of the COVID-19 pandemic, various combinations of condensed term lengths and online or hybrid delivery models have become commonplace. In spring of 2020, 1,300 US colleges and universities drastically altered their instruction modality with 65% adopting an online or hybrid model of instruction (College Crisis Initiative, 2021). In addition to alterations in instruction modality, many universities have condensed schedules to manage campus transmission risk. Many major universities have adopted a range of policies including removing midterm breaks, removing two weeks at the end of the term, or offering abbreviated courses (Nietzel, 2020).

However, changes in higher education delivery were already occurring before the pandemic accelerated the process. In a comprehensive survey of changes in university course delivery over the past hundred years, Harbor and Nemelka (2016), following Smith and Byrd (2015), reported several explanations for a recent increase in summer and online course offerings. Summer courses can allow for experimentation with pedagogy (benefiting instructors), and they can also benefit students by giving them the opportunity to catch up on credit hours, get ahead of schedule, or even pursue three-year degree options. Condensed online courses specifically provide a more flexible schedule, allowing students to travel or work during the summer. Distance learning is also beneficial for international students who may want the option to return home for the summer while continuing their education. Noting the particular benefits to students of summer online courses, Harbor and Nemelka (2016) noted that online offerings (pre-pandemic) made up about 25% of all summer courses.

As terms' formats vary, it is not always clear if the various lengths and modalities result in the same learning outcomes. This has prompted numerous discussions about the efficacy of different modes and durations of instruction. Interactivity between students, instructors, and class content has emerged as an important factor in explaining what makes courses effective (Anderson, 2003). Consequently, this finding has prompted inquiry into how the intensity and type of interaction may differ across instructional methods, as well as how these differences relate to student learning outcomes and satisfaction (Bernard et al., 2009).

This study compares student satisfaction and achievement of learning outcomes in a conventional full-semester, 16-week, face-to-face class (16FTF) with satisfaction and learning outcomes in the same class delivered in a condensed, 4-week, summer, online format (4OL). The course, learning outcomes, and professor are the same. Using a pretest/posttest assessment rather than student grades, this study compares student achievement of learning outcomes before and after each term, seeking to understand whether learning differs with the combination of different delivery methods

and course lengths. Because online classes are often offered in a condensed schedule, we believe examining the combination of variables (modality and duration) enhances ecological validity, thus allowing practical implications and recommendations that are more representative of an emergent classroom environment.

Literature Review

Even before COVID-19, it was not uncommon for sections of the same course to be offered in different lengths and delivery methods. Since COVID-19, of course, the number of combinations of course modality and duration seem to have significantly increased. For example, during the spring semester of 2020, almost 25% of US colleges and universities drastically altered their instruction format by condensing schedules, adopting online or hybrid models, or removing midterm breaks (College Crisis Initiative, 2021; Nietzel, 2020).

Several previous studies have examined single changes in courses rather than holistic comparisons based on both duration and online/face-to-face modality. Before online courses existed, for instance, Bohlin and Hunt (1995) studied how comfortable in- and pre-service teachers felt simply using computers in teacher training courses. They studied anxiety, confidence, usefulness, and liking of computers across different course schedules and arrangements, and they found that the two factors that contributed the most to student self-reported comfort with technology were more frequent meetings (i.e., more class meetings per week) and course duration of more than 10 weeks. Scott (1994) compared student perceptions of 14-week semester classes with 8-week and 4-week summer versions, finding that the more condensed duration featured "greater continuity of learning" and "greater concentration/focus on learning" because students' attention was not divided by as many other classes at the same time (p. 12). Students and instructors agreed that expectations for class performance in the summer were lower than in the regular semester, but nevertheless students reported more stress in summer classes because of the increased frequency of meetings (Scott, 1994).

In the study that focused most directly on comparing student learning in courses of different lengths before the advent of online courses, Van Scyoc and Gleason (1993) used a standardized economics test, along with student exam scores, to measure students' learning. Comparing results after 14-week and 3-week versions of the same course, they found that students demonstrated more learning during the 3-week course than they did during the 14-week course. However, these studies examined course instruction in only one format. It is possible that different modalities combined with different course duration may have a different impact on student learning.

It appears that students sometimes believe they learn better in the condensed schedule of summer classes. Ho and Karagiannidis (2007) asked undergraduates taking a summer class how they felt about the different delivery method, and their marketing students perceived that they learned more in the condensed schedule. Kucsera and Zimmaro (2010) also found that summer versions

of classes delivered by the same instructor received higher instructor and course evaluations than the full-semester versions. Anastasi (2007) compared face-to-face full-semester undergraduate classes with face-to-face summer classes. Though undergraduate students perceived the summer version to be slightly more demanding, their performance (measured by final course grades) was similar in both types.

Many courses that are offered online are also condensed, changing both the modality and the duration of the class. Recognizing this change and acknowledging the recent push for accountability in universities, Chatham-Carpenter (2017) has urged scholars to "investigate student learning in the online classroom" (p. 493). More recently, the COVID-19 pandemic has led many universities in the United States to transition to full or partial virtual learning.

While the current study attempts to expand understanding of the efficacy of online classes (that are also offered in more condensed time periods), it is not the first study to compare learning online with learning in comparable offline courses. Ferguson and DeFelice (2010) compared graduate student learning in full-semester courses with learning in summer online courses. By focusing on student perceptions and using academic performance as a measure of learning, they found that students did not perceive any differences in their learning. While students' grades were better in the online summer courses, they were less satisfied with their interactions with the instructor. Perhaps most similar to the current research was a study that used the same professor and the same class to compare full-semester classes delivered face-to-face and online (Friday et al., 2006). In this case the delivery method changed, but the course duration did not. The study found no significant difference in student performance.

In addition to affecting students' achievement of learning outcomes, differences in course duration and modality may also affect their satisfaction with the course. Here, satisfaction is defined as a student's subjective evaluation of the favorability of outcomes and experiences associated with education (Oliver & DeSarbo, 1989). The world of higher education is increasingly dynamic, and institutions can increase student admission and retention by ensuring student satisfaction (Elliot & Shin, 2002). Previous research has found that student satisfaction depends on multiple factors, including interaction quality (Clemes et al., 2008), student expectations (Alves & Raposo, 2007), student-centeredness of education, and instructional effectiveness (Elliott, 2002).

An additional factor that may differentiate student satisfaction in online versus face-to-face classes is social presence. Early research on social presence defines it as the extent to which the medium fosters a sense of closeness between communicators in a mediated interpersonal interaction. Social presence consists of intimacy, a mutual feeling of closeness; and immediacy, the perceived psychological distance between interactants (Short et al., 1976). The degree to which technology restricts social cues, such as vocalics or nonverbal cues, may limit perceptions of social presence (Allmendinger, 2010). Frisby et al. (2013) found that online instruction with more social cues (visual, auditory, textual) yielded higher perceptions of social presence and better attainment of

relationship goals among students compared to instruction with fewer social cues (text only). This suggests that the affordances of technology used in online instruction may have implications for student perceptions of instructors.

Studies on social presence may further explain how online instructional delivery affects perceptions of broader student-instructor relations. Through altering the degree of social cues in online instruction, researchers have tested how social presence may relate to a range of perceptions of instructors. Online instruction that is high in social presence (compared to low) has been associated with greater student perceptions of learning (Arbaugh, 2005) and instructor immediacy (Cui et al., 2013). Richardson et al. (2017) conducted a meta-analysis to investigate the role of social presence in student learning outcomes and found moderate positive correlations between student satisfaction and learning. However, a high degree of variation among study correlations suggests the nature of the online instructional setting played a central role in the relationship between social presence and learning outcomes. This invites further inquiry into how different characteristics of online instructional modalities may impact student satisfaction.

Research Questions

In this study, we examine this broad question: How does student learning in conventional semester-length, face-to-face instruction compare with student learning in condensed, online delivery? Rather than isolate the contributions of the online modality or the condensed term length, we look holistically at whether learning is similar even when multiple aspects of the course are manipulated. This manipulation of various aspects of a course offers a practical comparison, particularly in a time when COVID-19 has condensed semesters by one or more weeks and moved part or all of course content and interaction online. Studying the impact of these changes with the professor held constant may also shed light on how the achievement of learning outcomes varies among sections of courses taught by different instructors.

Though results of previous efforts to compare different course formats have been mixed, there are indications that the condensed, online format leads to comparable or improved student learning. This study tests that idea by comparing undergraduate student learning in a conventional full-semester (16-week), face-to-face class (16FTF) with student learning in the same class offered as a condensed, summer (4-week) online class (4OL). Therefore, the following research questions are posed:

> **Research Question 1:** How did the achievement of individual learning outcomes differ among students in the 4OL versus 16FTF courses?
>
> **Research Question 2:** How does course format impact changes in students' achievement of learning outcomes?

Previous studies' assessment of learning outcome achievement primarily relied on students' final grades. This measurement is problematic because final grades are impacted by variables like students' time management skills, punctuality, and ability to follow directions in addition to their learning. Furthermore, final grades represent the extent to which students have achieved the *combination* of all course learning objects. Our first research question explores the achievement of learning outcomes individually to determine which ones are (not) being met. A final issue with measuring student learning with final grades is that it does not account for students' previous knowledge of content when beginning the course. Therefore, our second research question relies on *changes* in student overall scores between the pre- and posttests to assess the extent to which student knowledge improved.

In response to inconsistent findings related to social presence in varying formats and durations, and the impact of social presence on satisfaction, the final research question is posed:

Research Question 3: How did student satisfaction differ between 4OL and 16FTF courses?

Method

The Study Course

The course at the heart of this study is a writing-intensive course required of all communication majors at a large public university in the Midwestern United States. Two versions of this course, taught by the same professor and using the same learning outcomes, were compared in this study: a 16-week large lecture version with face-to-face instruction, and a 4-week online version of the same course. The face-to-face class typically contains 90 to 110 students, and the online summer version generally enrolls 17 to 20 students. Only one section of the course is offered each semester. Data collection occurred over the course of three years (2015 to 2017), and the data set includes responses from two 4OL sections and two 16FTF sections.

The 4OL and 16FTF sections share the same learning objectives but differ in number of assignments and interaction frequency and intensity. Both sections require two major papers and two exams, both include online readings and quizzes, both meet the definition of a writing-intensive course (Farris & Smith, 1992), and both rely primarily on lectures. There are some differences, however, necessitated by the differences in format. While the 16FTF class has 50-minute lecture periods, the 4OL class has asynchronous lectures broken into smaller pieces (mostly videos between 6 and 20 minutes in length). The same instructor teaches all of the sections in this study and has been teaching the course since 2001. Though there are, of course, minor changes in illustrations and applications over time, the learning outcomes are identical and the content is substantially the same. Online course videos cover the same content, by the same instructor, as in-person lectures.

While the 16FTF class has 18 homework assignments, the 4OL class has only 12. There are only 19 weekdays in the 4-week online session, so it would create a problem if the exams, major papers, and homework assignments of the full-semester course (22) exceeded that number. Consequently, the number of homework assignments for the 4OL section is reduced to avoid having more than one assignment due each day. A reduction in the number of assignments is not uncommon in many summer courses condensed into fewer weeks (whether delivered online or face-to-face).

In addition to the length and delivery method, courses varied in the nature and frequency of interaction between instructor and students. Due to the short duration and distributed nature of 4OL sections, additional interaction was required, resulting in frequent student-instructor interaction. In these 4OL sections, students corresponded with the instructor daily through the submission of class activities and assignments, and the daily receipt of instructor feedback on these assignments. In contrast, students in 16FTF sections interacted with the instructor infrequently outside of regular class meetings. Both course formats were structured to produce low-frequency student-to-student interaction, with interaction limited to class discussions.

This foundational course has four units intended to introduce students to concepts they will draw on during their continuing studies in communication: critical thinking and writing, rhetoric, qualitative research methods, and critical perspectives. The most challenging unit to translate into pretest/posttest questions was critical thinking and writing. Bearing in mind Medhurst's (1989) charge that teaching rhetoric and writing to undergraduates provides "analytical 'equipment for living'" (p. 175), the instructor developed prompts for the pre- and posttests that gave students the opportunity to demonstrate just those kinds of skills.

Most of the course comparison studies cited earlier used student grades to assess learning outcomes. However, as Friday et al. (2006) acknowledged, "using the grade received in the course as the outcome measure may be more a function of student compliance than student learning" (p. 76). A final course grade is the result of several factors including student learning, but it might also measure how well students meet deadlines and follow directions. Darling (2017) has called for a renewed focus on actual student learning rather than perceptions only, urging scholars to find "direct evidence of observed student learning" (p. 254). By using a pretest/posttest structure, this study responds to this limitation in previous studies and addresses the need for more direct evidence of student learning.

Each learning outcome in the course was translated into one or more items on the pre- and posttests that measured whether the outcome had been achieved. By separating the learning measure entirely from student grades, this approach assesses how much students know (relative to the learning outcomes) when they enter the class, and measures student learning gains by the end of the course. This is a normal part of instruction in the class, with the pretest being used to help the instructor understand the knowledge students bring into the class with them and the posttest highlighting areas where instruction did or did not result in meeting learning outcomes.

Participants and Design

The sample consisted of 186 students from two 4-week online sections (n = 28) and two 16-week face-to-face sections (n = 158) of the course. The makeup of class by gender was similar in the two conditions (4OL sections were 70% female/30% male, while 16FTF sections were 71% female/29% male). In both conditions, more than 75% of the students had sophomore or junior status. An instrument assessing all course learning outcomes was administered at Week 1 and Week 4 for 4OL sections, and at Week 1 and Week 15 for 16FTF sections.

Measures

Learning Outcomes

To assess differences in the achievement of learning outcomes between the course formats, we began with the six student learning outcomes in the syllabus (see Appendix). Each of the six outcomes was measured by at least one pretest/posttest item for a total of 10 items. Some of these items were measured dichotomously, while others had potential score ranges varying from two to four. (See the Appendix for a complete explanation of the scoring method.) The learning outcomes were designed to assess proficiency in the four units, including the critical thinking and writing outcomes of (1) writing a thesis statement and (2) composing an argument with supporting evidence. Students were further asked to (3) identify foundational rhetorical concepts and theorists, ancient and modern. Next, participants were asked to (4) differentiate between qualitative research methods and (5) distinguish among various critical perspectives. Finally, participants (6) applied two of these methods to analyze a problem context. In addition to scoring individual items, a global score was computed for each participant based on an aggregate computation of the 10 items ranging from 0 to 20.

Satisfaction

Past research has indicated differences in student satisfaction between face-to-face and online classes (Concannon et al., 2005; Dennen et al., 2007). Therefore, students' perceptions of the course were assessed using anonymous end-of-semester course evaluations. These evaluations include 11 five-point Likert-type scale items which assess students' satisfaction with the course and the instructor. (See Table 1 in the Results section for all course evaluation items.) Whereas satisfaction is typically measured with an aggregate single item, the use of this multi-attribute level measurement allowed students to evaluate their satisfaction with each dimension of the course (Elliott & Shin, 2002). Responses from both 4OL sections and both 16FTF sections were combined for analyses, resulting in 28 responses from 4OL classes and 97 responses from 16FTF classes.

Procedure

Participants were instructed that the instrument would be used to identify achievement of learning outcomes by reassessing their responses at the end of the semester. Completion time of the instruments was restricted to 25 minutes for both the pretest and posttest measures, in both the 4OL and 16FTF courses. Participants were asked to watch and evaluate a brief video advertisement as a writing prompt in support of the second learning objective. These videos were changed between time points while all other pretest materials were replicated at the second time point; the purpose of changing the video was to see how well students could make arguments about communication texts that were new to them. Using the same video at posttest might have introduced bias and given those students an advantage because they had already seen it and written about it earlier in the course.

In advance of the assessment, participants were informed that their responses would be anonymous and would not impact their grade in the course. To ensure anonymity, participants were asked to create a unique numerical code that was used to match pre- and posttest responses. Students who were absent during either part of the assessment, forgot their numerical code, or withdrew from the course were excluded from the analyses.

Coding and Reliability

Following the collection of all measures, two researchers compiled and coded responses. This was based on a detailed coding guide to determine whole or partial credit for responses at each time point. This process was directed by the course instructor, who provided a framework for how each response should be evaluated. Raters produced independent evaluations for 20% of the sampled responses, which was used to assess the degree of agreement. Cohen's kappa was computed to assess the extent of agreement between the coders. Across 9 of the 10 items, kappa values ranged from .80 to 1.00, which indicated substantial agreement across coders. One item rated as .49. For this item, sufficient variation in responses was not observed, which prohibited an accurate computation of kappa scores. Specifically, because 95.7% of students answered that item correctly, the kappa was artificially lowered. However, this item yielded a high percentage of consistent evaluations between raters (all values higher than 96%), indicating a high level of agreement. Collectively, these scores suggest a very high degree of agreement between coders.

Results

As learning may have varied as a function of class modality and duration, Research Question 1 investigated how learning outcome achievement differed between 4OL and 16FTF students. Independent samples *t* tests were conducted to determine whether there were significant differences in posttest learning outcomes between 4OL and 16FTF sections.

Results indicate that, when compared to students in 16FTF sections, students in the 4OL courses scored significantly higher for

- Learning Outcome 2 ($t[181] = 2.07$, $p = .04$)
- Learning Outcome 3 ($t[94.83] = 3.94$, $p = .001$)
- Learning Outcome 4 ($t[181] = 3.64$, $p < .001$)
- Learning Outcome 5 ($t[181] = 2.96$, $p = .003$)
- Learning Outcome 6 ($t[180] = 3.84$, $p < .001$)

The difference in the achievement of Learning Outcome 1 bordered on significance ($t[3.08] = 1.96$, $p = .051$) such that, on average, 4OL students scored higher than 16FTF students. (See the Appendix for details regarding learning outcomes and scoring.)

Although 4OL students achieved significantly higher learning outcomes on the posttest, it may be the case that they began the course with a better understanding of course content than 16FTF students. An independent samples *t* test indicated that the 4OL courses scored significantly higher on the pretest ($p < .001$). Therefore, Research Question 2 was assessed using change in learning outcome scores rather than posttest scores. Deltas were calculated for online and offline sections by subtracting overall pretest score from posttest score so that a higher score indicated more learning. An independent samples *t* test revealed that there was a significant difference between 4OL and 16FTF sections ($t[180] = 2.04$, $p = .04$). The 4OL sections experienced significantly more learning ($M = 6.11$, $SD = 4.11$), compared to 16FTF sections ($M = 4.70$, $SD = 3.89$). These results indicate that not only did 4OL students end the semester with greater understanding of course concepts than their 16FTF counterparts, but their learning also increased significantly more throughout the course.

Research Question 3 asked how satisfaction differed between 4OL and 16FTF students. Although students in 4OL sections achieved more in terms of learning outcomes, students in 16FTF classes were more satisfied with their instructor. Independent samples *t* tests were conducted to assess differences in satisfaction between 4OL and 16FTF sections for course evaluation items. Results indicate a significant difference in overall instructor score between classes, such that students in 16FTF sections rated the instructor significantly higher ($M = 4.42$, $SD = 0.76$) than students in 4OL sections ($M = 4.04$, $SD = 1.07$; $t[123] = -2.15$, $p = .034$). However, the effect size for this difference was small ($r = .19$). There were no significant differences between any other items. (See Table 1 for all item scores.)

Table 1: Course Evaluation Items and Scores for Online and Traditional Classes

Item	4-week, online format		16-week, face-to-face format		*t*
	M	*SD*	*M*	*SD*	
Overall, I would rate this instructor as . . .	4.04	1.07	4.42	0.76	-2.15*
Overall, I would rate this course as . . .	3.68	1.02	4.00	0.97	-1.53
My instructor has displayed genuine interest in the topics covered in this class.	4.64	0.56	4.72	0.45	-0.71
This course has been well organized.	4.43	0.79	4.50	0.67	-0.48
This course has been challenging.	4.75	0.44	4.77	0.43	-0.17
My instructor has been well prepared for class each day.	4.64	0.56	4.76	0.43	-0.98
My instructor has provided useful feedback throughout the semester.	4.11	1.29	4.43	0.74	-1.25
My instructor has treated all students in class with respect.	4.29	1.05	4.55	0.67	-1.28
My instructor has created an atmosphere that promotes learning.	4.25	1.04	4.56	0.60	-1.52
This class has provided a meaningful learning experience.	4.04	1.07	4.36	0.76	-1.79
My instructor shows respect for diverse groups of people.	4.43	0.88	4.52	0.65	-0.61

Note: Items are rated on a 1–5 Likert-type scale, with 1 representing "very poor" and 5 representing "excellent."
$n = 28$ for 4-week, online format; $n = 97$ for 16-week, face-to-face format.
*$p = 0.034$.

Discussion

Condensed summer instruction has served as an important and flexible feature of higher education that enables experimentation with different approaches to pedagogy (Harbor & Nemelka, 2016). In recent years, one emerging innovation in higher education often layered on top of condensed summer instruction is online instruction formats. Despite increasing prevalence of both adaptations (particularly during COVID-19 precautions), questions persist concerning the efficacy of condensed, online instruction in achieving the same educational outcomes attained in traditional full-semester, face-to-face classroom settings. We introduced an assessment measure

for a writing-intensive course across four semesters using a pretest/posttest method to determine the extent to which learning outcomes were achieved. This instrument was applied to two 16FTF sections and two 4OL sections to identify potential differences in learning outcomes and student satisfaction across delivery method and course duration.

This study yielded several important results to inform the achievement of learning outcomes in online courses. Learning objectives targeted basic writing skills, critical thinking skills, description of basic rhetorical concepts, and recognition of different qualitative methods and critical perspectives. One objective of this study was to explore whether the combination of class delivery method and duration seemed to make a difference in students' achievement of learning outcomes. Compared to 16FTF sections, posttest learning outcomes were significantly higher for students in 4OL sections. Furthermore, students in 4OL sections experienced significantly more learning throughout the semester than students in 16FTF sections. The results yielded an average improvement of 4.7 points for 16FTF sections and 6.1 for 4OL sections out of a possible 20 points, which demonstrated a significant difference. Moreover, we found that at the level of individual items, students in the 4OL sections outperformed students in the 16FTF sections on five of the six learning outcomes Taken together, this demonstrates a clear difference in learning outcomes achieved between condensed online and full-semester face-to-face sections, with greater student learning occurring in the condensed online format.

The intensity of the 4OL sections may have accounted for the advantage in learning outcomes relative to 16FTF sections. While there was more variety in the types of interactions in which students could engage in the 16FTF sections, student-teacher interaction was far more frequent for 4OL sections. This echoes the predictions originally posited by Anderson (2003), wherein meaningful learning experiences can be supported insofar as a single type of interaction occurs frequently. In the present case, the additional coordination requirements entailed by 4OL courses may have promoted the achievement of learning outcomes through regular student reports and consistent instructor feedback. In contrast, the relatively low degree of student, instructor, and content interaction which characterized 16FTF sections may have attenuated the meaningful learning outcomes attained by students in this format. This finding reflects Bernard et al.'s (2009) strong empirical support for the strength of interaction being associated with the promotion of learning outcomes.

These results seem to confirm similar studies' observation that student performance can be higher when class meetings (in this study, even virtual class meetings) are closer together (Bohlin & Hunt, 1995) and when semester length is condensed (Van Scyoc & Gleason, 1993). Summer courses also tend to be taken alone or with perhaps one other course, potentially allowing students to focus more on their learning with fewer distractions—what Scott (1994) called "greater continuity of learning" (p. 12). Interestingly, these earlier findings all predate the existence of online courses. This study suggests that the benefits of shorter, more intense instruction extend not only to in-person summer sessions, but also to online courses.

The finding that pretest scores were already higher for 4OL sections has two potential explanations. One is that summer students are often motivated to get ahead of schedule in their plans of study; the department where this study was conducted has an optional three-year degree program that requires summer enrollment, and some of those students may have been in the summer sections in this study. Therefore, these academically accelerated students may begin the class with more background knowledge. At the other end of the spectrum, some summer students are retaking the class to earn a higher grade. This also happens during the regular semester, but the percentage of students retaking the course was higher in the summer (21.6% of the 4OL students were retaking the class, while only 11% of the 16FTF students were retaking the class). Because these students had previously taken all or part of the course, they likely retained some of their learning from earlier attempts, giving them a higher score on the pretest. Possibly connected to this higher number of summer students repeating the course, summer students also tended to be slightly more advanced in their academic progress. The 4OL sections were 38% sophomores, 38% juniors, and 24% seniors, while the 16FTF sections consisted of 4% freshmen, 56% sophomores, 33% juniors, and 8% seniors.

Surprisingly, although students in 4OL sections experienced more learning, they were less satisfied with their instructor's performance than students in 16FTF classes (for the same instructor). One explanation is that, due to the brief duration of the course, students were unable to get to know their instructor on a personal level, and therefore did not feel as connected to them. Another explanation is students' perception of social presence. Computer-mediated communication can be a social experience, but it is the type of interactions that take place and the level of community that is created that impact the level of immediacy experienced by users (Gunawardena, 1995). Although students in 4OL classes "interacted" with the instructor more frequently by receiving consistent feedback, these interactions were mediated and asynchronous, which may not have provided the level of immediacy experienced through synchronous, face-to-face interactions in the 16FTF class. Students in the 4OL courses were given the option of interacting with the instructor via phone calls, but they chose to use email when contacting him with questions.

While encouraging in its confirmation that student learning occurs during this course (whatever the format), the results from this study are not all positive. The mean aggregate score of 12.77 out of a possible 20 points indicates that students on average are leaving the course *without* being able to earn more than 7 of the 20 points that were used to measure the six desired learning outcomes. If final grades for students were based solely on this figure (or if instructors' teaching were judged solely on these assessments), an achievement score of 63.85% is not very impressive. It certainly leaves a lot of room for improvement, and one other benefit of this system is that it shows the instructor which learning outcomes need the most remediation—and possibly suggests changes to instruction and activities related to them.

Limitations

This study provides empirical evidence suggesting that students learn more in condensed, online courses than they do in full-semester, face-to-face classes, but findings should be interpreted carefully. One central source of caution is that the course duration and modality were not tested independently. This limits the ability to identify how each variable contributed to the observed differences in achievement. It is possible that the condensed 4-week duration or the online delivery method independently yielded higher learning outcomes. Alternatively, the effects of duration and modality on achievement may have interacted in combination. Furthermore, small inconsistencies between the sections, such as duration of lectures and number of homework assignments may have impacted learning outcomes. Regardless, we cannot draw conclusions about the individual impact of course dimensions.

While the unique and separate causal roles of course duration and modality cannot be established, the study offers a useful comparison that is representative of the multifaceted learning environments that now characterize higher education. Researchers across social scientific disciplines have long identified the tradeoffs between internally valid research designs that offer controlled settings (prioritizing individual causal inferences) and those that capture the complex world to which findings are meant to be applied (Gigerenzer & Marewski, 2015). Designs that emphasize internal validity risk artificially disregarding the "real world" context in which instructional interventions and student assessment occurs. Accordingly, communication researchers have acknowledged pervasive limitations in the extent to which assessment instruments represent, describe, and are comprehensible to the targeted classroom environment (see Mazer & Graham, 2015). If this study had assessed course modality and duration independently, it would fail to represent the plurality of course characteristics that typify emergent instructional environments, particularly in the age of COVID-19.

Though the role of course modality and duration cannot be determined independently, the findings offer a comparison in learning outcomes between the historically predominant course format (in person, full term) and the emergent format (online, condensed). The need for assessment procedures for current instructional settings has increased in importance, with many US universities compelled to adopt online courses and abbreviate semester terms to varying degrees in the wake of the COVID-19 pandemic. Moreover, a procedure to assess the effectiveness of these condensed online formats is increasingly important due to growing concerns among instructors about online student learning (Aucejo et al., 2020).

Another factor that could have impacted results was the difference in class sizes. While the 16FTF classes include 90 to 110 students, the 4OL sections contain between 17 and 20 students. Previous research indicates that class size has an impact on students' learning outcomes and their satisfaction with the course (Bedard & Kuhn, 2008; Finn & Achilles, 1990; Monks & Schmidt, 2011). However, the relationship between class size and student success is highly debated, and some more

recent studies indicate that class size has no effect on achievement (Angrist et al., 2019; Leuven & Løkken, 2020). Furthermore, the majority of these studies focus on the impact of class size in face-to-face classrooms. To the authors' knowledge, there are no studies that compare student achievement in small, online classes to achievement in large, face-to-face classes.

A further limitation is that the scores may have been artificially skewed due to the characteristics of the different student samples. While the researchers observed moderately higher learning outcomes for 4OL sections, this may be a feature of the more condensed nature of the class. The 4OL class might have simply produced only short-term retention of information compared to the 16FTF course, increasing scores. Future studies would benefit from comparing learning outcomes of face-to-face sections to online sections for both condensed and full terms to provide a more nuanced understanding of the relationship between course modality and learning outcomes. Following up 6 to 12 months after the completion of each class might also reveal whether the condensed online gains are retained.

The setting in which the assessments were completed could also have artificially inflated the learning scores observed in 4OL sections. The instrument for 16FTF sections was administered during regular class meeting times, which produced a controlled environment for the participants. In contrast, 4OL students may have retrieved information from other sources to bolster their responses (e.g., searching for answers online), thus producing scores that are artificially inflated and do not accurately reflect achievement of learning outcomes. However, responses were anonymized to minimize this risk and students were explicitly informed that results would not impact their grades. Thus, students had low motivation to artificially bolster their scores.

One caveat for measuring the students' learning related to writing is that both the pretest and posttest were timed; students had 25 minutes in which to complete each of them, and each included two brief writing prompts. Condon and Kelly-Riley (2004) found that timed writing assignments tend to result in lower levels of critical thinking. For the purpose of this study, however, the time pressures were the same in both the pre- and posttest phases, so the comparison should still be valid even if the situation is not ideal for the best quality writing.

Practical Implications

Despite these limitations, the results of this study provide important guidelines for higher education. First, the creation and implementation of a tool that assesses student learning independent of final grades may pave the way for the use of similar assessments in other courses. Scholars have been critical of reliance on final grades as a measure of student achievement because of confounding variables like students' compliance, punctuality, and ability to follow directions. An assessment tool that measures achievement independently of these factors may provide a more accurate representation of student learning.

Results also provide insight into how course modality and duration, in combination, impact college students' experience. While students achieved more learning objectives in the 4OL course, they were less satisfied with their instructor. Future research is needed to determine a cause for the latter result, but one explanation is a lack of social presence. To combat this issue, online instructors could increase social presence by providing video—rather than written—feedback and by requiring students to attend virtual office hours via Zoom or another video conferencing platform. These suggestions are supported by previous research that indicates interacting with instructors via video and receiving video feedback increases students' perception of learning and social presence in online classes (Lyons et al., 2012; Thomas et al., 2017).

American higher education is currently facing a time of uncertainty in light of the COVID-19 pandemic. Most American institutions elected to transition online beginning midway through the spring 2020 semester, and since that time efforts to condense and/or move courses online have continued. Although disagreements exist on the effects these transitions have on mental and emotional health, results of this study indicate that, academically, students are not disadvantaged by online learning delivered in less time than a conventional semester. Furthermore, even in the absence of a pandemic, students may choose to participate in condensed, virtual classes to save money through early graduation. The results of this study suggest that students are not sacrificing education quality by finishing more quickly.

Areas for Future Study

One area for future research that could address a limitation of this study is testing course duration and modality independently to discern whether the condensed or online nature of the course had a more significant impact on learning outcomes and student satisfaction. This study took a holistic approach by examining these components simultaneously, but information on the independent impact of duration and modality could provide guidance for best educational practices moving forward.

Future research could also compare posttest scores with students' grades in the course to better understand the relationship between achievement of learning outcomes and final grades. A critique of basing the achievement of learning outcomes on grades alone is that final grades are impacted by other variables such as time management skills and the ability to follow directions. A study evaluating the strength of the relationship between grades and posttest scores could provide evidence to support or undermine this critique.

Finally, the relationship between students' perception of learning and actual learning could be an avenue for further research. Students' impressions of course effectiveness are impacted by many variables, including interest in the content and instructor likability; these factors may influence how much individuals feel they have learned during the semester. Comparing perceived learning

with actual learning could provide evidence of whether student perception is a valid measure of course effectiveness.

Conclusion

This study provides several findings that can inform both instructors and their students seeking proficiency in course material. By creating an instrument to measure achievement of learning outcomes directly, rather than relying on student grades (a product of many factors other than achievement of learning outcomes), researchers took an unflinching look at how much students are actually learning in one required communication course. This framework of assessment (operationalizing learning outcomes for a pre- and posttest analysis) was also significant because it addressed an advanced type of course. The instrument's successful implementation provides a model for other classes to use in measuring and comparing achieved learning objectives across multiple sections, durations, and modalities.

Instructors are experiencing increasing pressure to show evidence of student learning to administrators, accreditors, and even students. And during COVID-19 times, universities are under scrutiny about whether condensed, online instruction is as effective as conventional face-to-face, on-campus, semester experiences. Through a direct evaluation of learning objectives across instructional formats, assessment of specific courses can provide tangible evidence of achievement in learning objectives and deficiencies within the course. Such an assessment may therefore both serve as a powerful tool to justify course practices to universities and serve as a basis for identifying deficits in specific learning objectives to prompt course development.

Finally, this study reinforced the idea of several earlier studies that students can learn more in an abbreviated version of a course than a course offered during a traditional full semester. Programs need not fear that a condensed, online delivery method will reduce student learning. In fact, quite the opposite was demonstrated here. For departments trying to expand condensed and/or virtual learning options, this study provides evidence that such offerings can actually lead to better achievement of student learning outcomes.

References

Allmendinger, K. (2010). Social presence in synchronous virtual learning situations: The role of nonverbal signals displayed by avatars. *Educational Psychology Review*, *22*(1), 41–56. https://doi.org/10.1007/s10648-010-9117-8

Alves, H., & Raposo, M. (2007). Conceptual model of student satisfaction in higher education. *Total Quality Management & Business Excellence*, *18*(5), 571–588. https://doi.org/10.1080/14783360601074315

Anastasi, J. S. (2007). Full-semester and abbreviated summer courses: An evaluation of student performance. *Teaching of Psychology*, *34*(1), 19–22. https://doi.org/10.1080/00986280709336643

Anderson, T. (2003). Getting the mix right again: An updated and theoretical rationale for interaction. *The International Review of Research in Open and Distributed Learning*, *4*(2). https://doi.org/10.19173/irrodl.v4i2.149

Angrist, J. D., Lavy, V., Leder-Luis, J., & Shany, A. (2019). Maimonides' rule redux. *American Economic Review: Insights*, *1*(3), 309–324. https://doi.org/10.1257/aeri.20180120

Arbaugh, J. B. (2005). Is there an optimal design for on-line MBA courses? *Academy of Management Learning & Education*, *4*(2), 135–149. https://doi.org/10.5465/amle.2005.17268561

Aucejo, E. M., French, J., Ugalde Araya, M. P., & Zafar, B. (2020). The impact of COVID-19 on student experiences and expectations: Evidence from a survey. *Journal of Public Economics*, *191*, Article 104271. https://doi.org/10.1016/j.jpubeco.2020.104271

Bedard, K., & Kuhn, P. (2008). Where class size really matters: Class size and student ratings of instructor effectiveness. *Economics of Education Review*, *27*(3), 253–265. https://doi.org/10.1016/j.econedurev.2006.08.007

Bernard, R. M., Abrami, P. C., Borokhovski, E., Wade, C. A., Tamim, R. M., Surkes, M. A., & Bethel, E. C. (2009). A meta-analysis of three types of interaction treatments in distance education. *Review of Educational Research*, *79*(3), 1243–1289. https://doi.org/10.3102/0034654309333844

Bohlin, R. M., & Hunt, N. P. (1995). Course structure effects on students' computer anxiety, confidence and attitudes. *Journal of Educational Computing Research*, *13*(3), 263–270. https://doi.org/10.2190/YB6Q-HX39-11KK-GKYL

Chatham-Carpenter, A. (2017). The future online: Instructional communication scholars taking the lead. *Communication Education*, *66*(4), 492–494. https://doi.org/10.1080/03634523.2017.1349916

Clemes, M. D., Gan, C. E. C., & Kao, T.-H. (2008). University student satisfaction: An empirical analysis. *Journal of Marketing for Higher Education*, *17*(2), 292–325. https://doi.org/10.1080/08841240801912831

College Crisis Initiative. (2021, April 7). *COVID-19 data dashboard*. https://collegecrisis.org/covid-19-data-dashboard/

Concannon, F., Flynn, A., & Campbell, M. (2005). What campus-based students think about the quality and benefits of e-learning. *British Journal of Educational Technology*, *36*(3), 501–512. https://doi.org/10.1111/j.1467-8535.2005.00482.x

Condon, W., & Kelly-Riley, D. (2004). Assessing and teaching what we value: The relationship between college-level writing and critical thinking abilities. *Assessing Writing*, *9*(1), 56–75. https://doi.org/10.1016/j.asw.2004.01.003

Cui, G., Lockee, B., & Meng, C. (2013). Building modern online social presence: A review of social presence theory and its instructional design implications for future trends. *Education and Information Technologies*, *18*(4), 661–685. https://doi.org/10.1007/s10639-012-9192-1

Darling, A. (2017). The lecture and the learning paradigm. *Communication Education*, *66*(2), 253–255. https://doi.org/10.1080/0363523.2017.1285039

Dennen, V. P., Darabi, A. A., & Smith, L. J. (2007). Instructor–learner interaction in online courses: The relative perceived importance of particular instructor actions on performance and satisfaction. *Distance Education*, *28*(1), 65–79. https://doi.org/10.1080/01587910701305319

Elliott, K. M. (2002). Key determinants of student satisfaction. *Journal of College Student Retention: Research, Theory & Practice*, *4*(3), 271–279. https://doi.org/10.2190/B2V7-R91M-6WXR-KCCR

Elliott, K. M., & Shin, D. (2002). Student satisfaction: An alternative approach to assessing this important concept. *Journal of Higher Education Policy and Management*, *24*(2), 197–209. https://doi.org/10.1080/1360080022000013518

Farris, C., & Smith, R. (1992). Writing-intensive courses: Tools for curricular change. In S. H. McLeod & M. Soven (Eds.), *Writing Across the Curriculum: A Guide to Developing Programs* (pp. 71–86). Sage.

Ferguson, J. M., & DeFelice, A. E. (2010). Length of online course and student satisfaction, perceived learning, and academic performance. *The International Review of Research in Open and Distributed Learning*, *11*(2), 73–84. https://doi.org/10.19173/irrodl.v11i2.772

Finn, J. D., & Achilles, C. M. (1990). Answers and questions about class size: A statewide experiment. *American Educational Research Journal*, *27*(3), 557–577. https://doi.org/10.3102/00028312027003557

Friday, E., Friday-Stroud, S. S., Green, A. L., & Hill, A. Y. (2006). A multi-semester comparison of student performance between multiple traditional and online sections of two management courses. *Journal of Behavioral & Applied Management*, *8*(1), 66–81. https://doi.org/10.21818/001c.16698

Frisby, B. N., Limperos, A. M., Record, R. A., Downs, E., & Kercsmar, S. E. (2013). Students' perceptions of social presence: Rhetorical and relational goals across three mediated instructional designs. *MERLOT Journal of Online Learning and Teaching*, *9*(4), 468–480. https://jolt.merlot.org/vol9no4/frisby_1213.pdf

Gigerenzer, G., & Marewski, J. N. (2015). Surrogate science: The idol of a universal method for scientific inference. *Journal of Management*, *41*(2), 421–440. https://doi.org/10.1177/0149206314547522

Gunawardena, C. N. (1995). Social presence theory and implications for interaction and collaborative learning in computer conferences. *International Journal of Educational Telecommunications*, *1*(2), 147–166. https://www.learntechlib.org/primary/p/15156/

Harbor, J., & Nemelka, B. (2016). U.S. summer session strategies in context: Past, present, and future. *Summer Academe: A Journal of Higher Education*, *10*, 2–30. https://doi.org/10.5203/sa.v10i0.568

Ho, H., & Karagiannidis, V. (2007). Summer school teaching and learning: Some thoughts from undergraduate business students. *College Quarterly*, *10*(2), 1–12. http://collegequarterly.ca/2007-vol10-num02-spring/ho_karagiannidis.html

Korn, M. (2021, January 5). As COVID-19 surges, colleges make last-minute changes to spring calendars. *Wall Street Journal*. https://www.wsj.com/articles/as-covid-19-surges-colleges-make-last-minute-changes-to-spring-calendars-11609848003

Kucsera, J. V., & Zimmaro, D. M. (2010). Comparing the effectiveness of intensive and traditional courses. *College Teaching*, *58*(2), 62–68. https://doi.org/10.1080/87567550903583769

Leuven, E., & Løkken, S. A. (2020). Long-term impacts of class size in compulsory school. *Journal of Human Resources*, *55*(1), 309–348. https://doi.org/10.3368/jhr.55.2.0217.8574R2

Lyons, A., Reysen, S., & Pierce, L. (2012). Video lecture format, student technological efficacy, and social presence in online courses. *Computers in Human Behavior*, *28*(1), 181–186. https://doi.org/10.1016/j.chb.2011.08.025

Mazer, J. P., & Graham, E. E. (2015). Measurement in instructional communication research: A decade in review. *Communication Education*, *64*(2), 208–240. https://doi.org/10.1080/03634523.2014.1002509

Medhurst, M. J. (1989). Teaching rhetorical criticism to undergraduates: Special editor's introduction. *Communication Education*, *38*(3), 175–177. https://doi.org/10.1080/03634528909378752

Monks, J., & Schmidt, R. M. (2011). The impact of class size on outcomes in higher education. *The B.E. Journal of Economic Analysis & Policy*, *11*(1). https://doi.org/10.2202/1935-1682.2803

Nietzel, M. T. (2020, September 13). As Covid-19 lingers on, universities are adjusting their spring semester plans, often eliminating spring break. *Forbes*. https://www.forbes.com/sites/michaeltnietzel/2020/09/13/as-covid-19-lingers-on-universities-are-adjusting-their-spring-semester-plans-often-eliminating-spring-break/?sh=712c9c5c49fd

Oliver, R. L., & DeSarbo, W. S. (1989). Processing of the satisfaction response in consumption: A suggested framework and research propositions. *Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behavior*, *2*(1), 1–16.

Richardson, J. C., Maeda, Y., Lv, J., & Caskurlu, S. (2017). Social presence in relation to students' satisfaction and learning in the online environment: A meta-analysis. *Computers in Human Behavior*, *71*, 402–417. https://doi.org/10.1016/j.chb.2017.02.001

Scott, P. A. (1994). A comparative study of students' learning experiences in intensive and semester-length courses and of the attributes of high-quality intensive and semester course learning experiences. In *Proceedings: 30th Annual Conference of the North American Association of Summer Sessions*. http://files.eric.ed.gov/fulltext/ED370498.pdf

Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications*. Wiley.

Smith, K., & Byrd, C. N. (2015). 2014 Joint Statistical Report summary. *Summer Academe: A Journal of Higher Education*, *9*, 2–12. http://doi.org/10.5203/sa.v9i0.544

Thomas, R. A., West, R. E., & Borup, J. (2017). An analysis of instructor social presence in online text and asynchronous video feedback comments. *The Internet and Higher Education*, *33*, 61–73. https://doi.org/10.1016/j.iheduc.2017.01.003

Van Scyoc, L. J., & Gleason, J. (1993). Traditional or intensive course lengths? A comparison of outcomes in economics learning. *The Journal of Economic Education*, *24*(1), 15–22. https://doi.org/10.1080/00220485.1993.10844775

Biographies

Jessica R. Welch is an assistant professor of communication in the College of Arts and Sciences at Embry-Riddle Aeronautical University, where she teaches courses on science communication and research methods. Her research focuses on how the lay public understands and communicates complex scientific information, especially in online spaces.

Christopher R. Roland is an assistant professor in the School of Communication at the University of Central Arkansas. His research focuses on the experimental and computational investigation of mediated social influence processes.

Josh Boyd is professor and director of undergraduate studies in the Brian Lamb School of Communication at Purdue University. He has served as a faculty fellow at Purdue's Center for Instructional Excellence, and he developed Purdue's first official "Degree in Three" accelerated program.

Appendix

Learning Outcomes and Pretest/Posttest Measurement

At the end of this course:	points possible on pretest/posttest
1. You will be able to write a clear thesis statement that condenses an argument into one sentence.	0–3
2. You will be able to write and support an argument about a communication text.	0–3
3. You will be able to explain how rhetoric is foundational for communication.	0–4
4. You will be able to distinguish among qualitative methods of communication research.	0–3
5. You will be able to identify and distinguish among critical perspectives on communication.	0–3
6. You will be able to explore a given sample of communication using multiple methods and perspectives.	0–4

Measurement:	learning outcome	points possible
1. You are completing an online course, and you've probably also taken many conventional classes delivered face-to-face. What do you think—are online classes more effective methods of instruction, or are conventional face-to-face classes? You don't need to make a thorough argument for your position, but in the space below write a complete thesis statement around which you would build an argument answering the question above.	1	3
2. In one well-developed paragraph, write an argument below about this short video.	2	3
3. Name the person recognized as the most influential thinker in the history of rhetoric and list two of that person's ideas that remain important and used today.	3	3

Measurement:	learning outcome	points possible
4. Offer one example of the rhetorical concept of identification (it can be a made-up example or an actual one, but it should show clear application of the concept).	3	1
5. In one sentence or phrase, define ethnography.	4	1
6. What qualitative method studies the basic building blocks of interaction to understand how communication acts (e.g., questioning, telling a joke, complaining) work?	4	1
7. What qualitative method believes that the interaction of several people about a question or issue produces richer and more complete information than asking people that same question individually, without the interaction with others?	4	1
8. What are two significant differences between a modernist and postmodern perspective?	5	2
9. In ideological criticism, what is assumed to be the root or default explanation for how communication texts work? Answer this question in a phrase or a sentence.	5	1
10. Imagine that you wanted to study a student singing group at this university. In the space below, offer two different qualitative methods or critical perspectives that you might use to understand this singing group, along with a sentence briefly describing how you could apply that method or perspective.	6	4