

Examining the Impact of Course Modality and Course Content Presentation Modality on
Undergraduate Grade Outcomes and Course Evaluations

A Dissertation Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

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August 2023

ACKNOWLEDGEMENTS

My sincerest gratitude goes out to both of my dissertation chairs Dr. Merilee McCurdy and Dr. Robert Williams as well as my committee members Dr. Karee Dunn and Dr. Sherry Bell for their perspectives, insights, and support. Their support and wisdom were invaluable throughout this process. I would also like to thank members of the Educational Psychology 210 team Alex Price, Lynette Neu, Danielle Shine, and Hallie Coleman. It has been a pleasure to work with them for the past 3 years. A special thanks to my cohort members Natalie Hassett, Jessica Kotik, Jade Bennett, and Kristen Fowler who have been amazing encouragers and support throughout my time in the program. Finally, I owe my greatest thanks to my parents, Maria Sandi and Jeffrey Hogan, for the endless amount of love and support. I would not be where I am or who I am today without them.

ABSTRACT

This study was conducted with students previously enrolled in an introduction to educational psychology course during the fall 2019 “F2F”, fall 2020 “online”, and fall 2021 “mixed” semesters, ($N=515$). The primary goal of this study was to examine how course modality, online and F2F, impacts certain course variables. Specifically, research questions examine how course modality impacts overall course performance, exam performance, homework completion, homework timeliness, and student ratings. Overall course grade, exam grades, and homework completion information were downloaded from Canvas and students identifying information were removed. De-identified student evaluation data were shared with the investigator.

A Kruskal-Wallis H test was used to examine the effects of modality (F2F, Online) on overall course performance, exam performance, assignment submissions, and adherence to deadlines. A Mann-U Whitney Test was used to examine the effects of modality on student ratings. There was no significant difference in course performance across modalities. However, there were significant differences in exam performance, homework completion, and timeliness in which the F2F semester had significantly better performance than the online and mixed semesters. Student ratings were significantly higher for the F2F semester on measures of classroom environment and structure. Additionally, those in the online semester spent significantly more time on the course than those in F2F semester. Implication for findings, limitations, and directions for future research are discussed.

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CHAPTER I

Introduction and Literature Review

Online learning has increased over the previous two decades and more students have been exposed to some aspect of online learning than ever before. Between 2005 and 2015, online course enrollment tripled (Stack, 2015). In 2010, 31 percent of higher education students had completed at least one course through an online format (Bell & Federman, 2013). In the same year, almost every undergraduate institution with over 15,000 students offered online courses (Figlio et al., 2013). The percentage of students enrolled in online courses continues to increase. In the fall of 2019, over 36 percent of students were enrolled in at least one distance education course (U.S. Department of Education, 2020), a 5 percent increase from a decade ago.

As a result of the Covid-19 pandemic, many more classes across the world were forced to move online. In 2020, 1.37 billion students had to adapt to online learning, as lockdowns and social distancing were implemented to stop the spread of Covid-19 (UNESCO, 2021). Many of these courses were not prepared for the switch to online learning. Given the current status of the pandemic and the increased adoption of online learning before the pandemic, it appears that online learning will likely become a permanent option for students. With an increase in online learning enrollment, it is important to examine whether these online modalities can be equivalent to traditional face-to-face (F2F) instruction.

Overall, the research on online and F2F course modalities are inconsistent. Therefore, it is important to examine the specific variables impacting student performance between online and F2F modalities and whether online courses can deliver similar student outcomes. This review of the literature will examine the technologies used to present course content followed by a review of course modalities and what the different modalities entail. Next, a review of the current

literature examining the difference in course grades, exam outcomes, student perspectives, adherence to deadlines, and completion of homework across online and F2F courses will be presented. Finally, a case will be made for future research and research questions will be presented.

Online Course Content Presentation

Before examining the differences between course modality and student performance, it is important to understand the different instructional formats within online courses -- synchronous, asynchronous, and hybrid. In synchronous courses, students attend a virtual class session at the same time every week usually through a live video platform (Scheiderer, 2021). Synchronous learning is closer to F2F learning and allows for live discussion, questions, and live lectures (Lowenthal et al., 2020). In asynchronous courses, the instructor and students engage with course content on their own time rather than during a regularly scheduled time frame (University of Waterloo, 2020). Within asynchronous courses, students learn on their own schedule with course material often being presented through prerecorded lecture videos, readings, and homework assignments (Scheiderer, 2021). Hybrid courses involve a blend of online and F2F instruction (Vols Online, n.d.). Hybrid courses may involve synchronous live lecture components or asynchronous components. Within hybrid modalities, instructors need to specify the nature of F2F and online instruction.

To examine the differences between online and F2F courses, it is important to be familiar with the technology that makes online courses possible. Course technology used by instructors to present online course content includes pre-recorded videos, Zoom, and Canvas. The next section of this paper will review the use and utility of these technologies to present course content within online courses.

Pre-Recorded Lecture Videos

When examining the delivery of asynchronous courses within higher education, prerecorded lecture videos are often used to present course content. The accessibility of recorded videos has increased due to the affordability of recording equipment, high internet speeds, and media production skills (Dinmore, 2019). Pre-recorded lecture videos may vary in format. Some videos may be a recording of a live class while others may be a recording of the instructor going through course content using a presentation of slides. These recordings allow students to view videos at their own pace. In addition, recordings allow for students to re-watch, pause the video to take notes, or focus on certain parts in preparing for an exam. This flexibility makes these courses more inclusive for students with disabilities as well (Dinmore, 2019).

Similar to other research on online course modalities, results are varied in support of pre-recorded videos. Moridani (2007) compared the use of live teleconferencing and recorded videos for course presentation within a pharmacogenetic pharmacotherapy course. Results indicated that there were no significant differences in performance between groups. However, those students in the asynchronous group reported that they could absorb information from the notes better but were overall less satisfied with the course. In an asynchronous course where lecture videos were used to deliver course content, student performance was equivalent to their F2F counterparts (Jong, et. al., 2013). A meta-analysis by Noetal et. al. (2021) found that when videos were used to present course content it was unlikely to be detrimental and usually resulted in an improvement in student performance.

Certain types of students may prefer recorded lecture videos even if it does not facilitate their course performance. Murphy and Stewart (2015) examined the use of recorded lecture videos within a physics course. Results indicated that there was overall no difference between

F2F and recorded lectures. However, they did find that weaker performing students tended to choose higher rates of recorded lectures which led to a reduction in engagement and achievement.

Zoom

Videoconferencing began in the 1960s; however, due to the high cost, it did not take off until the last 2 decades (Corria et.al., 2020). Specifically, the Covid-19 pandemic increased the use of videoconferencing software within education. Educators and students were given a week's notice to convert to an online format, and a large number of courses were not designed to be delivered online. As a result, videoconferencing tools were largely used to deliver course content. Videoconferencing has been widely used as a learning tool to simulate F2F lectures when F2F means are not possible (Al-Samarraie, 2019). It allows for a virtual F2F presentation that simulates nonverbal communication while building upon instructor presence.

Common video conferencing systems include FaceTime, Zoom, Skype, WhatsApp, Google Hangouts, and Microsoft Teams (Brame, 2021). Given the use of Zoom within the course in which this research took place, Zoom will be the focus of this review. While a review of Zoom is not necessary, a broad overview of the functions will be helpful. Within Zoom, instructors have access to features that may engage the class including share screen, breakout rooms, reactions, and polling. The "share screen" feature allows for the host/co-host to share their screen with everyone on the zoom call. Breakout rooms move participants into individual rooms to simulate small groups from a F2F classroom setting. Through the reactions feature students can choose from a variety of symbols such as thumbs up, thumbs down, or raise hand to simulate nonverbal communication within a classroom. The polling feature allows for instructors

to preload questions before the Zoom meeting begins and can be used to gauge students' knowledge of a particular subject.

Canvas

Learning management systems (LMS) are now used across F2F and online courses. An LMS is software made to support teaching and learning. Specifically, it organizes coursework, keeps track of student progress, and offers course access across a variety of devices (Canvas Team, 2021). According to Dahlstrom et. al. (2014) over 99 percent of institutions have some sort of LMS in place, over 85 percent of faculty use an LMS in their class, and 83 percent of students use an LMS in their courses. Common LMS include Moodle, Google Classroom, Blackboard, and Canvas. For the remainder of this paper, Canvas will be discussed given its use within the course examined.

Online learning would be very difficult without an LMS such as Canvas. Canvas is useful for organizing course materials, communication, and grade management. A Canvas course organizes these materials into Files, Quizzes, Announcements, Assignments, Modules, and Grades. In addition, instructors have the option to link other details to the course such as textbooks or zoom links. Within the Files section, instructors can upload important course documents, videos, PowerPoints, and other resources. Through the Quizzes tab, instructors can create quizzes or surveys to evaluate student work. In the Assignments section, instructors can create assignments for students. Modules are used to organize important course material by subject or chronologically. The Grades tab organizes student performance data so that instructors and students can monitor their progress in the course. Canvas also facilitates communication between instructors and students through the use of Announcements, which sends an email notification to the student.

Because of the organization held within Canvas, there is an opportunity for instructors to gather data regarding student performance and interactions within the course. Canvas allows instructors to download student grade data directly into an excel file and allows for instructors to access different data within the Canvas site itself. These data can be used to determine which strategies are working or how to improve upon certain aspects of the course.

Now that we reviewed the technology that makes course content presentation possible for online course formats, it is important to be familiar with the different instructional formats across online courses. These formats include synchronous, asynchronous, and hybrid.

Course Modality and Student Performance

Overall, there are many variables for instructors to consider when choosing an instructional format. Some of these variables include exam performance, overall course grades, student perspectives, homework completion, and adherence to homework deadlines. The next section of the paper will review the research surrounding these variables.

Exam Performance

When examining how well students are performing in a course, exam performance often provides valuable insight. A large body of research has examined the relationship between course modality and exam performance (Euzent et. al. 2011; Figlio et al., 2013; Gaylon et al., 2015; Glass & Sinha, 2018; Yen et al., 2018) however, this line of research has found inconsistent results. In addition, the body of research has relied on a variety of methodologies and course modalities which may contribute to the varied performance results and difficulty in interpretation.

Some previous research has found that traditional F2F courses have superior exam performance when compared to online courses (Figlio et al., 2013; Gaylon et al., 2015; Glass &

Sinha, 2018). In a study by Gaylon et al. (2015), researchers were interested in comparing group cohesion, as measured by a self-report survey, and student performance across a F2F course and an online hybrid course. Participants included 68 students enrolled in an undergraduate teacher-education course within a large southeastern university. Students enrolled in the F2F section met twice a week in the classroom while students enrolled in the hybrid section participated in class discussion through a discussion board with participation evaluated twice a week. Both modalities met in the same classroom to take the exams. Overall, results indicated that there was a significant difference in class cohesion ($p = .001$) and exam performance ($p = .027$), in which the F2F sections outperformed their online counterparts. A limitation noted by the researchers was the use of convenience samples rather than random samples. A study by Glass and Sinha (2018) examined the differences in student performance across online and F2F presentations of material within a hybrid undergraduate psychology course. Researchers used a within-subjects design with 37 participants enrolled in a state university. Half of the lessons were presented as F2F narrated PowerPoint presentations, and the other half were online recorded narrations of PowerPoint presentations. When the class material was presented in the F2F lecture, students earned higher scores on the exam and lesson questions ($p < .02$) versus when they learned the material online through a narrated PowerPoint. Limitations include the use of recorded narrations rather than live video teleconferencing platforms, some online students performing as well as the F2F students, and student choice to take online hybrid courses due to the fast pace and time-intensive nature of summer courses.

While some research supports the finding that F2F classes have superior performance compared to their online counterparts, other research has found no difference in exam performance between the two modalities (Euzent et al., 2011; Larson & Sung, 2009; Yen et al.,

2018). Euzent et al. (2011) examined the differences in student performance, student evaluation, and student satisfaction across instructional modalities. Participants included 300 students enrolled in two sections of an introductory economics course. One section received traditional F2F lecture while the other section watched the posted recording of the same lecture. Results indicated that when students watched recorded lectures online or attended class F2F, there was no significant difference in exam performance between F2F and the online section. Limitations included the lack of random samples, high attrition rates within the online section, and an inability to determine whether the online section watched the video of the lecture. Yen et al. (2018) were interested in the differences in a child development course delivered online, hybrid, and F2F. Participants were 85 students enrolled in an upper-level child development course. All classes had the same course content and instructor. Students in the F2F course attended lectures twice a week, students in the online section watched recorded lectures, and students in the hybrid section participated in a combination of F2F and recorded lectures. Results indicated no significant differences ($p > .05$) in exam performance for students enrolled in all modalities. Limitations included small sample size and a lack of control for GPA.

Limited research indicates that online courses may be superior to their F2F counterparts (Jorczak & Dupious, 2018). Jorczak and Dupious (2018) examined the difference in exam performance across 104 participants enrolled in an introductory psychology course offered F2F and online. The online course involved text-based lectures involving the same material introduced in lecture in the F2F section. Students enrolled in the online course outperformed their F2F counterparts on exams ($p = .001$). Limitations included the instructor involvement in research and possible instructor preference for a specific modality.

Course Grade Outcomes

When an instructor is choosing a modality for a course it is important to consider the overall grade outcomes for students. Again, the literature is inconsistent as to whether F2F or online course delivery have superior grade outcomes (Hart et al., 2018; Helms, 2014; Larson & Sung, 2009; York 2013). Similar to the exam outcome literature, the overall literature varies in course modalities and research methodologies.

Some of the literature indicates that students who were enrolled in online courses had poorer grade outcomes than students in F2F courses (Gibson, 2008; Helms 2014; Hart et. al. 2018; Xu & Jaggars, 2013). Helms (2014) examined student performance in a F2F and online psychology course. Participants were 105 students enrolled in F2F and online sections of careers in a psychology course. Both sections had the same assignments and discussion topics, the only difference between the two sections was course delivery modality. Students enrolled in the F2F section had higher final course grades ($p = .001$) than those enrolled in the online section. Limitations noted by the researchers include generalizability and student choice to take an online course. Hart et. al. (2018) examined the differences in student performance between F2F and online performance in a community college setting. Participants were students enrolled in online and F2F courses across various college courses at a California community college. Results found that students enrolled in online courses are less likely to earn a passing grade and also are more likely to repeat the course.

Similar to exam performance, research also has found that there is no difference in course grade outcomes between F2F and online modalities (Abdous and Yoshimura, 2010; Brown, 2012; Euzent et al., 2011; Larson & Sung, 2009; Newlin et al., 2005; McCutcheon et al., 2015; Stack, 2015; York, 2013). Abdous and Yoshimura (2010) were interested in the final grade

outcomes for students enrolled in F2F, satellite broadcasting, and live-streamed courses.

Participants were 3,258 students enrolled in F2F, satellite broadcasted, or live streamed courses.

Students enrolled in the F2F section met in the classroom, students enrolled in the satellite

sections were in a remote classroom watching the same lecture and could participate via

microphones, and students enrolled in the live-video section watched via computer and sent text

messages to interact. Results indicated that there were no differences in final course grades

across F2F, satellite broadcasted, and live-streamed courses. Limitations include convenience

sampling and low response rates which may limit generalizability. Wilson and Allen (2011) were

interested in the success of graduate students enrolled in an online course versus a F2F course.

Participants were 101 graduate students enrolled in four management courses at an HBCU.

Results indicated that there was no significant difference in withdrawal rates and course grades

between online and F2F courses. Limitations include generalizability to other universities and

convenience sampling. York (2013) was interested in course outcomes for social work students

enrolled in F2F, online, and hybrid courses. Participants were 42 students enrolled in a social

work management course. All assignments and tests were identical across sections and the

sections only differed in the delivery of course content. Results found that there was no

significant difference between the F2F and online sections. However, the hybrid group

performed significantly lower than both the F2F and online groups ($p = .03$). A limitation noted

in the study was the lack of recorded lectures for the online sections.

Homework Completion and Adherence to Deadlines

Completion of assignments is an important indicator of overall performance within a

course. Overall, the research in this area is sparse but supports that students in online courses are

less likely to complete homework and more likely to turn in assignments late (Hart et al., 2018; Helms; 2014).

Helms (2014) was interested in student outcomes in an online and F2F psychology course. Participants were 105 students enrolled in F2F and online sections of careers in a psychology course. Students in the online and F2F sections received the same assignment reminder messages. 64.8 percent of students enrolled in the online sections missed at least one grade opportunity compared to 18.9 percent of students enrolled in the F2F section ($p < .001$). Hart et. al (2018) examined the differences in student performance between F2F and online performance in a community college setting. Participants included over 100,000 students enrolled in online and F2F courses at 112 community colleges within the state of California. Across various types of courses, students enrolled in online courses were less likely to complete the course and course assignments and were more likely to repeat the course.

Student Perspectives of Online Learning

It is important to examine the students' perspectives of a course because it closely relates to student outcomes. Student satisfaction can provide insight into how well students may perform within a course (Eom et al., 2006). Overall, previous research is inconsistent regarding student perspectives of online and F2F learning (Aguilera-Hermida, 2020; Angelova, 2020; Ebner & Gegenfurtner, 2020; Rahayu, 2020; Spencer & Tremble, 2021; Yen et al., 2018;).

A large body of research suggests that students are equally satisfied by F2F and online courses and believe they deliver the same quality of instruction (Angelova, 2020; Driscoll et al., 2012; Euzent et al., 2011; Yen et al., 2018; York, 2013). Driscoll et., (2012) was interested in student performance and satisfaction across an online and F2F intro to sociology class. Participants were 368 students enrolled in three online sections and three F2F sections. Student

perspectives were collected by an online survey sent out at the end of each semester. Results indicated that students were equally satisfied by both F2F and online courses. In addition, there was no significant difference in student performance across online and F2F sections. Limitations noted by the researcher include convenience sampling from one university rather than a randomized sample. Angelova (2020) was interested in the university students' attitude towards online learning during the April 2020 Covid-19 quarantine period. Participants were 197 students enrolled in a 4-year university in Bulgaria. The survey was 11 items about attitudes towards online learning. Findings indicate no notable differences in reported learning quality between F2F and online lectures. Some students even noted an improvement in their ability to focus during online lectures.

While past research on online courses indicated that students are equally satisfied with online courses, other studies have indicated that students preferred F2F courses (Aguilera-Hermida, 2020; Ebner & Gegenfurtner, 2020; Newlin et al., 2005; Rahayu, 2020; Young & Duncan, 2014). In a study by Aguilera-Hermida (2020), researchers were interested in undergraduate students' perception of emergency online learning due to the Covid-19 pandemic. 298 undergraduate students completed a 36-item questionnaire regarding students' experiences with activities, attitudes, emotions, and educational experiences. Results indicated that students preferred F2F learning over online learning. Students also reported that online learning was unpleasant and had a negative attitude towards online learning. They found online learning to be more difficult as well. Limitations of this research included student stress due to the online pandemic, generalizability, and inability to reach students who did not have internet access. Rahayu (2020) was interested in students' attitudes towards a synchronous online course presented through Zoom. Participants were 62 undergraduate students taking an English course

at an Indonesian university. Results indicated that while students reported a positive attitude towards online learning, they still preferred F2F learning.

Some research has found that students have favorable ratings of online courses (Spencer & Tremble, 2021; Wiechowski & Washburn, 2013). Wiechowski and Washburn (2013) were interested in the ratings of students enrolled in finance and economics courses. Participants were 3,000 nontraditional students, older students with more business experience than traditional 18- to 22-year-old students, enrolled in 68 online courses, 26 blended courses, and 77 F2F courses. Students completed a Likert scale survey regarding their satisfaction with the course. Results indicated that students were more satisfied with online and blended courses ($p = .000$). Limitations included self-selection into desired modality and concerns about generalizability because students were older and nontraditional. Spencer and Tremble (2021) examined differences in students' performance and perspectives in online and F2F courses. Participants were 5,761 undergraduate students enrolled in courses from fall 2013 to fall 2018 semesters at a large public university. Students completed surveys at the end of each semester, which had a response rate of 14 percent. Findings indicated that students preferred F2F courses over online courses; however, students did report positive online experiences. A major limitation included no examination of F2F student perspectives, therefore, it is unclear if student perspectives would differ across course types.

When choosing whether to teach a class online or F2F instructors may want to consider exam performance, overall course grades, student perspectives, homework completion, and adherence to homework deadlines. The literature that examines these variables is inconclusive and would benefit from a further examination within an educational psychology course. The following section of the paper will make a case for further examination.

Best Practices for Asynchronous Online Courses

There is a large body of research that examines best practices for asynchronous online courses. This research gives instructors guides of how to best improve outcomes within asynchronous online courses. These recommendations include organization, instructor presence, and creating videos that maximize cognitive load.

Within an online course, it is important to establish a sense of community and collaboration (Bissonette, 2017) by creating an intuitive organized spaced that facilitates communication and establishes clear expectations. Organization is a key piece of a successful online course. An LMS like Canvas can facilitate content delivery, communication, and evaluation. It is recommended that instructors break course content down into modules organized by topic that are sequential. Within these modules it is important to organize the assignments intuitively. It could become frustrating if students have to click outside of the module to find content and it is difficult to find (Flower, 2020).

Instructor presence is also an important piece of asynchronous course delivery. Students want an instructor who cares and is present through online interactions (Community College Research Center, 2013). While F2F courses have set hours, an online instructor can be present by posting a weekly announcement, responding to email questions, holding online office hours, posting videos to clarify concepts, grading work in a timely fashion, and talking with students through discussion (Flower, 2020). Communication can provide clarity when there is uncertainty about expectations. It is important for instructors to communication clear expectations to students about what their role is in the course (Sanders et al., 2020). Asynchronous courses often use video to present content to students. Because of this it is important to consider certain factors when creating a video such as cognitive load, student engagement, and active learning.

When creating a video, it is recommended that the instructor maximize cognitive load to prompt working memory to process the most crucial information. Student engagement can be promoted by keeping videos brief, using conversational language, and speaking quickly. Active learning can be promoted by adding interactive questions, adding interactive features, using guiding questions, and making the video a part of a larger homework assignment (Brame, 2017).

Discussion posts or reflections have also been used to increase motivation and engagement while watching videos (Sanders et al., 2020).

Strategies to improve Retention and Course Outcomes

Past research has indicated that asynchronous courses may have poor retention and course outcomes; however there are certain instructional factors that can increase retention and course outcomes in asynchronous courses (Bawa, 2016; Glazier, 2015; Muljana & Luo, 2019). Researchers conducted a literature review to examine the factors that are associated with increased student retention in online courses. To do this they examined 40 empirically reviewed articles published from 2010 to 2018. They found that while certain student factors such as instructional level can predict success in online courses, there are things administrators and instructors can do to support success. Specifically, active communication, engagement, instructional guidance, early intervention, and on-going supports increased the likelihood that students completed the course (Muljana & Luo, 2019). Another literature review conducted by Bawa, examined factors associated with high attrition and factors that increased retention in courses (2016). Factors associated with increased attrition included misconceptions of cognitive load, social and family factors, motivation, technical constraints for students and faculty, lack of understanding of online learners, and limited faculty training. Ways to improve retention in the literature include mandatory online orientation, using computer mediated communication to

increase socialization, structured collaborative learning, and enhanced faculty training and support.

Rapport with an online instructor is also associated with increased retention and grades within a course. In a study by Glazier (2015), researchers were interested in whether implementing rapport building strategies in online classes would increase student retention and grades. Participants were 590 students enrolled in an introductory to political science course. Rapport building strategies included video updates, personal e-mails, and personalized electronic comments on assignments. Results showed that student who were enrolled in the courses with rapport building strategies had higher grades and lower attrition.

Increasing student engagement can help increase retention and performance within an online course. In a study by Cavinato et.al (2021) researchers were interested in the strategies asynchronous instructors use to engage students. In a survey of over 6,000 students enrolled at Indiana University, they found that students who participated in small-group and active-learning assignments had increased critical thinking, higher academic achievement, better reasoning, increased attention, and improved relationships.

Purpose of the Study

With the increase of online learning, especially due to the Covid-19 pandemic, it is important to examine how online learning compares to traditional F2F learning. As advances are made within video conferencing technologies, such as Zoom, and LMS, such as Canvas, the examination of how student performance compares across F2F and online courses will continue to be important. Instructors have the option of choosing hybrid, synchronous, and asynchronous modalities for online courses. When choosing the modality for their course, instructors may

consider certain variables such as exam performance, overall course grades, student perspectives, homework completion, and adherence to homework deadlines.

The review of the literature revealed varying findings related to exam performance, overall course grades, student perspectives, homework completion, and adherence to homework deadlines. Overall, the research examined various types of courses and used differing methodologies which revealed some limitations. Limitations included small sample sizes, student choice of course modality, low student response rate, and perspectives examined shortly after the beginning of the COVID-19 pandemic. The proposed study will address limitations by examining an educational psychology course with a larger sample size of approximately 540 students with a high rate of responses to the end of course of evaluations. The proposed study will also address these limitations by examining perspectives further into the pandemic where students had no choice whether to enroll in online or F2F class sections.

A further comparison of online and F2F courses can inform whether online courses are a viable alternative for F2F courses. An examination into exam performance, overall course grades, student perspectives, homework completion, and adherence to homework deadlines can give instructors a more precise understanding of the potential differences or similarities in online and F2F courses and help them choose which modality is best for their course. The results of this study aim to answer the following questions.

Research Question 1: How does course modality affect overall course performance? The literature is inconclusive as to whether online or F2F courses were superior to one another or equivalent to each other (Euzent et. al. 2011; Figlio et al., 2013; Gaylon et al., 2015; Glass & Sinha, 2018; Yen et al., 2018). The proposed study will add to the literature by comparing

student performance across five multiple-choice exams. It is hypothesized that students will receive higher course grades in the F2F modality.

Research Question 2: How does course modality affect exam grades? The literature is again inconclusive as to whether there is a significant difference in exam performance between online and F2F learning (Hart et al., 2018; Helms, 2014; Larson & Sung, 2009; York 2013). The proposed study will add to the literature by examining an educational psychology course with a large sample and a widely used LMS, Canvas. It is hypothesized that students will have higher exam performance in the F2F modality.

Research Question 3: How does course modality affect homework completion? Regarding homework and adherence to deadlines, the literature revealed that students in online courses have more missing assignments. The proposed study will add to the literature by examining a fast-paced course with over 40 assignments using a popular LMS. It is hypothesized that students will have higher homework completion rates in the F2F modality.

Research Question 4: How does course modality affect turning in homework on time? The literature revealed that students in online courses are more likely to turn assignments in late. The proposed study will add to the literature by examining a fast-paced course with over 40 assignments using a popular LMS. It is hypothesized that students in the online modality will have more late submissions than the F2F modality.

Research Question 5: How does course modality affect overall student ratings of the course? Similar to exam and course performance, student ratings of online and F2F modalities are inconsistent across the literature (Aguilera-Hermida, 2020; Angelova, 2020; Ebner & Gegenfurtner, 2020; Rahayu, 2020; Spencer & Tremble, 202; Yen et al., 2018). The proposed study will add to the literature by using end-of-course evaluations sent out by the university at

the end of each semester. The course has high rates of responses because of the opportunity to earn extra credit for filling out the anonymous course evaluation. It is hypothesized that students will more favorably rate the online modality than the F2F.

CHAPTER II

Methodology

Participants and Settings

Participants included approximately 540 undergraduate students enrolled in an educational psychology course within a large southeastern university. The University's Institutional Review Board (IRB) permitted the examination of student course data without obtaining informed consent from previously enrolled students. Permission was obtained before any data were analyzed. 180 undergraduate students were enrolled in six sections of an educational psychology course during the fall 2019 semester, an additional 180 students were enrolled in six sections of an educational psychology course during the fall 2020 semester, and the remaining 180 students were enrolled in the fall 2021 semester. Note that data from Spring 2020 were not included as that was the semester that transitioned online unexpectedly in March 2020.

Students in this course are usually sophomores or juniors; however, there are freshman, seniors, and graduate students who enroll in the course as well. The course serves as a general education credit or to fulfill a requirement to gain admission to the teacher education program. Approximately 30 students were enrolled in each section of the course. Two to three graduate teaching associates (GTA) and a Full Professor instructed the six class sections. The GTAs were supervised by the professor in weekly meetings. Course instructors and modalities changed across semesters. The fall 2019 semester and two sections of the fall 2021 were taught F2F, while the fall 2020 and four sections of fall 2021 semesters were online. Course design and additional course differences across semesters will be described below.

Course Design Fall 2019 – F2F

In fall of 2019, classes were held F2F. The course consisted of five units comprised of four lecture days and one exam day. All sections were held on Tuesdays and Thursdays. Each unit was approximately two and half weeks, sometimes longer depending on university holidays. Grades included attendance, participation, name cards, homework assignments, and exams. Course materials included instructor notes, PowerPoints, supplementary videos with ungraded questions, and an audio recording of the class for students who missed class. The instructor notes served as a textbook for the course. All course materials were created by the team of GTAs and the supervisor. Course materials were available on Canvas at the beginning of the semester.

Each lecture day of each unit included a set of 15 homework questions that were to be completed by 11:59 pm the day before the class meeting. To answer the homework questions students were required to review the corresponding sections of the instructor notes and PowerPoint slides. The homework questions were designed to prepare students for class discussion. The majority of homework assignments were awarded five points for completion. One of the 4 assignments was graded for quality and accuracy and worth a total of 15 points. The quality day was randomly assigned by the instructor and revealed to the students on the fourth day of each unit. Homework assignments were completed on Canvas, through an open ended survey where students automatically received credit. The instructor would then go through and manually adjust credit accordingly.

On lecture days, the discussion was centered around the corresponding instructor notes and lecture slides. By attending discussion days, students earned credit in three ways; attendance, name cards, and comments, worth a total of seven points. Students earned two points for attendance, one point for having a name card, and four points for making two comments in class.

Participation assignments were completed on Canvas, through an open ended survey where students automatically received credit. The instructor would then go through and manually adjust credit accordingly.

The instructors occasionally sent out reminders about homework and class events. The amount of announcements depended on the instructor. Instructors also set up meetings with students who earn below a 70% on the exam to discuss study strategies and course performance.

On the fifth day of each unit, students completed the unit exam in a computer lab through Canvas on a lockdown browser. The unit exam consisted of 50 multiple-choice questions. Each discussion day of each unit was equally represented in the number of questions. Students had the class period (75 minutes) to complete the exam. After completing the exam, the students received immediate feedback and could silently review the exam before leaving the lab.

Course Design Fall 2020 - Online

In fall of 2020, all course sections were completely online and asynchronous. The course consisted of five units comprised of four lecture video days and one exam day. Lecture videos were released on Tuesdays and Thursdays. Exams were available on Canvas through the Respondus lockdown browser during class time on Tuesdays and Thursdays as well. Each unit was approximately two and half weeks, sometimes longer depending on university holidays. Grades included lecture videos, homework assignments, review sessions, alternative assignments, and exams. The instructor notes served as a textbook for the course. All course materials were created by the team of GTAs and the supervisor. Course materials were available on Canvas at the beginning of the semester.

Each lecture video had 10 corresponding homework questions that were due by 11:59 pm the night before the lecture video was released. The homework questions were shortened to

lessen the workload for the online sections. To answer the questions, students were required to review the corresponding sections of the instructor notes and PowerPoint slides. Homework assignments were either five points or 10 points. Homework was designed to be completed on Canvas, through a open ended survey questions, where students automatically received a grade as they completed assignments. After the due date the instructor would go through and adjust points accordingly. Three out of four days were worth five points graded for completion. The remaining one assignment was graded for quality and accuracy, worth a total of 10 points. The quality day was randomly assigned by the instructor and revealed to the students on the fourth day of each unit.

At 8 am on Tuesdays and Thursdays, the lecture videos were released. The lecture videos were narrations of slides recorded by the professor. Students earned five points by watching the video and recording five things that they learned from the video. Lecture video assignments were due by 11:59 pm on Tuesdays and Thursdays. Lecture videos comments were designed to be completed on Canvas, through an open-ended survey questions, where students automatically received a grade as they completed assignments. The lecture video was embedded at the top of the assignments and open-ended boxes were below the video. After the due date the instructor would go through and adjust points accordingly.

Instructors also utilized the announcement features within Canvas to send students reminders of upcoming assignments, exams, or common course misconceptions. The announcements were up to the instructors discretion but instructors typically sent out similar announcements. Instructors also emailed students who earned a 70% or below to offer a meeting to talk about how students were preparing for the course and study strategies that may help them.

On assignments instructors left comments and feedback as to why students lost points and how they could improve on future assignments.

The Unit A review session was held during class time and did not have a grade attached to attendance. For Units B through E, a review session was held via Zoom between the fourth and fifth day of each unit. The review times were voted on by students. Students had the option to attend the Zoom review and record five things they learned to earn 10 points or they could choose to complete a supplemental assignment for 10 points. The supplemental assignments required students to watch a video or read an article with five corresponding questions.

On the fifth day of each unit, students completed the unit exam through Canvas on a lockdown browser. The unit exam consisted of 50 multiple-choice questions. Each lecture video day of each unit was equally represented in number of questions. Students had the class period (75 minutes) to complete the exam. After completing the exam, students received immediate feedback. To review the exam, students could arrange a meeting with their instructor.

Course Design Fall 2021 – Mixed

For the purpose of this study, the fall 2021 section will be referred to as “mixed.” Four sections of the fall 2021 semester were online and two sections were F2F. The course design of the two types of sections are discussed below.

Online

In fall of 2021, four sections were completely online and asynchronous. Two sections were face to face and described below. The course consisted of five units comprised of four lecture video days and one exam day. Lecture videos were released on Tuesdays and Thursdays. Exams were available on Canvas through the Proctorio lockdown browser during class time on Tuesdays and Thursdays as well. Each unit was approximately two and half weeks, sometimes

longer depending on university holidays. Grades included lecture videos, homework assignments, review sessions, alternative assignments, and exams. The instructor notes served as a textbook for the course. All course materials were created by the team of GTAs and the supervisor. Course materials were available on Canvas at the beginning of the semester.

Each lecture video had 10 corresponding homework questions that were due by 11:59 pm the night before the lecture video was released. The homework questions were shortened to lessen the workload for the online sections. To answer the questions, students were required to review the corresponding sections of the instructor notes and PowerPoint slides. Homework assignments were either five points or 10 points. Homework was designed to be completed on Canvas, through an open-ended survey questions, where students automatically received a grade as they completed assignments. After the due date the instructor would go through and adjust points accordingly. Three out of four days were worth five points graded for completion. The remaining one assignment was graded for quality and accuracy, worth a total of 10 points. The quality day was randomly assigned by the instructor and revealed to the students on the fourth day of each unit.

At 8 am on Tuesdays and Thursdays, the lecture videos were released. The lecture videos were narrations of slides recorded by the professor. Students earned five points by watching the video and recording five things that they learned from the video. Lecture video assignments were due by 11:59 pm on Tuesdays and Thursdays. Lecture videos comments were designed to be completed on Canvas, through an open-ended survey questions, where students automatically received a grade as they completed assignments. The lecture video was embedded at the top of the assignments and open-ended boxes were below the video. After the due date the instructor would go through and adjust points accordingly.

Instructors also utilized the announcement features within Canvas to send students reminders of upcoming assignments, exams, or common course misconceptions. The announcements were up to the instructors but instructors typically sent out similar announcements. Instructors also emailed students who earned a 70% or below to offer a meeting to talk about how students were preparing for the course and study strategies that may help them. On assignments instructors left comments and feedback as to why students lost points and how they could improve on future assignments.

Review sessions were held via Zoom on the fourth day of each unit. The zoom review sessions were completely optional to attend and there was no grade attached to the review session.

On the fifth day of each unit, students completed the unit exam through Canvas on the Proctorio lockdown browser. The unit exam consisted of 50 multiple-choice questions. Each lecture video day of each unit was equally represented in number of questions. Students had the class period (75 minutes) to complete the exam. After completing the exam, students received immediate feedback. To review the exam, students could arrange a meeting with their instructor.

F2F

In fall of 2021, two class sections were F2F. The course consisted of five units comprised of four lecture days and one exam day. All sections were held on Tuesdays and Thursdays. Each unit was approximately two and half weeks, sometimes longer depending on university holidays. Grades included attendance, participation, name cards, homework assignments, and exams. Course materials included instructor notes, PowerPoints, supplementary videos with ungraded questions, and an audio recording of the class for students who missed class. The instructor notes

served as a textbook for the course. All course materials were created by the team of GTAs and the supervisor. Course materials were available on Canvas at the beginning of the semester.

Each lecture day of each unit included a set of 10 homework questions that were to be completed by 11:59 pm the day before the class meeting. To answer the homework questions students were required to review the corresponding sections of the instructor notes and PowerPoint slides. The homework questions were designed to prepare students for class discussion. The majority of homework assignments were awarded five points for completion. One of the 4 assignments was graded for quality and accuracy and worth a total of 15 points. The quality day was randomly assigned by the instructor and revealed to the students on the fourth day of each unit. Homework assignments were completed on Canvas, through an open-ended survey where students automatically received credit. The instructor would then go through and manually adjust credit accordingly.

On lecture days, the discussion was centered around the corresponding instructor notes and lecture slides. By attending discussion days, students earned credit in three ways; attendance and comments, worth a total of ten points. Students earned two points for attendance, four points for making two comments in class, and four points for recording two things that they learned. Participation assignments were completed on Canvas, through an open-ended survey where students automatically received credit. The instructor would then go through and manually adjust credit accordingly. Most class days were held F2F but some class sessions were moved to Zoom due to high numbers of Covid cases within the class. The Zoom sessions were synchronous, and students earned credit in the same way as they did in-person.

The instructors occasionally sent out reminders about homework and class events. The number of announcements depended on the instructor. Instructors also set up meetings with students who earn below a 70% on the exam to discuss study strategies and course performance.

On the fifth day of each unit, students completed the unit exam through Canvas on the Proctorio lockdown browser. The unit exam consisted of 50 multiple-choice questions. Each lecture video day of each unit was equally represented in number of questions. Students had the class period (75 minutes) to complete the exam. After completing the exam, students received immediate feedback. To review the exam, students could arrange a meeting with their instructor.

Semester Differences

Major features of the course and course content were consistent across fall 2019, fall 2020, and Spring 2021 semesters. There are some small changes across semesters that should be noted. The GTAs that instructed courses changed from fall 2019 to fall 2020 semesters and again from fall 2020 to fall 2021.

The study questions changed from fall 2019 to fall 2020. In fall 2019 there were sets of 15 questions, while in fall 2020 the assignment was shortened to 10 questions. The questions were similar, covered the same content, and were improved for clarity. In addition, the quality day points were different across semesters. In fall 2019, the quality day was worth 15 points and in fall 2020 this was changed to 10 points.

Course modality changed across semesters. All sections of fall 2019 and two sections of fall 2021 were taught F2F, while fall 2020 and four sections of fall 2021 were taught online. Fall 2019 and the two F2F sections of fall 2021 incorporated attendance and participation credit. Fall 2020 and the online sections of fall 2021 incorporated lecture video credit for recording information that they learned from the video. The last difference involved the final exams. In fall

2019 the final exam was 100 items. In fall 2020 and fall 2021 the final exam was shortened to 50 items.

Dependent Variables

Course Grade

The course grade is a sum of points earned across lecture days/lecture videos, study questions, unit exams, final exams, and an extra credit opportunity. Across the semesters the point value of the lecture/ lecture video days, study questions, and final exam was changed to adapt the course load for the online course. To account for this the course grade will be compared by letter grades rather than total course points. There may be some additional differences in course grades across instructors due to the subjective grading of quality points and acceptance of late assignments. To account for these points will be removed from late assignments to match the late policy listed in the syllabus.

Exam Grades

Exam grades are defined as the number of points earned (out of 50) on each unit exam. The exam grades come from the unit exams taken at the end of each unit. Each unit exam consisted of 50 items (see Appendix C) taken through Canvas on the respondus lockdown browser. The F2F sections took the exam in a computer lab on campus while the online sections took the exam online. The settings of the lockdown browser slightly changed across F2F and online sections, where the online section had the addition of video recording because the exam was taken at home. The grading of exams was objective, and exams were automatically graded by the key uploaded to Canvas across sections. Some questions were changed or edited for clarity across semesters but covered the same content.

Homework Completion and Homework Submission Time

Homework completion was defined as whether the student turned in a homework assignment (see Appendix D). This was recorded as a zero within the grade book and was differentiated from late homework submissions. There are no differences across instructors and semesters as the policy stayed the same across semesters and instructors.

Homework submission time was recorded on Canvas. Late homework was defined as any homework assignment that was turned in past the due date and time. The course grading policy was zero points for late study questions. However, the policy had some subjectivity due to instructors granting extensions for extenuating circumstances. Instructor subjectivity should not impact this variable because the study will examine whether or not the assignment was turned in on time, not the grade attached to it.

Student Ratings

Student ratings are defined as students' evaluations of the course collected by the university at the end of each semester. End of course evaluations (see Appendix B) were sent by the university and student responses were completely anonymous. There were high rates of responses because students were offered five extra credit points if they submitted a picture receipt of the submission.

Procedures

Information for data analysis were collected from canvas grade book, speed grader, and/or de-identified and shared with the investigator via an excel file. Grade-related information will be collected by the section instructors from the grade book and downloaded to an excel file. Downloaded information was organized alphabetically. After removing extraneous data, students were randomly sorted by their student ID number in ascending or descending order. Next, all

identifying information was removed (Student ID, Name, Net ID). Upon receipt of the deidentified file, data from all sections will be aggregated into one file. Student ratings of the course were shared by the Office of Institutional Research and Assessment upon IRB and instructor approval. The data were already de-identified upon sharing with the primary investigator.

Fall 2019

Grade-related information was shared with the investigator from a previous investigation with the course data. Data included section number, de-identified participant numbers, exam scores, homework scores, homework submission time, and final grade scores.

Fall 2020 and Fall 2021

Student grade data were collected by the course instructor for the corresponding section. Final grade points, exam scores, lecture notes scores, and homework scores were downloaded into an Excel file from the grade book. Data also included students' first and last names and student ID numbers. Submission time and due date were collected from Canvas as well. Once data were collected, data were de-identified and shared with the investigator.

Data Analysis

A Kruskal-Wallis H test was used to examine the effects of modality (F2F, Online) on overall course performance, exam performance, assignment submissions, and adherence to deadlines. A Mann-U Whitney Test was used to examine the effects of modality on student ratings. The assignment submission and adherence to deadlines data were transformed into interval variables. Students who submitted a study question assignment were assigned a value of two while students who did not submit a study question assignment were assigned a value of one. The same process was used with the adherence to deadlines data. Students who submitted

assignments on time were assigned a value of two while students who submitted assignments late were assigned a value of one. The total point values out of 40 was used for the analysis. In addition, the course performance data were transformed into interval variables. Students were assigned values one through seven dependent on the letter grade.

CHAPTER III

RESULTS

In the results, differences in course performance, exam performance, homework completion, homework timeliness, and student ratings across the fall 2019 “F2F”, fall 2020 “online”, and fall 2021 “mixed” semesters, is examined. Comparisons across semesters for course performance variables are examined and discussed using the Kruskal-Wallis H test. Comparisons across semesters for student ratings are examined and discussed using the Mann-Whitney U test.

Course Performance Results

Kruskal-Wallis H tests were conducted to examine the course performance variables (course performance, exam grades, homework completion, homework timeliness) across fall 2019, fall 2020, and fall 2021. In the event of a tie of median scores, the mean rank will be presented to better illustrate any statistically significant post hoc comparisons.

Research Question 1: How does course modality affect overall course performance?

A Kruskal-Wallis H test was conducted to determine if there were differences in overall grade scores between fall courses with different modalities: "F2F" ($n = 167$), "online" ($n = 171$), and "mixed" ($n = 177$) for fall semesters. Distributions of overall grade scores were similar for all groups, as assessed by visual inspection of a boxplot. Median overall grade scores were not statistically significantly different between modalities, $\chi^2(2) = .093$, $p = .954$.

Research Question 2: How does course modality affect exam grades?

A Kruskal-Wallis test was conducted to determine if average exam scores between groups differed by course modality: "F2F" ($n = 167$), "online" ($n = 171$), and "mixed" ($n = 177$) for fall semesters. Distributions of average exam scores were similar for all groups, as assessed

by visual inspection of a boxplot. Median average exam scores were statistically significantly different between the different course modalities, $\chi^2(2) = 33.001, p < .001$. In addition to a statistically significant difference in median average exam scores across groups there was also a large effect size ($d = .508$). Subsequently, pairwise comparisons were performed using Dunn's procedure with a Bonferroni correction for multiple comparisons. Adjusted p -values are presented. This post hoc analysis revealed statistically significant differences in median average exam scores between the mixed ($Mdn = 40.20$) and online ($Mdn = 41.40$), $p = .019$, mixed ($Mdn = 40.20$) and F2F ($Mdn = 43.40$) $p = .000$, as well as online ($Mdn = 41.40$) and F2F ($Mdn = 43.40$) $p = .008$ course modality.

Research Question 3: How does course modality affect homework completion?

A Kruskal-Wallis test was conducted to determine if homework completion scores between groups differed by course modality: "F2F" ($n = 167$), "online" ($n = 171$), and "mixed" ($n = 177$) for fall semesters. Distributions of homework completion scores were similar for all groups, as assessed by visual inspection of a boxplot. Median homework completion scores were statistically significantly different between the different course modalities, $\chi^2(2) = 7.787, p = .020$. While there was a statistically significant difference in median homework completion across groups, the effect size was small ($d = .214$). Subsequently, pairwise comparisons were performed using Dunn's procedure with a Bonferroni correction for multiple comparisons. Adjusted p -values are presented. This post hoc analysis revealed statistically significant differences in mean rank homework completion scores between the online ($M = 242.70$) and F2F ($M = 275.93$) $p = .017$, but not between the mixed ($M = 255.87$) or any other group combination.

Research Question 4: How does course modality affect turning in homework on time?

A Kruskal-Wallis test was conducted to determine if homework timeliness scores differed by course modality: "F2F" ($n = 167$), "online" ($n = 171$), and "mixed" ($n = 177$) for fall semesters. Distributions of homework timeliness scores were similar for all groups, as assessed by visual inspection of a boxplot. Median homework timeliness scores were statistically significantly different between the different course modalities, $\chi^2(2) = 18.662$, $p < .001$. In addition to a statistically significant difference in median homework timeliness across groups there was also a medium effect size ($d = .367$). Subsequently, pairwise comparisons were performed using Dunn's procedure with a Bonferroni correction for multiple comparisons. Adjusted p -values are presented. This post hoc analysis revealed statistically significant differences in mean rank homework timeliness scores between the mixed ($M = 234.74$) and F2F ($M = 292.84$) $p = .000$, and online ($M = 248.06$) and F2F ($M = 292.84$) $p = .005$, but not between the mixed ($M = 234.74$) and online ($M = 248.06$).

Student Rating Results

A survey was given at the end of each semester to evaluate the students' perceptions of the course. Prior to examining the student rating data, the questions were broken down into three constructs: class structure, class environment, and hours spent.

The construct of class environment was measured by questions one through five (see Appendix B). A Cronbach's alpha was calculated to ensure that all three items measure the same construct. The items had a high level of internal consistency, as determined by a Cronbach's alpha of 0.859. The construct of class structure was measured by questions six through eight (see Appendix B). A Cronbach's alpha was calculated to ensure that all three items measure the same construct. The items had a high level of internal consistency, as determined by a Cronbach's

alpha of 0.800. The construct of hours spent was measured by question nine. Because there was only one question measuring the construct, Cronbach's Alpha could not be calculated. . In the event of a tie of medians, the sample ranks will be presented to better illustrate any statistically significant post hoc comparisons.

Research Question 5: How does course modality affect overall student ratings of the course?

A Mann-Whitney U test was conducted to determine differences in class environment evaluation scores between F2F and online modalities. Distributions of the class environment evaluation scores for F2F and online modalities were similar, as assessed by visual inspection. Median class environment evaluation score was statistically significantly higher for F2F modality ($Mdn = 25.00$) than in online modality ($Mdn = 23.00$), $U = 7672.50$, $z = -4.22$, $p < .001$. In addition to a statistically significant difference in ratings of class environment across groups there was also a medium effect size ($d = .489$).

A Mann-Whitney U test was conducted to determine differences in class structure evaluation scores between F2F and online modalities. Distributions of the class structure evaluation scores for F2F and online modalities were similar, as assessed by visual inspection. Median class structure evaluation score was statistically significantly higher in F2F modality ($Mdn = 15.00$) than in online modality ($Mdn = 14.00$), $U = 8536.00$, $z = -3.05$, $p = .002$. In addition to a statistically significant difference in ratings of class structure across groups there was also a medium effect size ($d = .339$).

A Mann-Whitney U test was conducted to determine if there were differences in total number of hours spent on class between F2F and online modalities. Distributions of the total number of hours spent on class for F2F and online modalities were similar, as assessed by visual

inspection. Mean rank hours spent score was statistically significantly higher for online modality ($M = 164.33$) than for F2F ($M = 128.53$), $U = 13181.50$, $z = 3.77$, $p < .001$. In addition to a statistically significant difference in hours spent across groups there was also a medium effect size ($d = .435$).

A Mann-Whitney U test was conducted to determine if there were differences in overall class evaluation scores between F2F and online modalities. Distributions of the overall class evaluation scores for F2F and online modalities were similar, as assessed by visual inspection. Median overall class evaluation score was statistically significantly higher for F2F modality ($Mdn = 3.66$) than in online modality ($Mdn = 3.58$), $U = 7804.50$, $z = -3.96$, $p < .001$. In addition to statistically significant differences in overall student ratings across groups there was also a medium effect size ($d = .465$).

CHAPTER IV

Discussion

The primary goal of this study was to examine how course modality, online, F2F, and mixed impacts certain course variables. Specifically, the research questions asked how course modality impacts overall course performance, exam performance, homework completion, homework timeliness, and student ratings. The students' scores and ratings were examined across three semesters: fall 2019 "F2F", fall 2020 "online", and fall 2021 "mixed". In this sample, there was no significant difference in course grade performance across modalities suggesting that students' final grades did not differ across modalities. However, there were significant differences in exam performance, homework completion, and timeliness in which the F2F semester had significantly better performance than the online and mixed semesters. Student ratings were broken down into three measures: classroom environment, class structure, and hours spent outside of class. Within this sample, ratings were higher for the F2F semester on measures of classroom environment and structure. Additionally, those in the online semester spent significantly more time on the course than those in F2F semester. The following section of this paper will discuss the results with greater detail, the limitations of the research, areas for future research, and contributions to the literature.

Research Question 1: How does course modality affect overall course performance?

Based on these results, there was no significant difference in overall course grade across F2F, online, and mixed semesters. These results did not support the hypothesis that the F2F semester would have significantly higher course grades than the online semester. This finding suggests that students' overall grades were not impacted by whether the course was taught online or F2F. Across all semesters most students earned a median grade of either an A or B. In

summary, results suggest that students' overall grades were not significantly different, even after the transition of a traditionally F2F course to an online modality due to the Covid-19 pandemic.

These results show that even when other performance factors (i.e. exam grades, homework completion, homework timeliness) are significantly different across modalities, students' final grades were not significantly different. These results may be attributed to the lack of range in grades. Previous research has referred to this lack of range as "grade inflation". Which may suggest that the level of mastery does not match the grade earned in a course. Instructors and universities are encouraged to use "grade inflation" to keep classes full, earn good ratings, and discourage students from transferring (Chowdhury, 2018). Students largely believe that the grades they earned are a direct product of their academic achievement, which can decrease work ethic and promote a false sense of accomplishment (Baglione & Smith, 2021). Some of the students in this sample may have not actually produced A or B quality work. However, it is unclear if grade inflation occurred within this course or whether the course was structured for student success. This lack of range, may account for why there were significant differences in other performance factors (i.e. exam grades, homework completion, homework timeliness) but not overall grades. It is unclear whether these nonsignificant results are an accurate picture of learning differences across online and F2F course modalities.

The comparison method may also explain the lack of significant differences in performance across modalities. Because the point values changes across semesters, performance was compared by overall letter grade rather than points earned within the course. It is possible that if points were compared that there may have been a significant difference like the other variables.

Research Question 2: How does course modality affect exam grades?

Overall, there were significant differences in exam grades across the F2F, online, and mixed semesters, with large differences across semesters ($d = .508$). Students' homework timeliness differed by .508 standard deviations across groups. These results confirmed the hypothesis that the F2F semesters would have significantly higher exam grades compared to the online semester. When examining the comparison between the F2F and online semesters, the F2F semester had significantly higher median exam scores ($Mdn = 43.40$) than the online semester ($Mdn = 41.40$). The results also indicated a significant difference between the F2F and mixed semester where again the F2F semester had significantly higher median exam scores ($Mdn = 43.40$) than the mixed semester ($Mdn = 40.20$). When comparing the exam performance across the mixed and online semester, the online semester had a significantly higher median exam score ($Mdn = 41.40$) than the mixed semester ($Mdn = 40.20$). In summary, results indicate that students in the F2F semester had the highest median exam score while the mixed semester had the lowest median exam score.

Differences may suggest the long-term effect of Covid-19 on higher education. In fall of 2021, student learning had been impacted by the pandemic for over a year and there may have been some fatigue associated with it. Results suggest that the F2F modality had the best median exam performance overall. However, it is unclear if this effect is due to F2F truly being the best modality for learning, Covid-19, or course design of the online modality.

Research Question 3: How does course modality affect homework completion?

Results suggest that there is a significant difference in homework completion across the F2F, online, and mixed semesters. These results confirmed the hypothesis that the F2F semesters would turn in more homework than the online semester. However, when examining the

magnitude of the differences across semesters there was only a small effect ($d = .214$). When examining the individual comparisons, there was a significant difference in homework completion across the F2F and online semesters. There were no significant differences when comparing the mixed semester and any other groups. At the surface level the medians for the F2F and online semester are the same ($Mdn = 40$). But when examining the mean ranks, the F2F group had a significantly higher mean rank ($M = 275.93$) than the online semester ($M = 242.70$). In summary, results suggest that students in the F2F semester completed significantly more homework than those in online semester.

The difference in homework completion could be attributed to the modality itself or the design of the online course. Muljana and Luo (2019) suggested that for students to successfully complete an online course, instructors needed to engage in active communication and periodic reminders. The online course did not have as many reminders to complete homework as the F2F course. This means that students in the online course most likely had to rely on time-management strategies to remind themselves to complete homework. The lower rate of homework completion could also be due to the stress of the Covid-19 pandemic. The stressors related to the pandemic could have caused some strain on the students' resources and ability to remember to complete homework.

Research Question 4: How does course modality affect turning in homework on time?

Results suggest that there is a significant difference in turning in homework on time across the F2F, online, and mixed semesters, with medium differences across semesters ($d = .367$). Students' homework timeliness differed by .367 standard deviations across groups. These results confirmed the hypothesis that the online semester would turn in significantly more homework late compared to the F2F semesters. When examining the individual comparisons

there is a significant difference between the F2F and online semester as well as the F2F and mixed semesters. There was no significant difference between online and mixed semesters. At the surface level the medians for the F2F and online semesters and F2F and mixed semesters are same ($Mdn = 40$). But when examining the mean ranks, the F2F group had a significantly higher mean rank ($M = 292.84$) than the online semester ($M = 248.06$) and the mixed semester ($M = 234.74$). In summary, results suggest that students in the F2F semester turned homework in on time more often than students in the online semester or mixed semester.

Again, the difference could be attributed to the modality itself or the design of the online course. The F2F course may have had more reminders to complete homework and study for tests than the online course. As a result, students in the online course most likely had to rely on time-management strategies to remind themselves to turn in homework on time. The stress of the Covid-19 pandemic could have contributed to the lower rate of homework completion during online and mixed semesters. Pandemic related stressors could have put some strain on the students' cognitive resources and ability to turn in homework on time.

Research Question 5: How does course modality affect overall student ratings of the course?

Overall, there were significant differences between course modality and student ratings of the course, with medium differences across semesters ($d = .465$). Student ratings in the F2F semester were .465 standard deviations higher than the online semester. These results confirmed the hypothesis that the F2F semesters would have significantly higher course evaluation ratings than the online semester. Students gave more favorable ratings (i.e. strongly agree, agree) for the fall 2019 F2F course when compared to the fall 2020 online course across all questions. When we look specifically at class environment factors (i.e. understanding of course content, additional

help, response time, learning environment, feedback provided), students rated the F2F course more favorably than the online course. Further examination revealed medium differences across semesters ($d = .489$). Student ratings of class environment in the F2F semester were .489 standard deviations higher than the online semester. Upon examination of class structure factors (i.e. learn something new, class organization, course materials), students rated the F2F course more favorably than the online course as well. Further examination revealed medium differences across semesters ($d = .339$). Student ratings of class structure in the F2F semester were .489 standard deviations higher than the online semester. Overall, ratings indicate that F2F courses are the preferred modality for students.

When time spent outside of the course was examined, the results showed that those in the online course spent significantly more time outside of the course than those who took the course F2F. Further examination revealed medium differences across semesters ($d = .435$). Student ratings of time spent in the online semester were .435 standard deviations higher than the F2F semester. Those in the F2F section often spent four to five hours or less completing work outside of the course each week, while more students in the online section spent more than five hours completing work outside of class.

Student ratings indicate that students spend less time in F2F courses and rate them more favorably than their online counterparts. The amount of time spent on coursework may impact students evaluation of the course. In F2F courses, students may need to spend less time on coursework due to the structure of support provided with the class environment and structure of in-person classes.

Limitations and Future Research

Covid-19

One major limitation of the study is the impact of the Covid-19 pandemic on the fall 2020 and fall 2021 semesters. It is unclear if the differences in exam performance, homework completion, homework timeliness, and course evaluation were due to the nature and organization of the online course or the stress of Covid-19 on students. By fall of 2020, students had a couple of months to become adjusted to online learning and by fall of 2021, students had been exposed to online learning for over a year. During both semesters, scores could have been impacted by students falling ill, having to quarantine, or worry about other instabilities due to the pandemic. Performance could have been impacted mental, physical, emotional fatigue reported by students (Mariappan & Nordin, 2021).

In fall 2021, there was a push to resume more in-person courses by the University. With this push, students had to navigate course modalities changing from Zoom to F2F. Navigating these quick changes across all courses could have added an additional stressor or confusion regarding due dates and assignments. By fall of 2021 students may have been experiencing online learning fatigue or “Zoom fatigue.” The over utilization of technologies such as Zoom can cause technology stress and in turn impact students’ physical and mental health (Bullock et. al., 2021). While the pandemic is not a permanent factor in education, future research examining technology stress and fatigue would be beneficial. Covid-19 likely exacerbated the increase of online learning and technologies. Future research should examine ways to minimize the impact of technology stress and fatigue within online courses. Additional research should also examine courses under “normal” circumstances without the impact of the Covid-19 pandemic. This research will provide additional data, as online technologies have improved since Covid-19.

Course differences

Another limitation includes differences in the course across semesters. From the fall 2019 semester to the fall 2020 and fall 2021 semesters, there were differences in number of homework items, number of exam questions, and instructors. The homework questions were shortened from 15 to 10 questions and exam questions slightly changed for clarity. Although efforts were made to ensure that questions covered the same topics, there is a chance that the change in questions could have impacted exam scores, homework completion, homework timeliness, or student perceptions. Future researchers should examine the course within the same semester in equal groups of online and F2F for comparison or ensure no changes across semesters.

Differences in instructors could also impact student performance factors or student performance. Some instructors may have provided more announcements F2F or posted more reminder announcements on Canvas. Instructors may have also differed in the amount of personal communication with students or rapport built with students. These factors could have impacted exam scores, homework completion, homework timeliness or student perceptions across semesters. Future research should make comparisons across the same instructor(s) to control for potential instructor differences.

Online Course Design

One limitation of the study is the course design of the online sections. While some aspects of the examined online design were aligned with ideal student performance (i.e. use of Canvas modules for organization), other aspects were not (Flower, 2020). One of these factors was communication. Communication can provide clarity while there is uncertainty (Sanders et. al., 2020). In this research, communication was not consistent across online sections, and is dependent on the instructor. While each instructor attempted to post the same announcements

across sections, it is unknown whether there was a difference in email communication or offers for zoom sessions. Future research should ensure consistent communication across sections.

Another factor associated with best online student performance was the optimization of online lecture videos by making them engaging, maximizing cognitive load, and promoting active learning (Brame, 2017). The asynchronous videos that covered course material was developed using a voice over of slides and was posted within a Canvas survey with spaces for comments of information students learned. The comments of things learned in the video could be optimized to be more engaging or made them active by asking questions. Future research in the course could examine online learning by making the videos more interactive and by incorporating active learning.

Other variables that have been shown to increase student performance in online courses include increasing student engagement through active and collaborative assignments (Cavinato, 2021). The online course examined in the study did not incorporate any collaborative or active learning assignments for students. The course might benefit from collaborative or active learning assignments and future research should examine the use of these assignments in comparison to F2F learning.

Additional research will be necessary to determine if improved course design would yield different results. The current study can provide researchers a basis of how to potentially improve the course to optimize online performance.

Generalizability

Another limitation is the generalizability of the course to other subject areas or grade levels. The course examined was an introduction to educational psychology course. It is unclear if the same results would have occurred in another subject area or grade level (i.e. K-12, graduate

school). Future researchers should continue to examine the comparison of online and F2F courses. More specifically research should examine the comparison of courses that were transitioned online due to the Covid-19 pandemic. It would also be useful to compare courses at other education levels such as K-12 or graduate level. This research could provide insight into whether online courses yield better outcomes at certain educational levels and inform instructors of when to choose online versus F2F formats.

Implications and Concluding Comments

The purpose of this study was to examine whether F2F or online modalities differed across variables such as course performance, exam performance, homework timeliness, homework completion, and student ratings. The results suggest that online and F2F courses do not differ across overall course performance. However, the F2F course surpassed the online course on exam performance, homework timeliness, and homework completion. This finding suggests that while overall performance did not differ across sections, students in online sections performed worse on exams, missed more homework assignments, and turned more homework assignments in late. It may also suggest that even if there are significant differences across exam and homework assignments the difference may not be great enough to impact overall grades. Results also suggest that students reported more favorable ratings of F2F courses compared to online modalities and spent more hours in the online modality compared to the F2F modality. Student ratings suggest that although online students are earning similar course grades compared to their F2F counterparts, they do not prefer online courses due to variables of class structure and class environment. Student reporting of time spent suggests that more time spent on a course is not necessarily associated with improved outcomes and that online courses require more student work than F2F.

Overall, these results contribute to the research by examining course delivery formats in an introduction to educational psychology course in a large undergraduate setting. Data from this sample will give future instructors in the area an idea of how F2F courses compare to online courses, and how to optimize future courses for the best performance. The results also provide insight into how students perform during global stressors such as Covid-19.

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Appendix A

Figures



October 29, 2021

Valerie Elaine Hogan-Sandi,
UTK - Coll of Education, Hlth, & Human - Educational Psych and Counseling

Re: UTK IRB-21-06602-XP

Study Title: Examining the Impact of Course Modality and Course Content Presentation Modality on Undergraduate Grade Outcomes and Course Evaluations.

Dear Valerie Hogan-Sandi,

On October 29, 2021, it was determined that the above referenced submission does not require IRB Review since the proposed research *does not involve human subjects* as defined by federal regulations. The federal definition of human subjects is not met because the information obtained for the proposed research *does not meet the definition of private identifiable information* since no identifiers will be obtained that would allow the identity of the participants to be readily ascertained by the researchers or otherwise associated with the information.

This determination applies to only those activities described in the above-referenced submission. If changes will be made to these activities which may alter this determination, contact us prior to making those changes.

If you have questions, contact us at 865-974-7697 or at utkirb@utk.edu. Please include this submission's title in all correspondence.

Thank you

Sincerely,



Lora Beebe, Ph.D., PMHNP-BC, FAAN

Chair

Figure A1
IRB Outcome Letter

Appendix B

Tables

Table B1

TN Voice Questions

TN Voice Items
The instructor contributed to your understanding of course content.
The instructor created an atmosphere that invited you to seek additional help.
The instructor responded to your inquiries about the course (e.g., emails, texts, phone calls) within a reasonable timeframe (i.e., 48-72 hours).
The instructor created a respectful and positive learning environment.
The instructor provided useful feedback on course assignments.
The course challenged you to learn something new.
The class sessions were well organized.
The course materials (readings, homework, laboratories, etc.) enhanced your learning in this course.
On average, how many hours per week have you spent on this course outside of class meetings (e.g., doing readings, completing assignments, studying for exams, and/or any other related course work)?

Note: Directions given to students completing TN Voice: Please rate the following questions based on your experiences in this course. The rating categories are 5=Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree, and 1=Strongly Disagree. If the question does not apply to this course then choose 0=Not Applicable.

Table B2
Performance Variable Results

Class Modality		Course Performance	Exam Performance	Homework Completion	Homework Timeliness
In Person - Fall 2019	N	167	167	167	167
	Median	7.00	43.4000	40.00	40.00
	Mean rank		305.88	275.93	292.84
	Minimum	F	31.80	29	30
	Maximum	A	48.80	40	40
	Std. Deviation	1.505	4.21550	1.275	1.316
Online - Fall 2020	N	171	171	171	171
	Median	6.00	41.4000	40.00	40.00
	Mean rank		257.12	242.70	248.06
	Minimum	F	.00	2	12
	Maximum	A	49.60	40	40
	Std. Deviation	1.599	6.97698	6.021	5.226
Mixed - Fall 2021	N	177	177	177	177
	Median	6.00	40.2000	40.00	40.00
	Mean rank		213.68	255.87	234.74
	Minimum	F	.00	0	0
	Maximum	A	48.60	40	40
	Std. Deviation	1.525	7.05971	5.419	5.588
Total	N	515	515	515	515
	Median	6.00	41.400	40.00	40.00
	Cohen's d		.508	.214	.367
	Minimum	F	.00	0	0
	Maximum	A	49.60	40	40
	Std. Deviation	1.541	6.42439	4.811	4.603

Table B3
Student Ratings Results

Class Modality		Class Environment	Class Structure	Total Evaluation Score	Hours Spent on Class
In Person	N	149	149	149	149
	Median	25.0000	15.0000	39.0000	3.00
	Mean Rank	165.51	159.71	164.62	128.53
	Std. Deviation	3.18134	1.74483	4.62184	1.511
	Minimum	12.00	7.00	20.00	1
	Maximum	25.00	15.00	40.00	12
Online	N	142	142	142	142
	Median	23.0000	14.0000	36.0000	3.00
	Mean Rank	125.53	131.61	126.46	164.33
	Std. Deviation	4.24170	2.65531	6.53121	1.616
	Minimum	6.00	4.00	10.00	1
	Maximum	25.00	15.00	40.00	11
Total	N	291	291	291	291
	Median	24.0000	14.0000	38.0000	3.00
	Cohen's d	.489	.339	.465	.435
	Std. Deviation	3.83424	2.28212	5.78801	1.585
	Minimum	6.00	4.00	10.00	1
	Maximum	25.00	15.00	40.00	12

Appendix C

Sample Exam Questions from Unit A through Unit E Exams

Unit A

1. Which Piagetian notion would not be considered an invariant function?
 - a. Schema
 - b. Preoperational thinking
 - c. Assimilation
 - d. Accommodation
2. In his early work in Paris on the assessment of children's intelligence, Piaget came to what conclusion regarding children's reasoning?
 - a. Young children's reasoning was quite different from that of more mature children.
 - b. Most of the reasoning that later appeared in the concrete operational stage was evident in the earliest cognitive stages.
 - c. Conservation was first manifested in what eventually was labeled as the sensorimotor period.
 - d. Preoperational reasoning represented the onset of logical reasoning.
3. Adoption studies have been used to determine the relative contributions of genetic and environmental contributors to IQ scores. What is the principal conclusion from this line of research?
 - a. The IQ scores of adopted children are more similar to those of their adoptive parents than those of their biological parents.
 - b. The older individuals get, even when living separately from both biological and adoptive parents, the greater the similarity of their IQ scores to those of their biological parents.
 - c. The IQ scores of fraternal twins reared together are more similar than those of identical twins reared apart.
 - d. The correlation between the IQ scores of virtual twins is stronger than the correlation between the IQ scores of fraternal twins reared apart.
4. The instructor notes underscore which environmental influence on intelligence scores?
 - a. Heredity is likely to have a greater impact on intellectual differences across students in an enriched environment than in an impoverished environment.
 - b. Heredity will produce greater diversity in intellectual development across students in an extremely impoverished environment.
 - c. Heredity has an equally strong influence on intellectual development at both environmental extremes.
 - d. Overall, environmental conditions have a greater impact than genetic factors on all levels of intellectual development.

5. With respect to the predictive validity of critical thinking, research in the 210 course most strongly supports which of the following claims?
- a. Critical thinking is the best overall predictor of all performance measures in the 210 course.
 - b. Critical thinking is one of the weaker predictors of performance in the course.
 - c. There is no ceiling level to the predictive validity of critical thinking.
 - d. Critical thinking best predicts performance on exams in the 210 course.

Unit B

6. Which cooperative learning arrangement have Slavin and Kohn both emphasized?
- a. Teacher-based decisions about students' cooperative planning
 - b. Development of student projects
 - c. Diversity within cooperative groups
 - d. Student mastery of basic content
7. What were the respective positions of Kohn and Slavin on the role of competition and cooperative in promoting human performance?
- a. Kohn was more likely than Slavin to use competition as a motivator for human performance.
 - b. Kohn used competition only intermittently in promoting group performance, whereas all of Slavin's models used competition.
 - c. Slavin used some individual and group competition in promoting cooperative performance whereas Kohn used no competition.
 - d. In general, Slavin used competition and cooperation to an equivalent degree in his cooperative learning formats, whereas Kohn leaned slightly toward more toward competition.
8. Research has shown that Slavin's model of cooperative learning more strongly supported which following claim regarding task structure and reward structure?
- a. Neither task structure nor reward structure is as important as past grades in accounting for improvement in group performance under cooperative learning.
 - b. Task structure and reward structure are equally important in accounting for improvement in student performance under cooperative learning.
 - c. Task structure is more important than reward structure in accounting for improvement in student performance under cooperative learning.
 - d. Reward structure is more important than task structure in accounting for improvement in student performance under cooperative learning.
9. In teaching a class in which some students almost never talk and other talk incessantly, how could you produce better balance in the frequency of discussion across individuals?

- a. Work out a credit system in which students maximize their participation credit by making a moderate number of responses.
 - b. Award some credit for participation by the reticent students and let the more talkative students participate as they wish.
 - c. Don't mention the credit system but rather just request moderation in participation by all students.
 - d. Call on students to participate rather than letting students volunteer comments.
10. In the consensus phase of structures controversy, students given the choice between the two original positions will be most inclined to do which of the following?
- a. Close to 100% will change their original position.
 - b. Virtually zero are likely to change their original position.
 - c. Only about 30% will change their original position.
 - d. Most students will show an equal split between changing and not changing their original position.

Unit C

11. According to information in the instructor notes, an examination of the relationship between moral reasoning and moral conduct indicates that
- a. individuals who score at higher levels on moral reasoning generally engage in higher levels of moral conduct.
 - b. moral reasoning and moral conduct go hand in hand.
 - c. there is no discernible relationship between moral reasoning and moral conduct.
 - d. moral reasoning is likely to be less predictive of one's moral stage than is moral conduct.
12. To promote college students' intrinsic motivation to learn, the instructor videos suggest which of the following instructor strategies?
- a. Lecturing on broadly based issues.
 - b. Including humor on most issues discussed in class.
 - c. Promoting deep learning over a relatively small array of issues.
 - d. Not putting students on the spot by asking them questions in class discussion.
13. Which assessment procedures is the most objective way to determine the occurrence of unacceptable behaviors such as lying, cheating, stealing, and fighting in actual classroom situations?
- a. Student surveys
 - b. Applied behavior assessment
 - c. Circles test
 - d. Kohlberg moral dilemmas

14. The study on deadlines with respect to student work, most supports which of the following conclusions?
- a. Students perform best when they set their own deadlines.
 - b. Students prefer to have teachers set the deadlines for completing their work.
 - c. Students prefer only one deadline over several deadlines.
 - d. Students spend more time on a work task when they set their own deadlines.
15. The research that has examined the relationship between Kohlberg's levels of moral development and Piaget's stages of cognitive development suggests that advanced cognitive development is
- a. unrelated to advanced moral development.
 - b. tantamount to advanced moral development.
 - c. essential but not sufficient to achieving advanced moral development.
 - d. concurrent with advanced moral development.

Unit D

16. What is the position of behaviorism on the definition of concepts addressed through behavioral research?
- a. All research concepts should first be defined operationally before research assessment is begun.
 - b. Research concepts should initially be defined ideologically before being defined operationally.
 - c. Cognitive concepts such as critical thinking cannot be defined operationally.
 - d. Operational definitions are useful only in behavioral research.
17. Which of the following methodological combinations are most alike with respect to outcome?
- a. positive reinforcement and positive punishment
 - b. negative reinforcement and negative punishment
 - c. positive reinforcement and negative reinforcement
 - d. continuous reinforcement and intermittent reinforcement
18. Under which of the following levels of a target behavior would an intermittent schedule for that behavior be most appropriate?
- a. When the target level for the behavior is weak.
 - b. When the target level for the behavior is strong
 - c. When the target level for the behavior is mostly moderate occurring at a moderate and steady level
 - d. When the target behavior is varying substantially

19. What is the advisability of using direct instruction with skills of extreme importance?

- a. Direct instruction becomes less useful as skills increase in importance.
- b. Direct instruction is less effective than a discovery approach in promoting acquisition of important skills.
- c. Direct instruction is most valuable when skills are exceedingly important.
- d. Direct instruction is only useful in teaching routine academic skills.

20. What is the major benefit of the Dolch Sight Word List?

- a. This sight word list replaces the need for alphabetic coding in recognizing words.
- b. The Dolch Word list negates the need for phonemic awareness in learning to pronounce words
- c. Students can learn to read better by first learning the pronunciation and meaning of words that frequently appear in the text to be read.
- d. The Dolch list negates the value of context in learning to identify unfamiliar words.

Unit E

21. If individuals don't believe that smoking will impair their health, but do believe they could stop smoking any time they wish, their beliefs would reflect which of the following combinations?

- a. internal locus of control and high self-efficacy
- b. external locus of control and low self-efficacy
- c. internal locus of control and low self-efficacy
- d. external locus of control and high self-efficacy

22. A legitimate conclusion from the information on self-esteem in this unit is that

- a. it's impossible for self-esteem to be too high.
- b. self-esteem is better earned than given.
- c. self-esteem is more a precondition of learning than a product of learning.
- d. such teacher comments as "you're fantastic" and "you're the greatest" build a healthy self-esteem.

23. Which of the following distinctions between stress and stressor is most consistent with information in the instructor notes regarding these two notions?

- a. A stressor is an event that triggers the stress response, and stress is the response to that event.
- b. The two notions are interchangeable.
- c. One can become habituated to a stressor but not to stress.

- d. One can become habituated to stress but not to a stressor.
24. What is the nature of the relationship between the level of stress and performance efficiency and effectiveness?
- a. no systematic relationship between level of stress and either efficiency or effectiveness of performance
 - b. positive relationship between level of stress and both efficiency and effectiveness of performance
 - c. negative relationship between level of stress and both efficiency and effectiveness of performance
 - d. curvilinear relationship between level of stress and both efficiency and effectiveness of performance
25. Research has yielded which of the following outcomes of Health Education?
- a. Reduced smoking.
 - b. Less use of damaging drugs
 - c. Decreased prevalence of obesity
 - d. All of the above.

Appendix D

Sample Homework Assignment

1. What are the similarities and differences between what IQ and achievement tests measure?
2. What is the difference between what verbal IQ subtests and performance IQ subtests measure?
3. What is the relative difference between the strengths of the correlation between IQ tests and achievement tests versus IQ tests and grades in school?
4. How well have scores at the top 1% on the Stanford-Binet intelligence test predicted long-term quality of life?
5. What comparisons between individuals have been used to determine the contributions of genetics vs. environmental experiences to IQ scores?
6. With increased age, does an adopted child's IQ become more similar to the natural or adoptive parents' IQ scores? What do these findings indicate regarding the relative contribution of heredity vs. the environment to IQ scores?
7. Why is heredity likely to have a greater impact on intelligence in an enriched environment than in an impoverished environment?
8. What is the difference in the IQ correlations between virtual twins and fraternal twins?
9. What is meant by cultural bias in intelligence testing?
10. What is the difference between curriculum-based assessment and curriculum-based measurement?

VITA

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