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A Case Study: Measuring success or failure of using virtual communication in a college class

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Abstract

This study analyzes college courses from 2019 to 2023 and whether their use of virtual communication positively or negatively impacts communication and thus learning. The objective is to analyze the success or failure of the virtual communication taking place, in a traditional in-person class versus a synchronous class versus a hybrid class using a specially designed Virtual Communication Evaluation device. The results show virtual communication can enhance any learning environment including the three modalities studied.

Keywords: face-to-face vs hybrid in higher education, virtual communication in college classrooms

Introduction

The debate continues about which is better face-to-face or hybrid classes? Even with the major increase of hybrid/synchronous classes in education during the pandemic and the transfer of millions of classes and students to remote, researchers can't put this argument to rest. Many studies in this area of research were and are being conducted that display a variety of findings from multiple perspectives. For example, Almuarik and Alangari, (2024) study found students' viewed hybrid positively, but still believed face-to-face education as higher quality; while (2023) studies by Baxter and Hainey as well as Belt and Lowenthal found learning remotely online was beneficial for instant feedback, supported motivation and fostered communities of practice. A (2022) study by Besalti and Satici found, "online learning students experienced excessive internet use due to the closure of schools, which resulted in lower learning satisfaction during the outbreak" (p. 880). While Chandler, et al., (2020) study showed, "multiple communication channels appear to relate to higher engagement" (p. 11). In addition, a Curry et al. (2022) study found that designing a new model for technology integration into the learning process was the key. While a Flynn-Wilson and Reynolds (2021) study showed, "satisfaction with delivery of course content and interaction among students and faculty was significantly more positive with the synchronous platform" (55).

Further, a Mentzer et al. (2024) study found a HyFlex (synchronous and flexible schedule) environment compared to a face-to-face only environment does not have a dramatic impact on student academic performance one way or the other. The research appears to support multiple sides of the issue and confirms that a learning gap is growing for students both in the U.S. and globally when technology is not utilized properly in the learning process. In the U.S., students in the K-12 system, moved to all online classes during pandemic and this change has given researchers a unique opportunity to study modality and how it impacts learning. Although, some researchers continue to blame the modality, multiple studies (Edouard, 2023; Ibrahim et al., 2020; Reigeluth et al., 2017; Lowell & Yang, 2023) have shown a lack of teachers and students trained in the use of this technology (Vogels, 2021) coupled with lack of access to WIFI may be the main reason this education gap occurred especially among the most marginalized communities (Carstens et al., 2021; Golden et al., 2023; Haleem et al, 2023). In fact, hybrid modality may be the answer to bringing higher quality education to marginalized communities by bridging the digital divide with mobile technology and bringing synchronous college classes to populations that have not had access to this level of education. Thus, the debate must continue with studies (Ha & Yoo, 2024; Jarrah et al., 2025; Ye, 2022) that measure the success or failure of synchronous/virtual classes as well as in-person classes because it is through this research that we may finally conquer the digital divide.

In a review of the current research in this area, it is evident that the instructor is key to the success of learning in any setting especially when the learning relies more and more on technology As Ye discovered in a (2022) study on instructor's impact on success in the learning process, "the development of technology-based learning shows a trend of shifting from relying on the intelligence of the system alone to a combination of intelligence of the system and the instructional expert" (p. 613). Shemshack's study concurred and also stated, "it is essential that teachers feel supported, so they are motivated to integrate instructional technology effectively", (2021, 24). In a majority of the studies (Almuarik & Alangari, 2024; Baxter & Hainey, 2023; Beatty, 2019; Belt et al., 2023; Chandler et al., 2020; Curry et al., 2022; Flynn-Wilson & Reynolds, 2021; Mentzer et al., 2024), the instructor played a vital role in the improvement of academic performance and that success appears to be grounded in their use of communication technology in the learning environment.

Relevant Literature Review on Virtual Communication in Higher Education

The field of communication technology research continues to expand with the increased use of virtual communication in education including the use of Zoom, MS Teams, and Blackboard, especially since the pandemic in 2020. Several studies (Almuarik & Alangari, 2024; Baxter & Hainey, 2023; Beatty, 2019; Belt & Lowenthal, 2023; Chandler et al., 2020; Curry et al., 2022; Goodridge et al., 2017; Flynn-Wilson & Reynolds, 2021; Mentzer et al., 2024; Ng, 2007; Peterson

et al., 2018; Yamagata-Lynch, 2014) have analyzed the use of synchronous/virtual communication in college classrooms and have found this modality beneficial or improved learning in college classrooms. However, other studies (Besalti & Satici, 2022; Bond et al., 2020; Layng, 2008) have found this modality can hinder or reduce learning in college classrooms as well as studies (Bower et al., 2014; Ha & Yoo, 2024; Szeto, 2014) which have found no difference in the academic performance of the two modalities. In addition, several other studies (Chen et al., 2015; Detyna et al., 2023; Meade & Parthasarathy, 2024) have had mixed results in academic performance when using in-person or synchronous/virtual communication in college classrooms. What is becoming evident in this area of research is that more study is needed that focuses on the use of communication - in particular the use of virtual communication in college classrooms and its impact on learning.

Multiple studies have found a key component of improved academic performance in the use of synchronous or virtual classes was successful communication. Study after study (Baxter & Hainey, 2023; Bower et al., 2014; Belt & Lowenthal, 2023; Curry et al., 2022; Flynn-Wilson & Reynolds, 2021) discussed how major elements of communication played a role in students' ability to learn the material such as instant feedback, access and more interaction with the instructor, fostering communities of learning and a collaborative environment. Chandler et al. study stated, "multiple communication channels appear to relate to higher engagement" (2020, 10). Six years earlier a Yamagata-Lynch study stated, "synchronous online whole class meetings and well-structured small group meetings can help students feel a stronger sense of connection to their peers and instructor and stay engaged with course activities" (2014, 191). And yet, it is still believed that synchronous/virtual classes are not as successful as in-person classes. The two modalities are not the same experience but that does not mean that synchronous/virtual classes cannot be as successful or even more successful than in-person learning.

Look at the study of Guevara-Otero et al., (2024) that used flipped learning to compare in-person, online and synchronous classes and found that regardless of the modality students' performance and satisfaction was the same. According to this analysis the instructional design was key, not the modality. Flipped learning relies heavily on the successful use of communication between the student and the instructor. A Jia et al., (2023) study found no difference in student learning and engagement in synchronous classes but flipped learning was more effective in supporting students' behavioral engagement in synchronous college classes. This research shows when proper instructional design of course material is coupled with proper integration of synchronous technology, learning outcomes and/or academic performance can be the same or better than in-person college classes (Mentzer et al., 2024; Ragni et al., 2024). One could argue that the same can be said of face-to-face college classrooms with the proper instructional design and use of technology, learning will improve in that setting as well. Then, it is not a case of one modality being better than the other, it is a case of instructional design and technology integration. For the purpose of this study, the researcher focused on the use of virtual communication in the design and

integration of synchronous/virtual technology in college classrooms. Of course, other factors that can impact academic performance including proper instructor/student technology training, the technology support for these classes, and access to updated functioning technology. Those areas will also be reviewed for this case study, but the focus will be on the success or failure of using virtual communication in a college classroom.

Most of the studies (Almuarik & Alangari, 2024; Baxter & Hainey, 2023; Beatty, 2019; Belt & Lowenthal, 2023; Chandler et al., 2020; Curry et al., 2022; Goodridge et al., 2017; Flynn-Wilson & Reynolds, 2021; Mentzer et al., 2024; Ng, 2007; Peterson et al., 2018; Yamagata-Lynch, 2014) reviewed stated more research is needed in this area and additional models and decoding devices should be developed. Researchers also need to conduct more studies on if a measurement device could aid in identifying which media rich technology is successfully impacting learning in college classrooms and if a decoding device could be of use to current educators. In addition, analysis should be conducted at a microlevel of the educational process to ensure more accurate findings and thus improve communication technology practices and the learning process. The pandemic has given this researcher a unique opportunity to apply the Virtual Communication Evaluation device or (VCE) in a case study on the use of virtual communication in college courses. Originally, the VCE was developed in a 2016 study to analyze virtual communication in the workplace but this could also be vital tool in education. After all what are college classes but a series of meetings and what is synchronous college classes but a series of virtual meetings, in both settings people are learning and exchanging information to meet certain outcomes. The (2016) study found, “that a definite pattern of criteria was being used when successful virtual communication is utilized in the workplace”, (Layng, 173). Thus, if communication is key to the success of learning in synchronous/virtual college classrooms and this device measures the success of virtual communication in the workplace then it can also be utilized to measure the success or failure of virtual communication in the virtual college classroom as well.

In reflecting on today’s global environment, trying to turn back education to the way it was five years ago before the pandemic seems outdated and a waste of valuable skills and knowledge gained on the use of technology to the learning process during that time period. No matter how hard administrations and higher educational institutions try, college courses are no longer limited by physical boundaries, nor should they be after the lessons learned from thousands of colleges going totally online and taking over 14 million college students along for the ride (Hess, 2020). Instead, universities increasingly are requiring instructors and students to conduct classes, pursue projects, and hold meetings without ever being in the same room or the same country. However, using this communication technology is not the same as using technology effectively (Layng, 2016). To be adequately prepared to participate effectively in this virtual arena, it is imperative that researchers analyze and discover how organizations and educators effectively function in this setting. Today students may be sitting alone at home attending a virtual class with other students they have never met, each of them in separate places at different geographic locations and time zones.

Research has given us many strategies to improve virtual learning over the last decade from Yamagata-Lynch, (2014) study that found more synchronous delivery brought more learner engagement and the instructor impacts academic performance, which Ibrahim et al. (2020) study also confirmed. To Peterson, et al., (2018) study which found, "asynchronous cooperative learning may not work as designed due to students' lack of perceptions of interdependence" (p. 7). However, Dinh's (2023) study found a direct link between improved cognitive engagement and improved academic performance and that synchronous online teaching activities in relation to student learning engagement needed further study. There are also extensive literature reviews of successful virtual teams where researchers found trust-building was the key factor in that success and consistent virtual communication was the factor that builds that trust (Garro-Abarca et al., 2021; Layng, 2016). A study by Elsayary et al., (2024) discovered effective virtual communication can improve teachers' learning outcomes and attitudes. This study's researcher asks, "if teachers' learning outcomes can be improved by the successful use of virtual communication in the classroom then why not student's learning outcomes as well". The majority of these studies develop models and strategies but very little research has used any measurement instrument in analyzing the virtual communication taking place that identifies the "successful" techniques that aid in the learning process. The regular use of a decoding device could be utilized to measure if "successful" criteria are being used to manage virtual communication in the college classroom and thus may transform the learning process and help instructors improve learning in their courses.

The courses selected for study are offered at a mid-sized midwestern university and were always taught face-to-face because it is a performance-oriented course. This college course was traditionally taught in person in 2019 and then the modality was moved to totally online synchronous/virtual in 2020 and 2021 because of the pandemic. Finally, the course was then offered as a hybrid class that is both in person and synchronously/virtual in 2022 and 2023. The VCE helped analyze if a synchronous/virtual course was successfully using virtual communication or not. In other words, are consistent successful practices in the utilization of virtual communication taking place in college classrooms and can the VCE help to identify these practices.

Methodology

This study's research questions include: Are successful virtual communication strategies or criteria being used in this case study's synchronous/hybrid college classrooms and if so, what are they? And how does the case study's synchronous/hybrid students' academic performance compare with the in-person students' academic performance on the same assignments and the overall course? This study used triangulation mixed methodology to improve the validity and reliability of the

results. Researchers (Creswell et al., 2003; Creswell, 2006; Flick, 2018; Jarrah et al., 2025) have used this analysis to produce robust findings in various fields of study from education to the sciences. As Creswell stated, "This design is used when a researcher wants to directly compare and contrast quantitative statistical results with qualitative findings or to validate or expand quantitative results with qualitative data" (2006, 62). This study uses both qualitative and quantitative data by comparing and contrasting the VCE device findings with academic performance (grades) and student surveys. As Elsayary et al., found this type of methodology can extend the breadth and depth of the data collected "to seek clarification of the results from one method with the results of another" (2024, 82). This analysis allowed the researcher to collect data using the VCE device, which measured the use of virtual communication and compared it to the academic performances of individual assignments and the overall course scores to quantitative/qualitative student surveys of the courses studied. Thus, "Qualitative research and quantitative research can mutually support each other and provide a fuller picture of the issue under study" (Flick, 2018, 21). This analysis is based on similar mixed methods inquiry used in Goodridge et al., (2017) as well as Baxter and Hainey's, (2023) study.

Procedure

The study involved a post analysis of students across six distinct classes at a mid-sized midwestern university in the United States spanning five academic years from 2019 to 2023. These six cohorts were students enrolled in the same subject in a performance-oriented course. Different modalities were implemented within each class. The initial two 2019 classes, known as the pre-pandemic group, used the traditional in-person approach and used Blackboard for instructional support. The next two classes offered in the fall of 2020 and 2021, referred to as the pandemic group, adopted a synchronous modality and used Zoom to conduct virtual classes and Blackboard for instructional support. Finally, the fifth and six (fall 2022 and fall 2023) classes, were designated the post-pandemic group, and used the hybrid modality where students attended both in person and synchronously using Zoom and Blackboard for instruction.

The same assessment and curriculum including five assignments and learning objectives were used throughout the six assessed periods. Except for the final assignments, which were different in the 2019 and 2020 courses because the mini-newscast assignment required the students to perform the assignment in the lab. This could not occur during the pandemic, so the final assignment was changed from the in-studio newscast to the online cover letter, resume and virtual interview assignment for the 2021, 2022, and 2023 courses. The same learning objectives were assigned with both versions of the final assignment in all six courses and still provided enough data to properly analyze the academic performance. To gather the students' perceptions of their experience with these courses, the university's standard student evaluations were reviewed (Price & Kirkwood, 2014). These were voluntary questionnaires that are administered by the university through Blackboard. The students' overall academic performances were also analyzed and the VCE device was applied to measure the success or failure of the virtual communication taking place in these

college courses. A total of 104 students were enrolled in the six courses with 45 females and 58 males. In the pre-pandemic groups, 36 students participated, comprised of 50% male ad 50% female students with ages ranging from 17 to 22 years old. The pandemic groups had 34 students with 64% male and 36% female with ages spanning 17 to 22 years old. The post-pandemic group included 33 students with 60% male and 40% female with ages between 17 to 31 years old.

These courses were analyzed in the summer of 2024 beginning with the assignment and academic performance data, which was collected, sorted and analyzed. Next, the VCE device was applied measuring all communication taking place including verbal (face-to-face), text-based (email and discussion posts), video/audio (Zoom meetings and phone calls), and social media (Using group chats on Backboard/Zoom). The quantity of communication taking place as well as the accountability of the students were also measured using the VCE device. Finally, the student evaluation survey's data was collected, sorted and analyzed. Once all the data was collected and analyzed from the three procedures, the results of the academic performance, VCE and student surveys were compared and contrasted utilizing triangulation mixed methodology. The data was gathered and analyzed in the summer of 2024 after all the courses had been completed and IRB approval was sought and approved before the data was collected.

The six courses selected to be studied took place during the fall semester under the guidance of the same instructor over a five-year period from 2019 to 2023. The subject was delivered over four months for each course, that spanned 15 weeks for a total of 30 sessions, each lasting one hour and twenty minutes. In the pre-pandemic groups, traditional learning modality was employed, students met in-person in a lab. The instructional approach included instructor-developed materials, complemented by videos and supplementary reference materials within the classroom setting **(**Guevara-Otero, et al., 2024). Twenty sessions consisted of instructor lectures, activities, Q & A, as well as lab work contextually linked to real-world applications. Interactive classroom assignments were conducted over ten sessions, throughout the semester and each assignment was used to create a foundation of learning for the next assignment. The assignments included performing a 30-second radio commercial, a 60-second VO-SOT news story, and a 2-minute sports play-by-play in the studio and the scripts and content were provided by the instructor. In the second half of the semester, the assignments consisted of the students producing and performing a live shot in the studio as well as producing and performing a mini-newscast in the studio and handing in a script to the instructor in-person.

In the pandemic group, synchronous/virtual modality was employed, students met completely online using Zoom. The instructional approach included instructor-developed materials, complemented by videos and supplementary reference materials provided using Blackboard. Twenty sessions consisted of instructor lectures, activities, Q & A, as well as Zoom lab work contextually linked to real-world applications. Interactive classroom assignments were conducted over ten sessions, throughout the semester and each assignment was used to create a foundation of learning for the next assignment. Pre-class activities facilitated the grasp of basic theory and practice, facilitated by video and interactive resources. Subject materials underwent a

transformation into interactive virtual content. Online in-class activities were focused on supporting comprehension through both individual and collaborative efforts **(**Guevara-Otero et al., 2024; Baxter & Hainey, 2023). The assignments included a 30-second radio commercial, a 60-second VO-SOT news story, and a 2-minute sports play-by-play, all performed virtually using Zoom with online teleprompter software for the scripts and content was provided by the instructor. In the second half of the 2020 semester, the assignments consisted of the students producing and performing a live shot remotely in the field using their smart phones and uploading their videos to Blackboard discussion boards and as well as writing a mini-newscast and emailing the script to the instructor. In the second half of the 2021 semester, the assignments consisted of the students producing and performing a live shot remotely in the field using their smart phones and uploading their videos to Blackboard discussion boards and writing a cover letter and resume that is emailed to the instructor as well as taking part in a virtual interview for a media job.

In the post-pandemic group, both in-person and synchronous/virtual modality was employed, students met both face-to-face and virtually using Zoom. The instructional approach included instructor-developed materials, complemented by videos and supplementary reference materials provided using Blackboard. Twenty sessions consisted of instructor lectures, activities, Q & A, as well as in-person and Zoom lab work contextually linked to real-world applications. Interactive classroom assignments were conducted over ten sessions, throughout the semester and each assignment was used to create a foundation of learning for the next assignment. Pre-class activities facilitated the grasp of basic theory and practice, facilitated by video and interactive resources. Subject materials underwent another transformation into interactive audiovisual content that could be used in the hybrid setting. Both online and in-person activities focused on supporting comprehension through both individual and collaborative efforts **(**Guevara-Otero et al., 2024; Baxter & Hainey, 2023). The assignments included a 30-second radio commercial, a 60-second VO-SOT news story, and a 2-minute sports play-by-play, all performed either in the studio or virtually using Zoom with online teleprompter software for the scripts and content was provided by the instructor. In the second half of the semester, the assignments consisted of the students producing and performing a live shot remotely in the field using their smart phones and uploading their videos to Blackboard discussion boards and writing a cover letter and resume that is emailed to the instructor as well as taking part in a virtual interview for a media job. The post-pandemic group's class was designed to give the students versatility of being in-person and/or virtual allowing the student to choose the modality and how they engaged in the learning process.

For the three groups (in-person, synchronous/virtual, hybrid), the measured variables included the average scores of assignments and overall course academic performances, VCE scores for the course, and students' perceptions from the standard university's student evaluations. This triangulation collection of data should ensure the validity of the findings via various data collection sources on the same topic. It allows the researcher to capture different dimensions of the same issue to provide a more complete picture of the phenomenon of interest (Baxter & Hainey's, 2023;

Goodridge et al., 2017; Guion et al., 2011). The methodology involved in this case study consists of applying a decoding device that measures defined "success criteria". Success can be defined in many ways depending on the situation but for the purposes of this study the term success or successful will be defined as completing or accomplishing a goal (Layng, 2016, 177).

A case study analysis was conducted, and the virtual communication content (email, discussion posts, chat rooms, Zoom meetings and phone calls) and technology was decoded utilizing the measurement device called the Virtual Communication Evaluation or VCE (Layng, 2016) for this study based on virtual communication research. Case study analysis is a method of studying and analyzing communication in a systematic, objective, and qualitative manner for the purpose of measuring variables, and thus the best choice for discovering the application of "success criteria" from the VCE. The researcher used the VCE to decode each individual course use of virtual communication and the decoding tool divides the "success" criteria into categories such as trust-building (TB), routine communication (RC), media richness (MR) and accountability (A) (Layng, 2016, 200).

Course demographics, technology literacy, and efficiency of technology channels were also evaluated. The subsequent analysis identified which of the decoding devices variables contributed to success in virtual communication and learning. The VCE was applied to each course content and all six courses student academic performance were compared to see if there is any significant difference of the averages and VCE scores. Finally, the university's student evaluations were reviewed to observe the students' perceptions of the learning taking place in these six courses. As stated earlier, the data was gathered and analyzed in the summer of 2024 after all the courses had been completed and IRB approval was sought and approved before the data was collected.

Results

Course and Assignment Averages

The assessment for all assignments and course academic performances were based on a 4.0 scale. The traditional in-person pre-pandemic group 1 assignment averages and overall academic performances were: radio assignment was a 3.5, VOSOT (voice-over & sound on tape) assignment was 3.16, play-by-play assignment was 2.7, live shot assignment was 3.27, with a total assignment average of 3.15 and the overall course average at 3.33. The traditional in-person pre-pandemic group 2 assignment averages and overall academic performances were: radio assignment was a 3.5, VOSOT assignment was 3.56, play-by-play assignment was 3.81, live shot assignment was 3.51, with a total assignment average of 3.51 and the overall course average was 3.33. The

synchronous/virtual pandemic group 1 assignment averages and overall academic performances were: radio assignment was a 3.8, VOSOT assignment was 3.81, play-by-play assignment was 3.75, live shot assignment was 3.62, with a total assignment average of 3.74 and the overall course average was 3.01. The synchronous/virtual pandemic group 2 assignment averages and overall academic performances were: radio assignment was a 3.58, VOSOT assignment was 3.7, play-by-play assignment was 3.47, live shot assignment was 3.05, , with a total assignment average of 3.45 and the overall course average was 3.63. The hybrid post-pandemic group 1 assignment averages and overall academic performances were: radio assignment was a 3.37, VOSOT assignment was 3.56, play-by-play assignment was 3.56, live shot assignment was 3.87, with a total assignment average of 3.59 and the overall course average was 3.35. The hybrid post-pandemic group 2 assignment averages and overall academic performances were: radio assignment was a 3.5, VOSOT assignment was 3.55, play-by-play assignment was 3.5, live shot assignment was 3.05, with a total assignment average of 3.4 and the overall course average was 3.43.

The overall averages show that except for a slight dip from the 2019 in-person pre-pandemic group to the synchronous/virtual pandemic in 2020, the course averages were same or higher in the synchronous/virtual and hybrid courses. The slight dip in the overall course academic performances from the 2019 to 2020 courses could be an effect from the pandemic shift from in-person to all classes online and students were still making the adjustment to the modality change as well as major life changes at that time. The assignment averages show a similar pattern with the radio assignment average the same or higher in both synchronous/virtual only courses and in one hybrid course than in the in-person class. In addition, the 2022 hybrid course radio assignment average was not significantly different and was only slightly under the in-person course radio average. The VOSOT assignment averages display that both synchronous/virtual and hybrid courses averages were the same or significantly higher. The play-by-play assignment averages in five of the six courses show that both synchronous/virtual and hybrid courses averages were same or significantly higher. Only the 2019 in person group 2 scored higher than the synchronous/virtual and hybrid courses. This score was also much higher than the other 2019 in person group 2 class, which could be another anomaly. The live shot average is similar in both synchronous/virtual courses and in the in-person class, however, the 2021 synchronous/virtual course and the 2023 hybrid course was significantly different but was less than .22% under the 2019 in-person courses' live shot average. However, the 2020 synchronous/virtual course and the 2022 hybrid course live shot averages were significantly higher than the 2019 in-person courses.

When analyzing the three groups (pre-pandemic, pandemic, post-pandemic) overall assignments and course academic performances there appears to be no significant difference between the three modalities or learning impact from the pandemic on these courses, according to the results of this case study. Table one shows the scores (based on a 4.0 scale) of the assignments and overall course averages, and it is evident from the data that the pandemic synchronous/virtual only classes and the post-pandemic hybrid classes' academic performances were the same or higher than the pre-pandemic in-person classes in a majority of the assignments. Only two assignments appeared to

show the 2019 pre-pandemic in-person classes doing better than the other modalities and that was in the 2021 synchronous/virtual course and 2023 hybrid course live shot and Play by Play assignments. This appeared to be an anomaly and is only slightly lower than the pre-pandemic in-person courses for the live shot. And only one pre-pandemic course assignment, the play by play scored higher than the 2021 synchronous/virtual course and 2023 hybrid courses. The VCE decoding device and the university's student evaluation surveys may help to explain these exceptions to the academic performance data, which answered one of the research questions of this case study, how does the case study's synchronous/hybrid students' academic performance compare with the in-person students' academic performance on the same assignments and the overall course? The case study data displays synchronous/hybrid college classes appeared to help students achieve the same or better academic performance than the traditional in-person setting. The overall course score averages include the assignment scores plus participation points. To demonstrate these findings more clearly, Table 1 displays the averages based on a 4.0 scale.

Table 1: Course and Assignment Averages

Assignment Averages	2019/In person Group 1	2019/In person Group 2	2020/Virtual only	2021/Virtual only	2022/Hybrid	2023/Hybrid
Radio	3.50	3.50	3.80	3.58	3.37	3.50
VOSOT	3.16	3.56	3.81	3.7	3.56	3.55
Play-by-Play	2.70	3.81	3.75	3.47	3.56	3.50
Live Shot	3.27	3.18	3.62	3.05	3.87	3.05
Total Assignment average	3.15	3.51	3.74	3.45	3.59	3.40
Course score average	3.33	3.33	3.01	3.63	3.35	3.43

Virtual Communication Evaluation (VCE) Decoding Device

The VCE was used to measure if successful virtual communication was taking place in these six courses and the researcher applied one VCE decoding device (Appendix A) to each course. The VCE consists of four categories: trust-building (TB), routine communication (RC), media richness (MR), and accountability (A). The categories are worth 25 points each and the total decoding device is based on a one-hundred-point scale. The first category on the VCE is trust-building, which consists of five areas: pre-work, face-to-face contact, virtual communication used, bonding of the group and if a culture or community is built with the group. The second category is RC, which is divided in to five areas: daily, weekly, bi-weekly, monthly, and time quantity spend with

group members. The third category is media richness, which is divided into five areas: text-based, mobile, video/audio, social media, and technology interface. The final category is accountability, which is divided into four areas: participation of group members, communication roles of members, productivity of members, goals met for group members and feedback received from leader to group and group members to leader. For the purpose of this case study the group members are the students, and the leader is the instructor. The decoding device scores virtual communication (VC) in each category are 5 for excellence in VC, 4 for good VC, 3 for average VC, 2 for poor VC, and 1 for fail to VC.

The overall group/course score rankings are as follows:

- Extremely Successful (100-90)
    - VC was extremely successful with little or no miscommunication, goals met.
- Successful (89-80)
    - VC flowed well with some miscommunication, but goals were met.
- Moderately Successful (79-70)
    - VC had several issues with miscommunication, but goals were still met.
- Unsuccessful (69-60)
    - VC had major issues with miscommunication and goals were not met.
- Failure (59 and below)
    - VC had total communication breakdown and goals were not met.

The researcher/coder applied the VCE by reviewing the course syllabi and analyzing the Blackboard course sites of the pre-pandemic, pandemic, and post-pandemic courses. The overall instructional design of the course was also looked at as well as all the communication that took place during the courses including email, phone calls, Zoom calls and chat sessions and face-to-face meetings. The results showed the pre-pandemic in-person group 1 overall course score was 70, which means VC was moderately successful, but the group had several issues with miscommunication, still the learning outcome goals were still met. The in-person class group 1 highest score 20/25 was in RC area while the lowest score 14/25 was in MR. In other words, the RC was strong because the group met regularly but the use of technology was limited mostly emailing the instructor outside of class, which is why the MR score was so low. The results showed the pre-pandemic in-person group 2 overall course score was 70, which means VC was moderately successful, but the group had several issues with miscommunication, still the learning outcome

goals were still met. The in-person group 2 class was the same as the first in-person group 1 class. The highest score 20/25 was in RC area while the lowest score 14/25 was in MR. In other words, the RC was strong because the group met regularly but the use of technology was limited mostly emailing the instructor outside of class, which is why the MR score was so low.

The results showed the pandemic 2020 synchronous/virtual overall course score was 84, which means VC was successful and the communication flowed well with some miscommunication, and the learning outcome goals were met. The synchronous/virtual fall 2020 class highest score 24/25 was in the MR area while the lowest score 18/25 was in TB. In other words, the MR area was strong because the class met regularly by using multiple technology such as email, Blackboard, Zoom calls and chat sessions, which means the students had more access to the instructor. The lowest score was in the TB area most likely due to the class never meeting in-person, which can impact a group's ability to build trust, and this is also at the height of the pandemic when all classes were meeting virtually. The results showed the pandemic 2021 synchronous/virtual overall course score was 88, which means VC was successful and the communication flowed well with some miscommunication, and the learning outcome goals were met. The synchronous/virtual fall 2021 class highest score 24/25 was in MR area while the lowest score 19/25 was in TB. In other words, the MR area was strong because the class met regularly by using multiple technology such as email, Blackboard, Zoom calls and chat sessions, which means the students had more access to the instructor. The lowest score was in the TB most likely due to the class never meeting in-person, which can impact a group's ability to build trust.

The results showed the post-pandemic 2022 hybrid overall course score was 97, which means VC was extremely successful and the communication flowed well with little, or no miscommunication and the learning outcome goals were met. The hybrid fall 2022 class highest scores were 25/25, a tie between the TB and A areas and the lowest score 23/25 was in the RC area. The scores in all four categories improved a great deal by giving students the ability to meet in-person and virtually it helped build trust with the students and thus they were more accountable for their assignments. The reason the RC slightly lower could be that the communication was not on a daily basis. The results showed the post-pandemic 2023 hybrid overall course score was 97, which means VC was extremely successful and the communication flowed well with little, or no miscommunication and the learning outcome goals were met. The hybrid fall 2023 class highest scores were 25/25, a tie between the TB and A areas and the lowest score 23/25 was in the RC area. The scores in all four categories improved a great deal by giving students the ability to meet in-person and virtually it helped build trust with the students and thus they were more accountable for their assignments. The reason the RC was slightly lower is that the communication was not on a daily basis. The VCE data displays synchronous/virtual only and hybrid college classes appeared to help students improve their communication and that the communication was significantly better than the

traditional in-person setting. To demonstrate these findings more clearly, Table 2 displays the VCE categories and overall scores in points and on a 4.0 scale.

Table 2: Virtual Communication Evaluation (VCE) Device Scores

VCE Device	2019/In person Group 1	2019/In person Group 2	2020/Virtual only	2021/Virtual only	2022/Hybrid	2023/Hybrid
TB	17/25	17/25	18/25	19/25	25/25	25/25
RC	20/25	20/25	21/25	22/25	23/25	23/25
MR	14/25	14/25	24/25	24/25	24/25	24/25
A	19/25	19/25	21/25	23/25	25/25	25/25
Total score	70 or 2.8	70 or 2.8	84 or 3.36	88 or 3.52	97 or 3.88	97 or 3.88

The VCE decoding device was very helpful in measuring the success or failure of virtual communication in these six courses. It is evident by the scores that as access to the instructor grew through media richness and the virtual communication improved as did trust, routine communication and accountability of both the students and the instructor (Baxter & Hainey, 2023; Elsayary et al., 2024). Thus, positively improving meeting the learning objectives of the pandemic and post-pandemic classes. There was a dramatic increase in the scores from the upper eighties in the synchronous/virtual only courses to the upper nineties in the hybrid courses. It became obvious by looking at the VCE results that the students thrived with more use of virtual technology in class and assignments when paired with the ability to meet in-person (Guevara-Otero et al., 2024; Layng, 2008). The VC helped students who could not physically make it to class when they were sick or had personal issues to not miss course content, which improved their trust, accountability and ultimately their scores. According to the VCE results, the post-pandemic hybrid courses were the most successful at VC, followed by the pandemic synchronous/virtual courses, and the pre-pandemic in-person classes came in last. The in-person course might have placed last because not as much virtual technology was used in that class as in the pandemic and post-pandemic classes but one would still expect the in-person class to have scored much higher in the trust-building and routine communication areas of the device, but that was not the case.

The VCE decoding device results have answered the first research question, that successful virtual communication strategies or criteria were being used in this case study in the synchronous/hybrid college classrooms and help identify them. These successful criteria or strategies include using more virtual communication technology in classes and in assignments to improve trust, access to the instructor and make the students more accountable for their assignments thus increasing

engagement and learning (Jarrah et al., 2025; Layng, 2016). The VCE and academic performance data results appear to support that the case study synchronous/hybrid students' academic performance and communication is the same or better when compared with in-person students' academic performance and communication on the same assignments and the overall course. The next step in the gathering of data is to observe if the students' perceptions agree or disagree with the results of the students' academic performances and the application of the VCE device.

Student Surveys

Every semester at this mid-sized midwestern university, voluntary student surveys are conducted in the last three weeks of a semester. Students are sent an email and can access the standard survey through the Blackboard system and their feedback is kept completely anonymous. The instructor is sent a summary of the results with students' comments and there are no identifying elements except for the course number, section, and semester date. Four of the student survey sets from 2020 to 2023 used the exact same questions, and used the Likert system with strongly agree, agree, disagree, strongly disagree or N/A. The score was based on a Likert scale where 4.0 is the highest-ranking score and the questions on survey included:

1. I put forth my best effort in this course.
2. Expectations for performance were clearly communicated throughout the semester.
3. The teaching strategies used motivated me to do my best work.
4. The teaching approaches used supported my learning needs.
5. The course provided a comfortable environment for expressing views and ideas.
6. I received feedback on my work within a reasonable timeframe.
7. The quality of the feedback on my work helped my learning.
8. The grading in the course fairly reflected the quality of my work.
9. Overall, I had a good learning experience in this course.
10. The instructor worked to make the course engaging for all students.

The survey also had three open-ended questions that consisted of:

- Describe activities or assignments that were most beneficial to your learning?
- Suggest way(s) in which the course could be improved (if any)?
- Briefly describe what you thought was the most important thing you learned in the course?

The 2019 student surveys asked 14 questions ranked on a Likert scale with one being strongly agree and five being strongly disagree or N/A. This survey covered the same subject areas as the other surveys and asked the same open-ended questions. This could skew the overall results of the

student surveys but when weighed with the other data from VCE and assignment/course averages it should be sufficient to draw several conclusions from the results.

The response rate from the 2019 pre-pandemic in-person group 1 student surveys was only 2 out of 18 students so it is not statically significant data, but it is data none the less. 82% of the responses to the 14 questions were positive, 9% were neutral and 8% were negative responses. Perhaps, the more telling information is the responses to the open-ended questions, "The instructor was so knowledgeable and so relatable and gave us real, practical and useful information regarding television production", and an answer to the how this course could be improved stated, "I don't have anything, I would change". It is confusing that if two students thought so highly of the course then why didn't more students respond to the course survey. The answer may be that response rates for this university's student evaluation surveys decreased once they moved from giving surveys during class time to having the students take them outside of the course time at their convenience. The response rate from the 2019 pre-pandemic in-person group 2 student survey was only 4 out of 18 students so the rate did improve the data collection and yielded similar results. 82% of the responses to the 14 questions were positive, 9% were neutral and 8% were negative responses. Some of the responses to the open-ended questions were, "She is really experienced and provides fun anecdotes in order to tell us what to do and what not to do. She taught us everything well and prepped us before each major assignment. I feel more confident stepping out into the world after taking her class", and an answer to the how this course could be improved stated, "Give a lesson on all the production elements before production days". It is confusing that if four students thought so highly of the course then why didn't more students respond to the course survey. The answer once again may be that response rates for this university's student evaluation surveys decreased once they moved from giving surveys during class time to having the students take them outside of the course time at their convenience.

The pandemic 2020 synchronous/virtual only response rate improved to 25% with 4 out 16 students responding and the summary of the responses to the ten questions were a 3.32/4.0, which is 83% positive responses. The open-ended questions were similar to the responses to the Pre-pandemic in-person course such as, "I enjoyed how the class was set up", and an answer to the question what was beneficial or something important you learned in class stated, "How to write news script and talk on camera". The pandemic 2021 synchronous/virtual only response rate significantly improved to 12 out 16 students and the summary of the responses to the ten questions were a 3.85/4.0, which is 96% positive responses. The open-ended questions were more descriptive and positive then the responses to the pre-pandemic in-person or pandemic synchronous/virtual only courses such as, "I can't think of anything to improve in the course", several students replied, "nothing or N/A", and an answer to the question what was beneficial or something important you learned in class stated, "The assignment in this class were performance based and we received two takes. After the first try we would get feedback immediately on what we did good on and how we can improve. This was super beneficial to my learning as I was improving on the spot and was

able to immediately implement my learning". One student did express the instructor could be a bit more lenient on grading assignments but other than that said the class was just fine.

The post-pandemic 2022 hybrid response rate improved to 14 out 17 students and the summary of the responses to the ten questions were a 3.73/4.0, which is 93% positive responses. The open-ended questions were more descriptive and positive then the responses from the three former student course surveys with statements that include, "The only thing I would suggest is switching the live-shot with the PBP, still have both just change the order", several students replied "to change nothing or N/A", and an answer to the question what was beneficial or something important you learned in class stated, "I can't pick just one, I loved all the assignment we did!". There were really no negative responses to the open-ended questions. The post-pandemic 2023 hybrid response rate improved to 16 out 16 students and the summary of the responses to the ten questions were a 3.95/4.0, which is 98% positive responses. The open-ended questions were even more descriptive and positive then the responses from the four former student course surveys with statements that include, "I don't think the course could improve anymore. This course already teaches you all you need to know and will prepare you for other classes and in the future overall", several students replied, "to change nothing or N/A", and an answer to the question what was beneficial or something important you learned in class stated, "Every activity and assignments throughout this course were all equally beneficial. The VOST, play-by-play, radio assignment and virtual interview all had me become more comfortable in front of the camera and my speech has 100% improved with my articulating". There were really no negative responses to the open-ended questions and the positive responses to these questions went on for pages and several students mentioned that the virtual communication was one of the most important skills they learned in the course. The student surveys appeared to support both the results of the student averages and the VCE decoding device that the successful use of virtual communication can improve student learning, academic performance, and student satisfaction. To demonstrate these findings more clearly, Table 3 displays the student survey results in percentages and overall course averages on a 4.0 scale.

Table 3: Student Survey Scores and Course Averages

Student Survey	2019/In person Group 1	2019/In person Group 2	2020/Virtual only	2021/Virtual only	2022/Hybrid	2023/Hybrid
Positive	82%	82%	83%	96%	93%	98%
Negative	09%	08%	00%	00%	00%	00%
Neutral	08%	09%	00%	00%	00%	00%
Survey averages based on 4.0	3.28	3.28	3.32	3.85	3.73	3.95

Discussion

All the results point to the same conclusion over and over again, using virtual communication can enhance any learning environment from an in-person course to a synchronous/virtual only course to a hybrid course. The key is in how technology is integrated into the classroom and the ability of both the instructor (Beatty, 2019; Chandler et al., 2020; Curry et al. (2022); Edouard, 2023; Ibrahim et al., 2020) and student's (Detyna et al., 2023; Flynn-Wilson et al., 2021) utilization of virtual communication. Many past studies support this finding including Baxter & Hainey (2023) study that stated, "The research identified some interesting findings, namely that certain participants considered that learning remotely online was beneficial for instant feedback, supported motivation and fostered communities," (69). Belt & Lowenthal (2023) study concurred, "…the benefits of real-time visual communication outweigh the drawback identified", (p. 4954). Challenges to overcome include getting students more comfortable appearing on camera and understand that some learning styles work better in-person while other learning styles excel in remote classes. One of the keys to getting students more comfortable on camera is having students experience more synchronous courses, which can bolster learner's classroom engagement and thus academic performance as well (Jarrah et al., 2025).

Many of the challenges can be met by, "informing students at the beginning of the semester about the advantages of each modality and how to maximize their learning abilities" (Ha & Yoo, 2024, 299). The more students use properly designed virtual communication for learning the more comfortable they will become, and the more satisfied students will be with virtual classes. This is supported by student responses in a (2021) Flynn-Wilson and Reynolds study that found student interaction with virtual classes was much more positive with synchronous platforms and they felt more competent and satisfied the more virtual courses they had taken. This case study supports that finding because as the students took more virtual classes, they became more adept at working in that educational setting. As long as the instructor is successfully using VC in the classroom and does not just mimic the traditional lecture format in the synchronous/virtual or hybrid course. "Technical knowledge goes beyond having basic technology skills. "Instead, it requires that instructors understand how and why they use technologies" (Edouard et al., 2023, 128). The students' academic performance shows that even though the majority of the assignments in the six classes were the same, the classes that utilized more virtual communication such as discussion board posts, Zoom meetings with the instructor and emailing was integrated into the instructional design, the more the scores increased. The VCE decoding device results were very similar to the averages increase. It displayed that virtual communication was used for more than just the modality of the course but as part of the assignments, which in turn showed the more students trusted the process, the more they became accountable for their work. The student surveys also support these findings by showing that student's satisfaction with

the course grew as more virtual communication was integrated into the learning process (Jarrah et al., 2025; Jia et al., 2023).

Simply put, the higher course and assignment scores, the higher VCE scores as well as the higher student course evaluation scores all belong to the synchronous/hybrid courses. These are the courses that used both in-person and synchronous/virtual communication and allowed students choice and versatility. While the in-person class average scores were very similar to the synchronous/virtual only courses, the student surveys and VCE scores were significantly different. The student survey results could be due to the low response rate, but the VCE scores display that the in-person class could have improved its use of VC in the class and assignments. "Student engagement is an important contributor to learning irrespective of delivery mode", (Meade & Parthasarathy, 2024, 10). This case study found the more successfully virtual communication was integrated into the course content; the more learning improved regardless of the modality. Successful VC created more access and engagement between the students and the instructor and that built trust as well as created a community that routinely communicated with each other through multiple technology channels, thus helping the students be more accountable for their work and improving academic performance in a majority of the courses and assignments analyzed.

These results agree with similar findings by several researcher's discussed in the literature review of this article including Baxter and Hainey (2023), Belt and Lowenthal (2023), and Dinh, (2023) studies. Academic performance is not necessarily impacted by the modality of college classrooms but by how certain elements are utilized for successful academic performance to occur and virtual communication has become a key element. The case study's results display that these synchronous and hybrid college classes appeared to help students improve their communication as well as student satisfaction with the course and improve or equal the academic performance over the traditional in-person setting. To demonstrate these findings more clearly, Table 4 shows a summary of the three measurement devices' averages per course based on a 4.0 scale.

Table 4: Summary of Measurement Devices' Averages

Measurement's Summary Scores	2019/In person Group 1	2019/In person Group 2	2020/Virtual only	2021/Virtual only	2022/Hybrid	2023/Hybrid
VCE Device	2.80	2.80	3.36	3.52	3.88	3.88
Academic Average	3..33	3.33	3.01	3.63	3.35	3.43
Student Survey	3.28	3.28	3.32	3.85	3.73	3.95

Limitations

One of the limitations of this study includes all five assignments in all six courses were not the same. Two of the courses were changed due to pandemic social distancing rules and this could have slightly skewed the overall course averages. It might have helped better validate the academic performance averages to include more pre-pandemic courses in the analysis that were virtual online before the pandemic since the actual shift from in person to all synchronous courses had an impact on the learning process. In other words, the shift itself impacted scores and could explain why the 2020 virtual only course had a lower academic average than the 2019 in person courses. Another limitation is that the researcher was the coder for the VCE, which might have influenced the decoding results. It might reduce coder bias if objective coders were trained to apply the device to courses that they have not taught. Finally, the university's student surveys for all six courses were not the exactly the same and this made it more difficult for the researcher to generalize the findings. It would have been more thorough to design a specific survey for this study that could have supplied more focused results, but a general survey given to all students in all classes at this mid-western university did yield some objective results. Although this case study does have some limitation the triangulation mixed methodology collection of the data aided in validating the findings.

Suggestion for Future Studies

Future researchers should focus on doing more experimental studies on the use of virtual communication in learning at both the college and K-12 levels. There should also be more application of decoding devices such as the VCE in different educational settings to help prove or disprove the validity of using such an instrument to measure the success of virtual communication and its impact on the learning process. Finally, there needs to be even more studies conducted on

synchronous/virtual classes and hybrid classes to better inform instructors of successful practices in using this technology and to help improve the instructional design when using this technology.

Conclusion

It is evident from past research that online modality (Layng, 2008) was here to stay, and that instructional design was key to using this technology well in the college classroom. However, that study's focus was on asynchronous learning and at the time the findings showed that synchronous learning was not quite ready for "prime time" as they use to say in television. Although video conferencing was available, it was cost prohibitive and the technology at the time could not deliver video and audio content in a clean an immediate manner to the masses. Poor audio, slow or no access to WIFI and lack of non-verbal communication hindered the successful use VC in college classrooms (Bower et al., 2014; Chen et al., 2015). Today, synchronous/virtual technology is more than capable of being used to deliver live high-quality video and audio at a fraction of the cost it was just a few years ago. The pandemic proved that this technology can be successfully and unsuccessfully used in education. Multiple studies found that student engagement is key to improving academic performance (Almuarik & Alangari, 2024; Baxter & Hainey, 2023; Beatty, 2019). Virtual communication is crucial to that student engagement as a recent (2025) study by Jarrah et al. found that university students had more active engagement in synchronous online classes than in face-to-face classes. These hybrid courses force students to get more involved and not just passively sit in a classroom listening to a lecture. Belt & Lowenthal (2023) study also supports these results of increased student engagement, whereas Flynn-Wilson and Reynold's, (2021) study found that student competency and satisfaction of the synchronous course grew the more hybrid courses they completed. In addition, Goodridge et al. (2017) study showed a direct correlation that asynchronous/hybrid students received significantly higher final course grades than the face-to-face students most likely due to the hybrid course better meeting the different learning styles of the students. Thus, more student engagement through multiple channels of virtual communication can improve academic performance. At the very least as a Mentzer et al. (2024) study showed a HyFlex environment does not have a negative or positive impact on academic performance when compared to face-to-face. This study has found that education can be vastly improved when using virtual technology as long as several elements are addressed including: instructor/student technology training, proper instructional design and integration of technology into the course and assignments and access to the software and technology. The pandemic also uncovered that the digital divide still exists and that access to technology for all communities is a necessity for people to learn, work or just function in modern society (Raja & Nagasubramani, 2018).

This case study is another piece of the puzzle on how successful virtual communication in a college classroom can positively impact student academic performance and satisfaction when taking

virtual or hybrid classes. As Chandler et al., stated in their (2020) study, "The technological genie has been let out of the bottle in terms or remote learning for face-to-face brick and mortar classroom constituents," (12). It is not a choice of the learning is better if students are in-person or virtual, that choice has already been made by the students. According to this case study, they want both and why not, when the world is hybrid, why should students' education be one dimensional. The debate should not be about which modality is better but should focus on the process and how virtual modality can improve the learning experience and outcomes for present and future college students.

References

Almuarik, G. S., & Alangari, M. A. (2024). "Till we meet again!": The synchronous hybrid teaching of English in Saudi Arabia**,** *International Journal of Arabic-English Studies (IJAES) 22*(2). 2024 DOI: https://doi.org/10.33806/ijaes.v24i2.668

Baxter, G., & Hainey, T. (2023). Remote learning in the context of COVID-19: Reviewing the effectiveness of synchronous online delivery. *Journal of Innovative Teaching & Learning. 16(*1). 67-81.

Beatty, B. J. (2019), Learning in a hybrid-flexible course: The student experience in hyflex courses. In B. J. Beatty (Ed.), *Hybrid-Flexible Course Design*. EdTech Books. https://edtechbooks.org/hyflex/student_experience. 1-29.

Belt, E. S., & Lowenthal, P. R. (2023), Synchronous video-based communication and online learning: An exploration of instructors' perceptions and experiences. *Education and Information Technologies. 28:*4941–4964. https://doi.org/10.1007/s10639-022-11360-6

Besalti, M., & Satici, S. A. (2022). Online learning satisfaction and internet addiction during Covid-19 pandemic: A two-wave longitudinal study. *TechTrends. 66*. 876-882.

Bond, M., Buntins, K., Bedenlier, S., Zawacki-Richter, O., & Kerres, K. (2020). Mapping research in student engagement and educational technology in higher education: A systematic evidence ap. *International Journal of Educational Technology in Higher Education*. *17(*2). https://doi.org/10.1186/s41239-019-0176-8

Bower, M., Kenney, J., Dalgarno, B., Lee, M. J.W., & Kennedy, G. E. (2014). Patterns and principles for blended synchronous learning: Engaging remote and face-to-face learners in rich-media real-time collaborative activities. *Australasian Journal of Educational Technology*. *30*(3). 261-272.

Carstens, K.J. Mallon, J.M. Bataineh, M. & Al-Bataineh, A. (2021). Effects of technology on student learning. *The Turkish Online Journal of Educational Technology*. *20*(1). 105-113.

Chandler, R.C. Burton, B.G. Wallace, J.D. & Douglas, D. G. (2020). Eyewitness to the suddenly online paradigm shift in education: Perspectives on experience, sustaining effective teaching and learning, and forecasts for the future. *Journal of Literacy and Technology. 21*(3). 5-13.

Chen, P., Xiang, J., Sun, Y., Ban, Y., Chen, G., & Huang, R. (2015). *Exploring students' discussion in face to face and online synchronous learning*. In: Chen, G., Kumar, V., Kinshuk, Huang, R., Kong, S. (Eds.) Emerging issues in smart learning. Lecture notes in educational technology. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-662- 44188-6_26

Creswell, J. W., Plano Clark, V. L., Gutmann, M., & Hanson, W. (2003). Advanced mixed methods research designs. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 209–240). Thousand Oaks, CA: Sage.

Creswell, J. W. (2006). Qualitative inquiry and research design: Choosing among five approaches. London: Sage Publications.

Curry, J. H., Jackson, S. R., & Morin, H. (2022). It's not just the how, but also the who: The TCoP model of technology integration. *TechTrends. 66*, 980-987.

Detyna, M., Sanchez-Pizani, R., Giampietro, V., Dommett, E. J., & Dyer, K. (2023). Hybrid flexible (HyFlex) teaching and learning: climbing the mountain of implementation challenges for synchronous online and face-to-face seminars during a pandemic. *Learning Environments Research*. *26*. 145–159.

Dinh, C. T. (2023). Impact of synchronous online learning environment on students' cognitive engagement and learning outcomes. *Turkish Online Journal of Distance Education*. *24*(3). 22-38.

Edouard, G. (2023). Why and how colleges and universities should leverage technology mentoring to maximize faculty's technology integration efforts. *TechTrends. 67*. 124-132.

Elsayary, A., Meda, L., Karaki, S., & Mohebi, L. (2024). The Effective use of virtual communication in an online professional development program: Investigating teachers' attitudes. *Turkish Online Journal of Distance Education*. *25*(1). 78-94.

Flick, U. (2018). Doing triangulation and mixed methods. London: Sage Publications.

Flynn-Wilson, L., & Reynolds, K. E. (2021). Student responses to virtual synchronous, hybrid, and face-to-face teaching/learning. *International Journal of Technology in Education. 4*(1). 46-56.

Garro-Abarca, V., Palos-Sanchez, P., & Aguayo-Camacho, M. (2021). Virtual teams in times of pandemic: Factors that influence performance. *Frontiers in Psychology*. *12.* https://doi.org/10.3389/fpsyg.2021.624637

Goodridge, W. H., Lawanto, O., & Santoso, H. B. (2017). A learning style comparison between synchronous online and face-to-face engineering graphics instruction. *International Education Studies*. *10*(2). 1-14. http://dx.doi.org/10.5539/ies.v10n2p1

Golden, A.R., Srisarajivakul, E. N., Hasselle, A. J., Pfund, R.A., & Knox J. (August, 2023). What was a gap is now a chasm: Remote schooling, the digital divide, and educational inequities resulting from the COVID-19 pandemic. *Current Opinion Psychology*, *52. https://www.sciencedirect.com/science/article/pii/S2352250X23000775?via%3Dihub*

Guevara-Otero, N., Cuevas-Molano, E., Vargas-Perez, A. M., & Sánchez Rivera, M.T. (2024). Evaluating face-to-face and online flipped learning on performance and satisfaction in marketing and communication students. *Contemporary Educational Technology*. *16*(1). ep490, ISSN: 1309-517X.

Guion, L. A., Diehl, D. C., & McDonald, D. (2011). Triangulation: Establishing validity of qualitative studies. *EDIS, 8*(3). DOI:10.32473/edis-fy394-2011

Ha, H., Yoo, S. (2024). Comparing synchronous and asynchronous online programming classes: Similarities and differences. *International Journal of Information and Education Technology*. *14*(2). 293-301.

Haleem, A., Javaid, M., Qardri, M. A., & Suman, R. (May, 2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, *3*. 275-285.

Hess, A. (2020). How coronavirus dramatically changed college for over 14 million students. https://www.cnbc.com/2020/03/26/how -coronavirus-changed-college-for-over- 14-million-students.html

Ibrahim, J., Frankel, A., Friedman, L., & Mansell, J. (2020). From survive to thrive: Using professional development to advance online teaching. *Journal of Literacy and Technology*, *21*(3). 44-58.

Jarrah, M., Alghazo, S., Al-Deaibes, M., & Alhawamdeh, H.A. (2025). Real-world experiences of online learning: the effect of synchronous online learning on university students' classroom engagement. *Humanities and Social Sciences Communications. 12.* 75. https://doi.org/10.1057/s41599-025-04701-6

Jia, C., Hew, K. F., Jiahui, D., & Liuyufeng, L. *(*2023). Towards a fully online flipped classroom model to support student learning outcomes and engagement: A 2-year design- based study. *The Internet and Higher Education. 56*. https://doi.org/10.1016/j.iheduc.2022.100878

Layng, J. (2008). Distance learning: The challenge and opportunity of online technology. *Journal of Literacy and Technology, 9*(3). 56-85.

Layng, J. (2016). The virtual communication aspect: A review of 15 years of virtual studies. *Journal of Literacy and Technology*, *17*(3). 172-218.

Lowell, V.L., & Yang, M. (2023). Authentic learning experiences to improve online instructor's performance and self-efficacy: The design of an online mentoring program. *TechTrends. 67*. 112-123.

Meade, J. A., & Parthasarathy, K. (2024). Does student engagement impact learning differently in face-to-face and virtual accounting classes? *Issues in Accounting Education*. *39*(2). 71-83. https://doi.org/10.2308/ISSUES-2023-009

Mentzer, N. J., Isabell, T. M., & Mohandas, L. (2024). The impact of interactive synchronous HyFlex model on student academic performance in a large active learning introductory college design course. *Journal of Computing in Higher Education*. *36*. 614-646. https://doi.org/10.1007/s12528-023-09369-y

Ng, K. C. (2007). Replacing face-to-face tutorials by synchronous online technologies: Challenges and pedagogical implications*, International Review of Research in Open and Distance Learning*. *8*(1). https://doi.org/10.19173/irrodl.v8i1.335

Peterson, A. T., Beymer, P. N., & Putnam, R.T. (2018). Synchronous and asynchronous discussions: Effects on cooperation, belonging, and affect. *Online Learning. 22*(4). 7-25. doi:10.24059/olj.v22i4.1517

Price, L. & Kirkwood, A. (2014). Using technology for teaching and learning in higher education: A critical review of the role of evidence in informing practice. *Higher Education Research and Development*. *33*(3). 549-564.

Ragni, A., Ippolito, D., & Masci, C. (2024). Assessing the impact of hybrid teaching on students' academic performance via multilevel propensity score-based techniques. *Socio-Economic Planning Sciences. 92.* https://doi.org/10.1016/j.seps.2024.101824

Raja, R., & Nagasubramani, P.C. (2018). Impact of modern technology in education. *Journal of Applied and Advanced Research*. *3.* 33–35.

Reigeluth, C. M., Myers, R. D., & Lee, D. (2017). The Learner-centered paradigm of instruction. In C. M. Reigeluth, B. J. Beatty and R.D. Myers (Eds.). *Instructional-design theories and models: The learner-centered paradigm of education.* New York, NY: Routledge.

Shemshack, A. (2021), What support do teachers need on effective instructional technology integration? *Journal of Literacy and Technology, 22*(1), 22-51.

Szeto, E. (2014). A comparison of online/face-to-face students' and instructor's experiences: Examining blended synchronous learning effects. *Procedia - Social and Behavioral Sciences. 116.* 4250 – 4254.

Vogels, E. A. (June 22, 2021). Digital divide persists even as Americans with lower incomes make gains in tech adoption, *Pew Research Center report*. https://www.pewresearch.org/short-reads/2021/06/22/digital-divide-persists-even-as-americans-with-lower-incomes-make-gains-in-tech-adoption/

Yamagata-Lynch, L. (2014). Blending online asynchronous and synchronous learning. *International Review of Research in Open and Distributed Learning*, *15*(2). 189–212. https://doi.org/10.19173/irrodl.v15i2.1778

Ye, D. (2022). The history and development of learning analytics in learning, design, & technology field. *TechTrends.* 66. 607-615.