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Bringing Face-to-Face Engagement to Online Classes: Developing a High-Presence Online Teaching Method

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Abstract: The trend to shift courses online is accelerating. Some students are gravitating toward asynchronous online classes; however, many still prefer in-person educational experiences. These students often are less engaged when taking online courses, and their willingness to pay for online courses is frequently less than for in-person courses. There is a need to bridge the gaps between online and traditional class delivery formats. This paper reports on a high-presence online teaching method that approximates the in-person experience by affording face-to-face conversations, real-time interaction, and features the instructor placed front-and-center with the lecture material. The paper reports a case study test of this method as applied to a graduate process reengineering course. Students in the course report that the method provides better student-instructor interaction and overall engagement than they expect from in-person classes. Students also report that the method approximates what they expect from in-person courses regarding the quality of interactions they have with their classmates.

Keywords: Online education, student engagement, social presence, media richness, instructional technology, course design, experiential learning, synchronous online distance learning.

While the number of online classes has been increasing, particularly over the past decade, external forces, especially COVID-19, have accelerated the transition to online teaching formats. Many students have struggled staying engaged with their courses during the shift to online, remote classes.

Although some students favor online learning, research suggests that most students prefer face-to-face instruction (Jaggars, 2014) and that many students view online courses as less desirable compared to face-to-face courses (Tichavsky, Hunt, Driscoll, & Jicha, 2015). Of students surveyed, 50% found that online courses lacked sufficient interaction with their instructor, 26% indicated that online courses lacked immediate instructor feedback as a critical missing component, and 10% indicated difficulty in getting clarification of material because they could not interact with the instructor. Other students noted the absence of the instructor's energy and enthusiasm during online instruction. Student satisfaction with their professors tend to be lower with online courses (Baker, 2010; Cole, 2016), frequently caused by a reduced amount of interpersonal interaction and personalized feedback from the instructor (Cole, 2016; Jaggars, 2014). Many students consider the quality of conventional online interactions such as discussion forums as lower than the quality of interactions that occur within a classroom (Tichavsky et al., 2015). This translates into students earning lower grades in online courses than in the traditional classroom setting (Bettinger, Fox, Loeb, & Taylor, 2017).

For many students, their willingness to pay is much lower for online education, in part because some universities offer online degrees for a fraction of the price of comparable in-person degrees, but also because these students believe their educational experience is diminished with the reduction of face-to-face educational opportunities. A recent survey finds that 75% of students do not believe online classes provide a quality learning experience. Another survey finds that 67% of students find

online classes less effective than in-person courses (Daniels, 2020). Student protests against the loss of in-person class options have grown louder, expressing resistance with statements like "There's no need to pay out-of-state tuition if I'm at home" and "I'm not paying full price for YouTube university" (Icon By The Noun Project, 2020). Students are demanding tuition cost reductions when required to take online classes rather than in-person ones (O'Brien, 2020) and institutions of higher education are facing student lawsuits demanding tuition refunds and changes in tuition rates during the pandemic because online classes are fundamentally a different experience than in-person, face-to-face instruction (G. Anderson, 2020; Binkley, 2020).

As health concerns abate and universities return to full capacity in their classrooms, funding, real estate costs, and other non-pedagogical factors will still drive a shift to online courses. At the same time, students will still maintain their expectations for interpersonal interaction, real-time engagement, and instructor motivation. This raises a key research question for teaching: how can the face-to-face benefits of in-person classes be captured while teaching an online class? In an attempt to answer this question, a high-presence online teaching method was developed for and tested during Summer 2020 for a process reengineering core taught within a masters of information systems program. The method uses the Zoom video conferencing app to enable real-time, (digitally) face-to-face interaction among instructor and all students, while superimposing instructors onto lecture slides so that instructors can interact with the students and the content while delivering the lecture, capturing the rich interactions students expect when everyone is physically in the same class room. The results of this case study (Yin, 2017) indicate that much of the interaction and engagement of in-person classes can be replicated online. The online method tested in this study achieved greater student-faculty engagement and interaction than students expect from face-to-face classes and student-student interaction which closely approximated the expectations from face-to-face courses.

Review of Related Literature

Students' desire for interaction and need to be motivated by the professor are key factors for creating effective learning environments (Tichavsky et al., 2015). These factors are often described as engagement, which can be increased through the use of "rich media" that approximates in person, face-to-face communication.

Engagement

Student engagement is the most critical factor for student learning (A. Singh, Rocke, Pooransingh, & Ramlal, 2019) and satisfaction with an online course (Martin & Bolliger, 2018). Student engagement can be summarized as students' psychological investment and effort focused toward learning and mastering the knowledge and skills taught in a class (Lamborn, Newmann, & Wehlage, 1992). Students are more engaged when the instruction increases contact between students and teacher, provides timely feedback on student's work, provides an opportunity for students to work collaboratively, and establishes high standards for what constitutes acceptable quality work. These course characteristics can be diminished or lost when courses move online, making students' psychological investment and effort tenuous when courses are moved online (Martin & Bolliger, 2018). There are three types of interactions necessary for effective engagement and interaction in online courses: learner-to-instructor, learner-to-learner, and learner-to-content (Moore, 1989). Learner-to-instructor engagement is the most important for successful online education. The two most important factors for fostering learner-to-instructor engagement is timely instructive feedback and the instructor's interaction (i.e. presence). Learner-to-content engagement can be achieved though "authentic activities" such as real-world activities. Group work builds learner-to-learner engagement (Martin & Bolliger, 2018).

Immediacy

Interaction is a cornerstone of the learning experience and strongly shapes learning outcomes (Wanstreet, 2009). Interaction impacts student motivation, active learning, and successful achievement of learning objectives. Opportunities for students to interact with each other and the instructor are necessary for effective online instruction (Dixson, 2010). Interactive immediacy, such as asking and answering questions, calling students by name, and communicating attentiveness to students, is necessary for effective learning (Baker, 2010). The ability for students to interrupt the instructor, such as to ask a question or request clarification, is important to learning new material and student engagement (Y. C. Liu & Burn, 2007). Immediacy and real-time interaction, such as those afforded by synchronous activities in an online course, positively impact student affective learning, motivation, and cognition (Baker, 2010), whereas asynchronous online instruction can result in student disengagement (Romero-Hall & Vicentini, 2017). Immediacy is an antecedent of social presence.

Social Presence

Social presence theory (Short, Williams, & Christie, 1976) suggests that immediacy and intimacy, conveyed by verbal cues and nonverbal cues such as facial expression and body language define one's "social presence." Social presence is the degree to which students feel emotionally and socially connected to others in the class (He, Xu, & Kruck, 2019). Social presence is about being actively engaged, but more importantly, perceived as being "real," understanding what makes a person authentic and unique, and "there," in a supporting and caring sense (Lowenthal & Snelson, 2017). Social presence is a necessary component of engagement (Dixson, 2010). Higher immediacy and intimacy create strong social presence and foster stronger connections (Keil & Johnson, 2002). In a computer-mediated setting, it is important for teams to project themselves socially into a community of inquiry (Lowenthal & Snelson, 2017). Specific to the teaching setting, instructor presence is the visibility of the teacher as perceived by the student (Baker, 2010). Instructor presence includes facilitating necessary discussions and maintaining student engagement. It builds the connectedness between teacher and students required for strong engagement (T. Anderson, Liam, Garrison, & Archer, 2001; Baker, 2010). Face-to-face instruction has higher social presence than computer-mediated channels; however, media that offer increased immediacy, intimacy, and instructor visibility can offer a high degree or social presence (Keil & Johnson, 2002). Computer mediated communication offers a spectrum ranging from lean to rich (Lowenthal, 2010). As such, the media richness of the technology tools directly affects instructor social presence and student engagement.

Media Richness

Online media afford various ways to increase visibility and instructor presence, creating different opportunities to provide verbal and visual cues that will engage students. Daft and Lengel (Daft & Lengel, 1984) propose a continuum between rich and lean media, based on a medium's ability to convey a broad or a limited range of cues. The theory posits that a high task-medium fit in communication media provides the ideal range of cues. Media richness has a positive impact on student concentration and satisfaction with online learning (S.-H. Liu, Liao, & Pratt, 2009). Commonly used "lean" media used in online education, such as chat boxes and widgets to replicate raising hands provide a very limited range of cues. On the other hand, media with high media richness afford teachers and students to communicate more effectively, including picking up on non-verbal cues (Fernandez, Simo, Sallan, & Enache, 2013; Ferschke, Yang, Tomar, & Rosé, 2015; S.-H. Liu et al., 2009; Romero-Hall & Vicentini, 2017). High media richness can reduce the distance among learning

participants, even when they are geographically separated (Zhao, Wang, & Sun, 2020). A medium is considered to be richer when it more closely it replicates face-to-face communication. Rich media are best suited for teaching and learning new material (Cole, 2016).

Online Teaching Method

The goal driving the redesign of the course was to capture many of the face-to-face benefits of in-person classes in an online class by matching the in-person, face-to-face experience as closely as possible. To accomplish this goal, a Summer 2020 process reengineering course employed the richest media available given budgetary constraints and the limitations of setting up a teaching studio in the basement of a suburban home. The media capabilities are modeled on the "WOW Rooms" at schools such as IE and Georgia State University (IE University, 2020; J. Mack Robinson College of Business, 2020), but with a budget of under $1000.

Lecture Design

The course design employed 4.25 hour long, live lectures on Saturday mornings. (This is the same length and schedule that in-person classes are usually offered. The class duration and schedule was a holdover from the schedule created by the registrar before the course moved online.) Attendance was required for all students. The class sought to replicate the instructor presence of an in-person course. Like in-person classes in this program, copies of lecture slides were available to students before class and the professor speaks extemporaneously rather than from a prepared script.

In most in-person classes, the instructor stands and uses a PowerPoint slideshow to accompany the lecture. The professor does more than simply provide a narration of a slide show. The instructor also monitors the facial reactions and body language of students, using real-time feedback to gauge engagement and whether students are grasping the material. Students answer questions posed by the instructor and can interrupt the lecture with questions and comments.

To replicate this class experience, the instructor stood in front of a green screen, which enabled the professor's body to be superimposed over the lecture slides. Hence, the lecture was delivered similar to how a weatherman presents the weather on television. Most lecture slides were reformatted so that the instructor could stand beside the content rather than blocking it. This enables the instructor to point to images and bullet points on the slide during the lecture, replicating the in-class experience. Instead of writing on a white board with markers, the instructor uses a virtual "whiteboard" and a drawing tablet to write and draw content for the students. Creating lecture content in real-time provides a sense of immediacy. Students can engage directly with the lecture content by contributing the data that is written and drawn by the professor. This live conceptual elaboration is only possible because of the instructor's presence, unlike information presented from a previously prepared lecture slide.

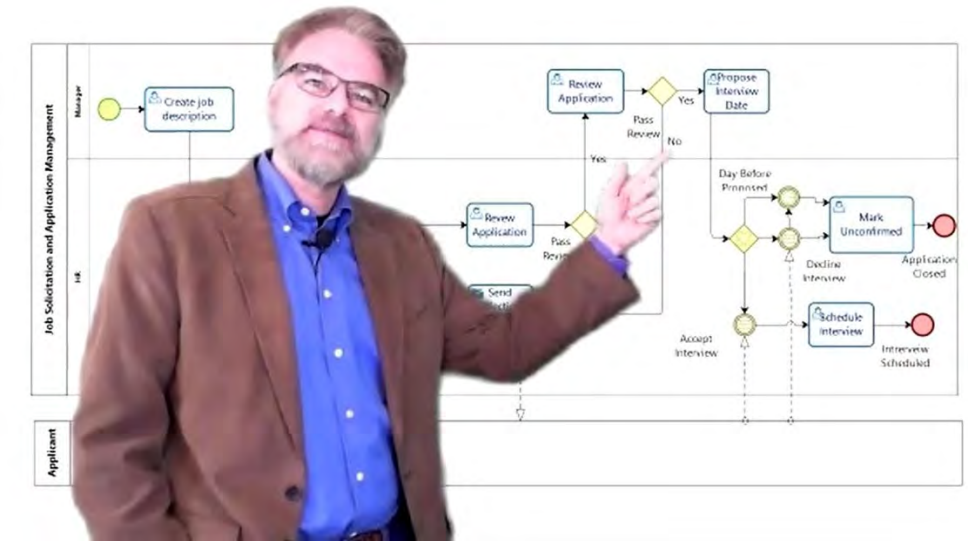

Figure 1. Image of online class lecture.

To monitor student engagement, and so the professor could benefit from the non-verbal feedback from students, all students are required to log in with their webcams on. All of the 41 students webcam streams appear simultaneously on a 50-inch-high-definition monitor, so that the professor could see the entire class at the same time. Students are free to unmute themselves at any time to ask questions, make comments, etc. The chat feature of the online tool is disabled because 1) such a feature would not be used in an in-person class and 2) this communication channel would distract attention away from the richer audio-video medium, likely reducing engagement.

Table 1. Summary of Online Lecture Design.

Component	Description	Pedagogical Benefit
Synchronous Teaching	All students are required to attend each lecture, which is conducted live during a regularly scheduled time	Allows for the real-time interaction and immediate answers to questions, both of which strongly shape learning outcomes
Webcams Required	All students are required to keep their webcams during the class. Images of all students are displayed to instructor concurrently on large monitor	Increases instructor presence by enabling instructor to respond to facial expressions and body language of students Increases social presence of each student, because they can see each other in a window of the Zoom app
Audio Communication	Students make comments and ask questions using computer audio, not typing text chat	Other communication channels would distract attention away from richer audio-visual medium, likely reducing engagement Text chat lacks the interruptibility that is important for learning new material and for student engagement
"Weatherman" Effect	Professor image is superimposed over lecture slides	Increases instructor presence because the instructor is featured alongside the content

		Enables instructor to point to images during instruction, increasing interactivity and increasing engagement
Virtual White Board	Instructor writes and draws images on virtual white board	Increases immediacy because content creation can be interactive, using student-supplied ideas and data, in real-time discussions Using student-supplied information increases interactivity and students' engagement with the content and the instructor It is not pre-created PowerPoint animation, but conceptual elaboration that exists only because of the instructor's presence

Another large monitor allows the instructor to see what is broadcast to the students – the instructor's image superimposed on top of a slide. This keeps instructors on point and also enables instructors to see themselves when gesturing to content on a slide and to make sure that the content is visible to the students. This helps provide a quality control check both for content visibility and for the instructor's interaction with the on-screen content.

Prior to the first class, students received an orientation video link (Dunlap & Lowenthal, 2014). The video explained the format of the class. It also instructed students how to create a Zoom account using their university assigned email address. Email-based Zoom accounts were needed so that students could be sent to pre-assigned breakout rooms for in-class activities in which students would work together in teams.

Figure 2. Screen shots from video introduction.

Video instructions to class explaining the use of green screen and drawing tablet (left) and that one monitor would display the image of professor superimposed over lecture slides and the other monitor would show all students' live webcam videos (right).

Assignments

Historically this course has been a high-touch class, with much instructor-student interaction and significant interaction among the students. It employs an active learning philosophy in which students

interact closely with the material, other students, and with the teacher (Bellanca, 2009; Demirci & Düzenli, 2017). Student-to-student interaction is fostered by team homework assignments, ungraded in-class team activities, and a term-long team project. The project follows an active learning technique employing a term-long group project with multiple milestones and includes in-class student group activities during most class sessions (Dadashzadeh, 2018; Gudigantala, 2013). This type of cooperative learning helps advance student understanding of the material (Ott, Carpenter, Hamilton, & LaCourse, 2018). For the past few years, students have been given an assignment that is due before the first class. The assignment requires students to watch instructional videos and submit a BPMN process model to get credit. The first assignment engages students with the course material prior to the first class.

Students are required to complete a business process modeling assignment on their own. Each student receives detailed, customized feedback. The personalized feedback can maintain instructor presence and a connection with each student throughout the semester (Dunlap & Lowenthal, 2014). The feedback also requires students to revisit the assignment, increasing student-content interaction.

The course is built around an in-depth process reengineering project based on processes that the students use at their jobs. Projects are selected based on the scope and suitability of a process for accomplishing the learning objectives within the 8-week "minimester" term. The first and second class sessions, along with several other sessions, involve breaking students into their teams to complete in-class activities based on the topics of the day. These structured small group collaborations enhance student-to-student engagement (Dunlap & Lowenthal, 2014; Lowenthal, 2009). The nature of the online method requires that breakout rooms be assigned prior to the beginning of a class session. As such, student teams need to be identified prior to the first day of class. Therefore, students were required to post to a discussion forum information about the business processes. The instructor selected the most suitable processes, then assigned students to teams based on those processes prior to the first class. Like the first homework assignment, the discussion post requires thought and engages the student with the course topic before the first class.

The course contains in-class team activities, in which the students apply the lecture content to an ungraded assignment. Students are sent into virtual breakout rooms to perform these assignments. The instructor visits each breakout room to check on the students and answer any questions they may have. The students then return to the main room and discuss the work they did. Teams are required to submit their work, even though they do not receive a grade.

The team project is an in-depth examination and redesign of a process at a real-world company, following active learning principles established by Merrill (2002). The problem solved by students is authentic. The project consists of multiple interim deliverables, applying a scaffolding approach (Demetriou, Spanoudis, & Mouyi, 2011; Paas, 1992) so that students can apply new knowledge to existing knowledge throughout the course. The instructor meets with each team to provide feedback after each deliverable, allowing the demonstration of knowledge and the contextual integration of that knowledge into the project.

Student teams schedule a meeting time from a menu of available times. Even for the previous face-to-face versions of this course, these meetings were conducted over video conference. This remained the same when the class was converted to a 100% online course. This type of project-based learning has been shown to increase student participation, increase understanding of course material, master the skills taught in a class, and increase enthusiasm for self-directed learning (Dadashzadeh, 2018).

Table 2. Summary of Assignments.

Component	Description	Pedagogical Benefit
Homework Assignment Due Before First Lecture	Students learn foundational concepts via prerecorded videos and apply them to an assignment before first class	Builds learner-to-content engagement prior to first lecture
Individual Assignment	Students create a BPMN 2.0 process diagram based on a written description of the process.	Builds learner-to-content engagement. Individualized feedback for each student increases instructor presence.
In-Class Assignments (via pre-assigned groups & breakout rooms)	Students are assigned to breakout rooms to work on ungraded assignments	Enables students to apply lecture content to practical problems, increasing learner-to-content engagement. Increases learner-to-learner engagement by allowing students to work collaboratively Helps students identify gaps in understanding which can be discussed with rest of class and with instructor
Group Homework	Students complete 2 homework assignments as a team	Builds learner-to-learner and learner-to-content engagement
Team Project	Students apply comprehensive knowledge of course topics to solve real-world problem Professor meets with teams multiple times to provide feedback	Builds learner-to-content and learner-to-learner engagement Increases instructor presence, fostering learner-to-instructor engagement

Figure 3 includes screen shots of the prerecorded introductory video with an explanation of the discussion board assignment (left) and the first technical assignment (right), both of which were due before the first class.

Figure 3. Screen shots of explanation of initial assignments.

Instructional Technology

The use of technology was inspired by the state-of-the-art classrooms that allow an instructor to interact with all the students in the class in real-time, despite being in different locations. Instead of a wall of large monitors, one 50" high-definition television was used. It was placed about 2 meters away from the instructor. The video conferencing software used was Zoom, which allows for 49 people to be displayed on a screen at one time. If more than 49 people attend the class, the instructor can scroll through different screens, each of which will display 49 other people. Despite 41 student images (the number of students enrolled) appearing on the screen at the same time with their names accompanying the images, the student images were clear and it is easy to read their facial expressions and body language. The laptop speakers were used to hear students and the instructor spoke into a USB-connected wireless lapel microphone.

JPG images of the lecture slides are uploaded as Zoom background images. During the lecture, they are controlled on the laptop, using the cursor keys to advance background slides. It takes a few minutes to upload the slides. Each one must be uploaded individually, but it only takes 3 clicks of the mouse for each one. Forty or fifty slides can be added in about 10 minutes.

At the time of this case study, a solid colored background was required for the "weatherman effect." Flat lighting provides the best effect. The basement setting used in this pilot has uneven lighting, so photographer's umbrella lights are used to provide appropriate lighting for green screen effects. A cloth green screen hung behind the instructor, although it would not be needed if the room had a single-colored wall and flat lighting. (Advances in Zoom's technology no longer require a green screen or good lighting for the weatherman effect.) A high definition webcam is on a tripod in front of the instructor. The monitor displaying the broadcast image is immediately behind the webcam, so instructors looks directly at the webcam at the same time they see the image broadcast to students.

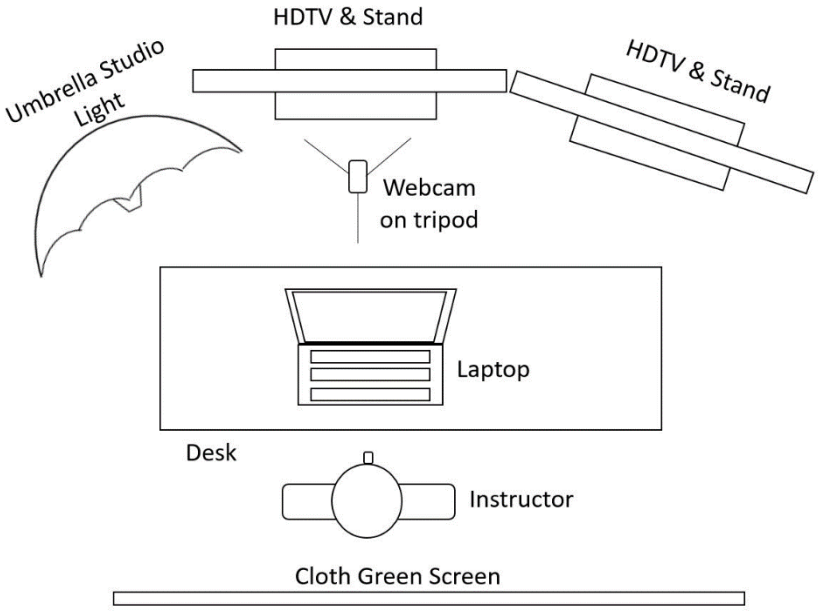

Figure 4. Studio set-up (Located in residential basement).

Zoom sessions were managed using a Dell Latitude with 16GB RAM and a Dell DisplayLink, which allows connecting the laptop to 2 external monitors. The image of the instructor and slides appeared on one external monitor. The faces of all the students were on the other external monitor.

The Zoom audio and video controls, which include which background image is displayed, appeared on the laptop screen. The laptop and DisplayLink were issued by the College for general job duties. Excluding the laptop and DisplayLink, the total budget for the online studio was under $1000.

Table 3. Teaching Studio Components and Actual Price Paid.

Teaching Studio Component		Price Paid
	Sceptre 50" 4K UHD LED TV	199.99
	Sceptre 50" 4K UHD LED TV	199.99
	Kanto MTM65PL Mobile TV Stand	129.99
	Kanto MTM65PL Mobile TV Stand	129.99
	Linco Photo Video Studio Light Kit AM169 (Includes Green Screen)	119.99
	Wacom Drawing Tablet	79.99
	Microsoft 1080p LifeCam	52.95
	Fifine K031 Wireless Lavalier Microphone with USB Receiver	39.99
	Amazon Basics 6-Outlet, 6' Surge Protector Power Strip	10.99
	Coleman Cale 7' Indoor Extension Cord	4.95
	Amazon Basics 4K HDMI Cable	14.99
	Amazon Basics 4K HDMI Cable	14.99
Total Cost		998.80

Data Collections & Results

The class was taught during Summer 2020. Prior to this class, the students had completed 30 hours of master-level instruction, most of which were taught face-to-face in a lecture hall. This previous experience informed students' expectations for face-to-face classes. At the end of the term, students were asked to complete a survey with 5 Likert-type questions and two open answer questions based on the teaching method used in the course. Participation was completely voluntary. One student did not participate. The 5 Likert-type questions were based on a 5-point scale: much less, less, same, more, much more. The instructions were as follows:

The Likert-type questions were converted to numeric scores with 1 representing "much less," 3 representing "same," and 5 representing "much more." The objective was to achieve a 3 ("same") rating.

Table 4. Student Evaluations of Class Format.

Item	Mean	Stnd Dev
Compared to my expectations of a face-to-face class, the ability to interact with the professor in this online class was	3.3	0.74
Compared to my expectations of a face-to-face class, ability to interact with classmates during class time was	2.7	0.76
Compared to my expectations of a face-to-face class, this class engaged my attention	3.6	0.90
Compared to my expectations of a face-to-face class, quality of interaction between students and professor in this online class was	3.2	0.95

Compared to my expectations of a face-to-face class, quality of interaction between myself and classmates was	2.9	0.89

This lecture style increases student-instructor interaction and student engagement. The survey results indicate that students found both the ability to interact with the instructor and the quality of that interaction to be superior to those they expect to have in face-to-face course. This result is surprising, especially given that the students took this course at the end of their master's program, after taking in-person classes from top professors. Table 4 lists qualitative feedback students provided about these interactions based on responses to what the students liked most about the class.

Table 5. Student Feedback about Student-Instructor Interactions.

The interactivity and the flow of the class. Along with that the practical examples of the topic in hand combined with the in-class exercises.
This class was almost similar to in-class experience. I really appreciate the efforts of the professor to make this class as interactive as possible.
Even though the class was online, there was full engagement by the students and professor. The class required webcam to be on, so it was not dull. There was a lot of interaction.
The webcam and green screen setup by the professor was really helpful and I appreciate this a lot which made this class much more interesting.
I really liked the way Professor arranged this online class in a very effective way, that no student misses anything and able to gauge everything.
Professor presents the material in a way that is easy to follow and understand the material

The biggest surprise is that student engagement was perceived as superior to in-person instruction. Given the substantial number of studies that find student engagement is less in online classes, the goal was to approximate a 3.0 score (i.e. "same" rating). Table 5 lists student feedback about students' engagement with the course, its material, and the instructor.

Table 6. Feedback about Student Engagement.

Professor is highly professional. He has a the ppt in background and is very successful in engaging the students. One of the best experiences and best class attended.
I liked the fact that even though this class was 100% online the professor asked questions to students and made sure everyone was attentive
You tried to imitate a classroom setting with the virtual background and seeing us as well, it made me personally more engaged to see that you wanted to deliver the best you could for us.
The slides as background during the lectures and the professor standing in front. It helped with staying focused rather than just looking at a slide and hearing a professor talk without seeing them.
Updates every week with the professor kept me engage within the class.

The ability for students to interact with each other and the quality of those interactions approximated, but did not match the expectations students had for face-to-face classes. The ability interact scored a 2.7 and the quality of student-student interactions scored a 2.9, respectively representing 90% and 96.7% of what they expect from in-person classes. Four students wrote that "the thing I liked most" was the group work in the breakout rooms and another indicated that the best part of the method was "webcams and class participation." Table 6 indicates longer statements

provided by students regarding student-student interaction. Most of these comments provide constructive criticism.

Table 7. Feedback about Student-Student Interactions.

It was the best online class I took here in [this university]. Especially the way we got to interact with our teams in the breakout rooms was something I enjoyed the most.
I would like the class to have class interaction and collaboration between the students.
The difficulty in working with groups online with Bizagi [the BPMN diagramming software used in the class] as one person has the program open and others have to point or state where to move a task or delete etc. When the process is complicated it can be difficult for everyone to know what area or task someone is talking about.
Have more dialogue between the students to create more in depth conversation about other experiences.
More Class discussions with professor and other students, interactive group discussions.

Discussions and Lessons

The course delivery method piloted in this process reengineering course exceeded to the goal of matching the engagement and instructor-student interactions that students expect from in-person classes. While surprising, the data suggest that low-cost online teaching tools can translate into successful student experiences with online courses. This is very important given the likely increase in online teaching in the next few years. The overall goal of this pilot was to explore the research question: how can the face-to-face benefits of in-person classes be captured while teaching an online class? The results are encouraging, but this course approximated, but did not equal or exceed the expectations students have for student-student interactions.

In-Class Collaboration Lessons

Most of the classes featured group work in which teams would spend 30-60 minutes working on a challenging, ungraded assignment. During this time, the instructor visits the different breakout rooms to answer any questions and provide advice. The purpose of these in-class activities has always been for students to engage in active learning by applying lecture concepts to real-world problems during class, so that they can realize what they do not understand. They can work with each other to gain an understanding, or raise their questions with the professor. Given that active learning group work takes longer when online than during in-person classes (de Oliveira Dias, Lopes, & Teles, 2020; Venton & Pompano, 2021), at least half an hour is needed in order for the professor to visit all the rooms, even just for a few minutes each. Longer breakout sessions provide more opportunity for interaction with other students and with the professor.

The in-class group work serves to build mastery of concepts and material. At the same time, it is an opportunity for students to interact with each other. This online teaching method approximates the experience of the classroom, but it does not equal or exceed it. Students rate the ability to interact with each other as 2.7, which is 90% of what they expect in an in-person classroom. They rate the quality of those interactions as 2.9, which is 96.7% of what they expect from in person interactions. This data suggests that in an online class, some of the in-class group work should be redesigned to bolster student-student relationships and the quality of the interactions they have with each other. The current activities were designed with a general active learning approach (i.e. "dynamic type of learning where students intensely interact with each other, with educational materials, and with

teachers" (Demirci, 2017)). Student-student interactions may be bolstered by employing specific active learning tools, rather than the current, more general approach.

While this online teaching method engages students in small group discussions, the student-student interactions may be improved by employing a think-pair-share (TPS) approach, in which students work individually before solving the problem as a group, then present the group's work to the class (McTighe & Lyman Jr, 1988). Beginning group activities with individual contemplation could prepare each student for more active engagement in the group discussion, and potentially provide more discussion and debate. This could increase the quality of the interactions and also improve the ability to interact for students who prefer to take time to think before they speak. While TPS is frequently applied to short activities, it can be effective for longer, more detailed activities (Demirci & Düzenli, 2017).

Instead of verbally asking students volunteers to speak their thoughts about various topics, "minute papers" could be adapted from the traditional use as an end-of-session reflection and feedback tool (Wilson, 1986) to a source of class discussion and participation (Holtzman, 2007). This would provide students a moment for reflection. The professor could then share and discuss a few of the minute paper responses. This would enable the students to engage more with their classmates' ideas, and enable them to respond to classmates' ideas, rather than be spectators as one student publicly discusses an idea with the instructor.

Technical Lessons

Students were required to log in to Zoom using an account created using their university email address. There were two reasons for this policy. First, Zoom allows meeting hosts to preassign breakout rooms by uploading the email address of those assigned to each room. It is easy and convenient; however, it requires that meeting participants log in using an account associated with the email address specified in the breakout room assignments. Second, it makes sure that people log in using their names, not the name of a child or spouse who might share the computer. Seeing people's faces and names on a monitor is similar to seeing students in a classroom with name placards at their desks. It helps the instructor and students match faces to names and learn who everyone is. Despite the instructions, each week some students entered the Zoom meeting without first logging in. This requires class time to manually assign them to breakout rooms.

For this course, PowerPoint slides were converted to jpg files. A small percentage of the slides spanned the whole image. Most slides repositioned material so that it was on one side of the image and covered less than two-thirds of the image from left to right. That way the instructor's image could be superimposed over the content without blocking it from view. Most of the slides contain large images and bold text written in a large font. Some slides, such as those depicting value stream maps or BPMN process diagrams, contain easy-to-view diagrams but small text. While Zoom generally does a good job delivering high-quality video images, small text may not reach participants clearly. Such images may need alterations to make the text larger so that it will be legible to the students. Also, if the internet speed drops to slow speeds, the background images lose focus and can become blurry. Care should be taken to make sure jpg versions of slides and other content use large text and large, sometimes simplified images.

Additional lessons can be learned from other research into the use of Zoom for teaching online courses. A key lesson is that technology is a medium for teaching. Too much focus on the video conferencing application will lead to poor results. Some teaching experiments using Zoom were unsuccessful because they focused on the instructional technology rather than on the user experience (Stafford, 2020). The high-presence online teaching method detailed in this case study takes a holistic approach that rethinks lecture design and carefully constructs assignments. Technology is a key

component, but in the high presence online teaching method, pedagogy and class design drove the choice of technology, not vice versa. Some teachers moved classes online with an a priori belief that an in-person classroom experience cannot be reproduced when delivered over communication software (de Oliveira Dias et al., 2020). Conversely, the method used for this course was created with the hope that a theory-based approach to course design could approximate the in-person experience.

Some studies that employed Zoom find that synchronous online class delivery can face many technical problems, such as those that result from limited broadband internet access among students (de Oliveira Dias et al., 2020) and the reality that many students may not have computers and other necessary equipment (C. K. S. Singh et al., 2020). Additionally, remote students can refuse to turn on their cameras, limiting the instructor-student and student-student interaction (Stafford, 2020). In the extreme, students can simply not attend online classes, although this can be addressed by requiring attendance as part of an overall grade, at least at the university level (de Oliveira Dias et al., 2020). While attendance, webcam use, and internet connectivity were not significant problems in this case study, this course was at the master level taught at an urban university. It is possible that enforcing webcam use may be more difficult in a secondary education environment. Courses with a base of rural students or schools located outside of major metropolitan areas with good broadband infrastructure may face technical difficulties using this high-presence online teaching method because it will be difficult for all students to transmit good quality video and audio. While all students in the course presented in this case study had laptops as a condition of enrollment, many universities, secondary, and primary schools may have students lacking the equipment needed to implement this teaching method.

General Lessons

The in-person class historically has been held during the same Saturday 8:00 AM - 12:15 PM time slot. This course customarily provides a break about halfway through the class. Several students recommend offering two breaks, providing reasons listed in Table 7.

Table 8. Feedback about Class Time Management.

If professor give us 2 breaks during the whole class it will be better.
The class was 4 hour long. It is a little difficult to sit in front of screen for so long even with breaks. I would like a little bit more break or may be divide into 2 sessions.
Maybe one more short break, having only one break after hours when I had my coffee before class didn't feel good always.
I think students need more breaks. They don't need to be long, but one 15 minute break for a 4 hour class is simply not enough. I had to get up to go to the bathroom a couple of times and felt my participation grade might have been impacted.

When offered in-person, the single break is usually about 15 minutes long, however, if students need to use the restroom or answer an important phone call, they can quietly excuse themselves from class for a moment. The webcam-on format seems to discourage similar behavior in the online format. Perhaps a simple announcement at the beginning of the term can alleviate such concerns.

One out of the 40 responding students (out of 41 students overall) indicated that they would have preferred the option to attend without using their webcam. That compares to 4 students who expressed that the use of webcams by the whole class was what they most liked about the class. The benefit students get from seeing other students – and the benefit the instructor gets by being able to

see student reactions and look at students when they ask questions or participate in discussions – seems to outweigh reservations about requiring webcam use.

Implications and Limitations

The high presence online teaching method discussed in this case study can be applied to many different classes. The method is straight forward, with the lecture design, an assignment design that engages students before the start of the course, and engages them throughout the term through group work and in-class activities. While the subject matter was a highly-technical STEM subject within a master's program, it should easily adapt to discussion-based courses within arts and humanities. The method provides a pedagogical and technical foundation that can be adapted based on the subject matter and the audience.

At the same time, the results of this case study should be considered within the context of its limitations. The sample size (n=40) represented a response rate of 97.6%; however, the results may differ for very small or very large classes. Additionally, the pandemic-era context during which the course was moved to an online format, should also be taken into account when considering the results of this case. In this case, the course was required to graduate and offered only in the online format. Students who choose a class using this method when given the option between online and in-person sections of the same class may not have the same response.

The 4.25 hour-long classes were consistent with the regular class length in this degree program. The high-presence online teaching method does not advocate for a particular length of class, but rather suggests adopting the schedule of the program in which a class is taught. This case study details a course taught in a university setting. Undergraduate and master students usually have autonomy and high levels of self-direction. Students meeting with groups in breakout rooms could be relied upon to work on assignments without direct or continuous supervision within the breakout room. Secondary students may have less self-direction and have developed less academic autonomy, which may make this online teaching method more suitable for Honors and AP courses than for all subjects in secondary education. While requiring students to complete an assignment before the first class is plausible in a university setting, there may be difficulties with such a requirement in a secondary education environment.

Conclusions

This case study reports the test of a high-presence, high engagement online teaching method piloted in a master-level process reengineering course. The goal was to capture many of the face-to-face benefits of in-person classes. The course design and instructional technology employed focus on providing interactive immediacy and fostering strong instructor presence. Combined, these contribute to student engagement, which is the most critical factor for student learning and satisfaction with online courses (Martin & Bolliger, 2018; A. Singh et al., 2019). A survey of students reports that the method provides superior student-instructor interaction and overall engagement than they expect from in-person classes and that the method approximates the quality of interactions that they expect to have with their classmates in an in-person setting.

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