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Using the SWIVL for Effective HyFlex Instruction: Best Practices, Challenges, and Opportunities

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Using the Swivl for Effective Hybrid Instruction: Best Practices, Challenges, and Opportunities

Abstract

Classroom technology and increased student comfort with video instruction through streaming services such as YouTube have created opportunities for enhanced learning in both face-to-face and remote contexts. Working professionals encounter travel and distance-related obstacles that limit access to universities. However, digital technology and distance learning practices lower barriers to education by allowing those who were physically or financially limited to participate. This transition is not automatic—not all degree programs are available online, and some convert more easily to online modalities than others. This paper reports on selected effective approaches for responding to the unplanned pivot from in-person learning to a hybrid/Hyflex learning delivery mode, in the context of a largely residential institution.

Our institution's immediate response to Covid-19 at The Citadel was to move all instruction online. Many universities found this approach to be sub-optimal. Recently, some schools, including The Citadel, opted for a Hyflex (Hybrid-Flexible) teaching model for the Fall 2020 return. The Hyflex model ensured that some of the students were in the classroom receiving the instruction in the traditional face-to-face mode (wearing masks and socially distanced), while others livestreamed the lesson and could participate in the lecture through Zoom, depending on their accommodation needs. Unlike purely face-to-face traditional teaching or fully online education, the Hyflex method uses both traditional lecture methods and electronic media to communicate course content to those unable to attend in person.

Lecture capture devices are crucial to supporting Hyflex models of instruction. While The Citadel had built out lecture capture classrooms in previous years, scaling these capabilities up under limited time constraints during the rapid shift to online learning was cost-prohibitive. While some universities opted to keep faculty remote, The Citadel reached for a solution that would accommodate all faculty and student needs. Balancing time constraints and existing facility capacity, The Citadel researched and chose to employ the system known as the Swivl (Apple), a robotic lecture capture device that tracks the presenter and facilitates livestreamed interactions with students online. At The Citadel, lessons could also be recorded and posted to the Learning Management Systems (LMS) for students in quarantine or those experiencing poor internet reception during class times.

This paper examines some of the best practices and challenges of using the Swivl system for Hyflex delivery of instruction in engineering courses and the success for faculty and students using this technology. Video recordings and delivery mode are tools in the instructional toolbox, just like lectures. Faculty members who are not experts in remote/online instruction may require periodic developmental training to ensure course quality. Instructors need and want to create a course in the preferred mode of face-to-face delivery but know that the current chaos will require all stakeholders to adapt to fully remote learning (synchronous or asynchronous) when required (pandemic or extreme weather event, etc.).

Background: Hyflex Model with Swivl

With the abrupt movement to the remote learning mode, most of our faculty who had not taught remotely experienced confusion when asked to implement the Swivl immediately. Some searched for ways to connect with their students that would support their new ways of teaching.

A corporate-level Zoom (https://Zoom.us/) package was quickly purchased by The Citadel and made available to all faculty to use to connect and teach their students, as well as pair with the Swivl robot. Of course, there were faculty who resisted the quick adoption of Zoom and opted instead to simply post their class notes on our LMS, or emailed lecture notes to their students, while other faculty pre-recorded their lessons using their phone or personal iPad and posted the recordings to the LMS. Zoom-streamed classes allowed for two accommodations: (1) lecture recording for future access by both instructors and students; (2) live interaction between online students and in-person students, as well as the instructor.

Auxiliary technology was also adopted within the School of Engineering at The Citadel. Engineering faculty quickly located USB-connected mini-document cameras that capture simple pen and paper content and employed them during virtual office hours. Pen tablets allowed for drawing figures on the Zoom whiteboard, and headsets were also employed to improve the quality of audio communication. At The Citadel, the engineering leadership decided on a minimum technology standard that faculty needed to provide, as all believed at that time that campus closures would be short-lived. The minimum standard adopted was a copy of the lesson or board notes that would normally be put on whiteboards, Powerpoint slides normally used in class, and a voice recording for each section of content placed on the board or when presenting the Powerpoint slide. With a proper file-naming structure, students could listen to the faculty and review the notes and Powerpoint slides that aligned with each lesson. Only a few faculty members decided to do the minimum—most began using the USB mini-document cameras or USB pen tablets with Zoom to record a lesson while live streaming or providing voice-over-PowerPoint for their lesson. In many cases, because there was a nation-wide shortage of webcams, many faculty members used the document camera as the webcam when not using it as a document camera.

The Citadel's Center for Excellence and Innovation in Teaching, Learning, and Distance Education (CEITL&DE) had been working with Swivl technology for online education. After several professors from many different majors known for quality teaching tested the Swivl-iPad pairing while using Zoom in a number of varying classroom and office scenarios, The Citadel decided in late June to purchase a Swivl for each classroom and selected labs, as well as an iPad for each faculty member. The Citadel also transitioned to a new LMS and integrated Zoom into the LMS for easy of scheduling and cloud recording.

Transitioning to Hyflex and Online Learning

The rapid pivot to online learning created some growing pains for both faculty and students, but more importantly, neither group was prepared for remote learning. As early as June 2020, it was clear that training was needed prior to the Fall 2020 semester for both faculty and students regarding what constitutes quality online learning, in the event that no face-to-face instruction

were possible. The Citadel's CEITL&DE initially put together one required module for all faculty and three additional modules for all faculty who might be teaching remotely due to pre-existing conditions (Table 1) or if all courses had to be taught remotely. More training modules have been developed as areas of instructional improvement were highlighted. Table 1 details the trainings that were created for selected faculty groups.

Table 1: Remote Learning Faculty Training

Type of Training	**What Faculty**
Live Streaming (Canvas/Zoom/Swivl)	Required training for all faculty teaching on-campus/face-to-face
Canvas Fundamentals-QOT #1	Required training for all faculty
Best Practices in Teaching Online-QOT #2	Required training for all faculty teaching online
Curriculum Mapping, Alignment, and Parity-QOT #3	Required training for all faculty teaching online
Best Practices in Assessments (Grading)-QOT #4	Required training for all faculty
Zoom Hosted Training	Optional training for all faculty
Respondus Monitor LockDown Browser Training	Required if you plan to use online proctored exams or quizzes
Evaluating Online Teaching	Department Heads

In July 2020, as faculty completed online training modules through the LMS using Zoom, the decision was made that barring an order from the Governor or President of The United States, The Citadel would return students and faculty to campus for the fall semester. Clearly, face-to-face instruction would need to be with masks (possibly shields and gloves as well; later determined neither required, mask or face shield, and no gloves if frequently use hand sanitizer and alcohol wipes for classroom technology between users), students at least six feet apart, and classrooms would need regular sanitizing. Multiple masks were purchased to be issued to each student as they arrived on campus for the first lesson, sanitizing hand wipes were placed in each room for students to wipe down the desk surfaces prior to unpacking learning materials, and hand sanitizer was placed in each room to be used after wiping down desks. Door handles were sanitized multiple times daily and rooms each night (atomizer) or faculty could use the one shared on each floor of each building as desired (15-20 minute drying time). Protocols were all supported by random testing of portions of each set of dorms on campus.

Class size and room allocations were also a challenge. The registrar determined which class sections would need to split into two or more sub-sections as not all students could fit given the six-foot separation requirement nor were there enough large rooms to move the larger sections to. Based on the technology purchased (Swivl, iPad for each faculty member) faculty would be required to teach to students face-to-face, synchronous on Zoom, and to record the lesson and post to the LMS for asynchronous students (moving to quarantine, too sick to attend synchronously, etc.). Most large sections were split into two or three sub-sections with each

alternating face-to-face (or every third lesson) and Zoom synchronous instruction throughout the semester. With 21.2 percent of lessons fully online sections and about 33 percent of courses being able to meet face-to-face while socially distanced, the rest alternated face-to-face each lesson (45.8 percent). However, there was a larger proportion of engineering courses that needed to alternate their instruction face-to-face and synchronously through Zoom because of the recent growth in the number of engineering students resulting in most sections near capacity (63 percent).

Faculty and students with pre-existing conditions would request through the Provost or Human Resources for an accommodation to teach or receive their course work remotely. For students residing in rural areas, WiFi connections were sometimes challenging to maintain. Also, faculty who chose to request accommodation to teach fully online were required to complete all four developed online training modules and ensure their course met at least 85% of the Quality Matters rubric requirements by the end of the fall semester and prior to the start of the spring semester to ensure faculty performed well and students received quality learning and engagement.

As the Swivls and iPads were distributed, additional training modules assisted faculty to ensure their iPad had the right settings for use with the Swivl and faculty practiced using the Swivl to stream and record lessons. Each program recognized a couple of faculty who used the Swivl in a summer course to "walk the hallways" during the first two days of classes to assist faculty in walking through the provided step-by-step procedure to stream and record their lesson.

The School of Engineering had two faculty who taught using the technology in summer 2020 to provide training during an all-hands-on-deck meeting prior to the start of the semester (Swivl and editing recorded lessons). A discussion ensued on the use of other technology such as the pen tablet, the mini-document camera, etc. as methods for enhancing the instruction versus using only voice over Powerpoint if we must return to fully online. However, the largest discussion was on the use of the Swivl to allow normal whiteboard presentation of content, questioning of students face-to-face or synchronously on Zoom, use of color markers on the boards, verbal communication while wearing a mask, and the need to repeat student questions and answers to ensure the marker/microphone around neck captured clearly the student questions and responses.

There were a number of hiccups in the first few days, but most faculty and students fell into a rhythm and most students were where they needed to be (in person or on Zoom), emailed faculty to ensure the lesson was being recorded if they could not be at least synchronous, and all content exchange to include HW and project submissions was through the LMS. The result of this rapid shift to embracing shared standards is that many School of Engineering faculty who taught fully online during Fall 2020 have achieved 95-100% compliance with the Quality Matters online review rubric, securing institutional approval for their online course to be taught in the future, if needed.

Administration – Opportunities for growth and Continuity of Instruction

While leading articles on higher education focused on many strategies that were not effective for remote instruction, The Citadel was fortunate to enjoy key early successes thanks to faculty

perseverance. During Spring and Summer 2020 semesters, faculty prevented technological issues from impacting grades and mitigated student connection issues through the use of loaned computers and planned hot-spots, etc. The Citadel also created an option for students to request pass-fail-only grade reporting after students viewed their grades going into finals. As a result, the average course grades were only slightly down from the previous spring. The biggest issue was the disappointment of students who craved the face-to-face engagement of college. The Citadel decided in May 2020 to set the conditions for students to return to campus for face-to-face instruction and the residential model The Citadel is known for.

With technology protocols established and a shared vision for quality online instruction in place, the administration's focus shifted to mitigating potential Covid-19 spikes. Making decisions early and committing to a shared plan would prove critical to our shared successes. Discussions among leadership evaluated the viability of a fall break and a risk assessment of students returning after a fall break. Of course, no one knew for certain which Covid-19 restrictions would be needed for Fall 2020, but with social distancing, enforced mask-wearing on campus except in offices with four walls, dorm rooms (roommates only), showers, and running outside, The Citadel sought a method to allow for simultaneous teaching face-to-face, synchronous learning for those available, and asynchronous learning options for those quarantined or not available for the other two modes. This decision was based on the need to get as many students as possible into face-to-face education knowing that current classrooms could only support half the normal load while socially distanced. The administration decided in early July 2020 to start the semester a week early and send students home for the fall (Thanksgiving) break to complete semester finals online. The success of limited Covid-19 spikes, with the exception of unauthorized off-campus parties, led to an early fall decision to cancel spring break and start one week later, since no vaccine would be employed with enough coverage prior to the spring semester to ensure reasonable campus safety if there were a spring break.

The pandemic has also strengthened the existing Continuity of Instruction (COI) plan, already made robust as part of the regional accrediting body, the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC). Our initial COI plan included language ensuring instruction in the event of extreme weather events, but did not detail its implementation, or how instruction would be accomplished. At The Citadel, almost every year the fall semester is disrupted with a hurricane or early evacuation for a possible hurricane that ultimately often misses our area. The Citadel's integration of Zoom into the LMS, the purchase of Swivl for each classroom and most labs, and iPads for each faculty member have impacted future hurricane planning. The turmoil that this pandemic caused to traditional teaching and learning has resulted in faculty acquiring new skills and technology that will help them solve other problems, such as hurricane evacuations. The turmoil also required more standardized and rigorous expectations of students as well. The Citadel adopted standard language that all syllabi must contain for the fall. Some of the requirements outlined specific equipment such as a webcam, reliable wifi if off campus, scanning (possibly with a smartphone), and masks on campus. Syllabi also contained expectations of students to include webcam on if attending class, appropriately dressed, awake, etc.

Now, our COI plan allots 2 days for evacuation and then resumption of all learning through remote methods. If evacuation occurs on a weekend, then the academic calendar stays the same. If it occurs during the week, remote learning on the weekend will be implemented to return the schedule to the proper flow upon return. The return-to-campus protocol mirrors this approach if it does not occur on a weekend, which would be most desirable. In fact, a few faculty members who had scheduled surgeries in the spring/fall that were pandemic-postponed recorded lessons during the fall semester break without masks (classrooms sanitized and no students around) for use during recovery time in a fully remote mode. A number of faculty have recorded labs without students present last spring and this fall using Swivl for fully online labs.

Developing online teaching and learning skills has scaled up course development opportunities for faculty and departments across the School of Engineering. Many faculty were not comfortable with this modality and did not desire to spend the time converting courses. With almost half of spring courses and many fall courses in some form of conversion, and many faculty forced to teach remotely, the learning curve and requirements suddenly did not appear so daunting. In fact, across the campus at The Citadel there is much discussion and broad agreement that faculty are prepared to deliver at least one lesson taught remotely. Similarly, each student must take each year one course fully online – all of which serve to improve the skills of both faculty and students to teach and learn remotely.

Swivl Technology

Prior to the pandemic, there was already a great deal of scholarship dedicated to the appropriate use of classroom technology to enhance the effectiveness of teaching and learning [1-4]. Due to the unplanned conversion to remote learning in education that began in earnest in March 2020, creating flexible, adaptable, and successful instruction is a concern and priority for faculty and administration alike [5]. Preparing for face-to-face, synchronous, and asynchronous instruction and learning in a single course that has students possibly using both in-person and online options during a single semester presents a unique challenge for an instructor's time management and capabilities [6]. Instructor's success in course delivery is in direct relation to their mastery of the delivery technology.

Because of its ability to capture the nuances of human behavior so well Swivl+iPAD technology has been employed in teacher training practicums and medical practicums for just under a decade [4, 7-8], and the technology has been identified as key to lowering barriers to education, particularly in geographically remote or rural regions [5-6]. In the classroom, the Swivl robotic mount sits on a tripod or desk and, using a smart device, tracks and records the person holding the marker, a remote-control device, automatically [9]. The Swivl offers a holistic response to the need of preparing for many delivery options within one integrated system. Classroom setup is easy for most instructors, and they can start/stop recording and upload recordings to their LMS for asynchronous students. Faculty can hear and see remote students during the class while also employing recorded instruction for those who missed class or for future remote/online offerings. This allows the instructor to use the traditional lecture format, transmitting information from one to many, while mitigating the 'disconnecting' of the physical classroom, student, and teacher.

Capturing both teacher and student interactions and reactions, studies on Swivl's impact on pedagogy reveal that early-career educators as well more established instructors both benefit from using Swivl in the classroom [4]. Because the Swivl follows and captures the instructor throughout the classroom, the resulting video can be used to facilitate self-reflection and training, just as athletes and coaches watch videos of themselves [2, 10]. Wearing masks obviously complicates interaction over Swivl, though this can be mitigated by the increased salience of the visual cues that remain: eye contact, facial expression, gesture. Additionally, some faculty can opt to wear face shields while teaching.

Prompting self-reflection, the same reasons that make the Swivl so effective can also make it uncomfortable to use. Studies report an increased self-awareness and self-consciousness on the part of instructors who rewatch their lecture captures [2, 6]. At the same time, teachers acknowledge that Swivl lecture capture has prompted important changes to the way they teach, which would have never happened without rewatching lecture capture videos.

Evaluation and assessment are also impacted by Swivl technology. Lecture capture through Swivl can facilitate remote observations of instructors without the classroom disruption of a guest physically joining the class [7]. Instructors reported that remote observation through Swivl also seemed less confrontational than in-person teaching observations [3].

Evidence also suggests that when implemented correctly, students also come to prefer Hyflex teaching modalities over time, recognizing a quickened pace to their learning [5]. Hyflex teaching produces the most knowledge gains when (1) lectures and slides are posted prior to class, (facilitating before-class learning); (2) synchronous class time is spent doing discussion and solving problems that extend the before-class material; (3) students are given after-class assignments or experiments that prompt global knowledge connection and personal reflection, resulting in long-term memory formation [5, 11]. Hyflex models were already being praised within pedagogical research as the new normal prior to the Covid pandemic, as Hyflex approaches offer advantages to student learning and retention that are not available in traditional teacher-centered classrooms [12].

To capture student and faculty perceptions of Hyflex/hybrid learning, as well as invite them to freely reflect on their experiences with all forms of course delivery they have experienced, a survey was developed for both students and faculty. The following guiding questions shaped construction of the surveys:

(1) How effective is the SWIVL as a mode of course delivery compared to other formats?

(2) How can The Citadel best react to unplanned future course delivery shifts?

Survey data from students

After employing the Swivl and teaching in Hyflex modality, the authors wanted to measure its effectiveness. The fall semester schedule allowed the last lecture to occur before Thanksgiving, and all final exams were administered remotely starting in December. In mid-November, a preliminary survey was given to over 87 engineering students representing all four undergraduate

years. Students were not required to complete the survey, nor were they incentivized, however students at The Citadel are accustomed to providing feedback and commentary to instructors in the School of Engineering. The survey items detailed in Table 2 were approved under IRB protocol 1920-24b at The Citadel. The survey asked them to rate the effectiveness of different instructional delivery methods, using face-to-face instruction (pre-Covid) as the baseline (100% effective) and the other methods as a percentage from 0 → 125%. See Table 1. Included in the comparison were other modes of instruction that the students experienced during the spring term.

Table 2. Student and Faculty Assessment of Teaching Modalities

Modality	**Face to Face**	**Remote, synchronous (live instruction)**	**Remote, asynchronous (pre-recorded instruction)**	**Swivl – Hyflex (part face to face, part livestream)**	**Voice over Power point**	**Other?**
Effectiveness Fall – wk 13 (Student)	100%	74.88 n=87	62.17	79.70	54.80	68 n=5
Effectiveness Fall – complete (Student)	100%	71.30 n=119	57.75	76.61	46.42	27.50 n=12
Faculty	100%	77.5 n=12	68.75	82.92	63.64	60 n=1

In this survey, there were free text responses to determine what they liked the least or most about the Swivl. The responses to this survey established a baseline before they completed the semester and did not yet have their final grades. The free text responses also informed more direct survey questions for a follow-on survey when they returned in the spring.

The second survey was given early in the spring semester (n=119). Both students and instructors were asked to compare and evaluate instructional modes. Ratings on modality effectiveness from the student perspective before and after final exams and grades are given in Table 3. From both surveys, quantitative data emerged concerning the perceived effectiveness of the Swivl-Hyflex mode compared to the others. Of note is that 'Other' forms of instructional delivery had small sample sizes in both surveys (5 and 12, respectively) with no comments on what the other delivery modes were. In both the fall and early spring surveys, students found the Swivl-Hyflex modality the most effective, about 5 points higher than remote synchronous. Any of the asynchronous modes (remote or voice-over-PowerPoint) were deemed to be substantially inferior. Student and faculty perceptions on the efficacy of synchronous, asynchronous, and Hyflex teaching modalities largely match, however a perception mismatch arises in evaluating voice-over-Powerpoint delivery. Faculty overestimate voice-over Powerpoint's effectiveness, while students rate it as 46-54% as effective as face-to-face instruction.

Additional questions on the early spring survey revealed three main categories concerning the Swivl: instructor interaction, distractions, and recording availability. Multiple questions were used to draw on these broader groupings. A standard 5-point Likert scale was used to assess their level of disagreement (1) to agreement (5). Questions not highlighted in this data gaged their grade expectation, stress level, location of livestreaming, and variety of distractors.

The first category, instructor interaction, revealed the desire of students wanting to interact and see their instructors, Figure 1. Students were asked how important it was to see their instructors every lesson, their comfort with a smaller sized in-person class due to social distancing, and their comfort with a remote learning environment. It was important that they had the opportunity whether it be in person or livestream (rating = 4.01). With pre-Covid class sizes of 20-24 students, reducing them in half for classroom protocol during the fall had very little impact on their level of comfort. They found the half-filled sections during face-to-face instruction as comfortable (3.3) as a full classroom. The corollary for when they livestreamed on alternate days revealed they were also comfortable (2.73) with remote instruction as long as they could see and interact with the instructor. The last question in this category showed that students generally

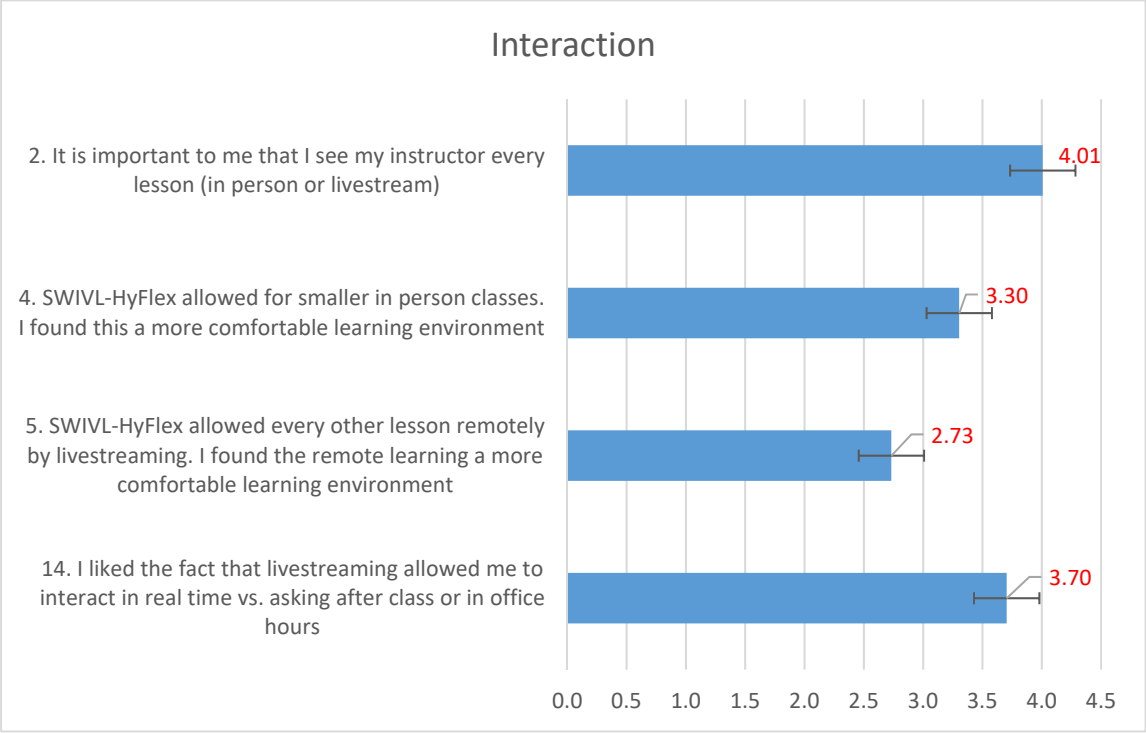

Figure 1: Interaction with Instructor

agreed (3.70) that they liked that livestreaming allowed them to ask questions and interact immediately, rather than seeking the instructor after class or during office hours. Although instructors and students in the classrooms wore masks, capturing reactions of both took deliberate effort. Instructors were instructed to pay more attention to students' eyes since the mouths were covered. Some instructors even exaggerated some expressions to make a point, knowing that the masks would shield some of the reaction. Over time, many students became

more comfortable asking questions even when livestreaming and instructors learned voices if they could not see them on the screen.

Additionally, students were instructed through The Citadel of proper places to livestream (dorm rooms, library, and empty classrooms) and unacceptable places (athletic team rooms, outside of a building). Three questions in this category assessed their ability to overcome the distractions at different points in the semester, first few weeks, midterm, and end of term. Students generally agreed they overcame the distractions and focused on the lesson while livestreaming with progression as the semester transpired. They rated themselves at 3.71, 3.80, and 3.83, respectively at these points. Students adjusted their behavior when livestreaming to meet the additional challenges of livestreaming. Students disagreed (2.22) that they could never overcome the distractions or temptations from not being face-to-face in the classroom.

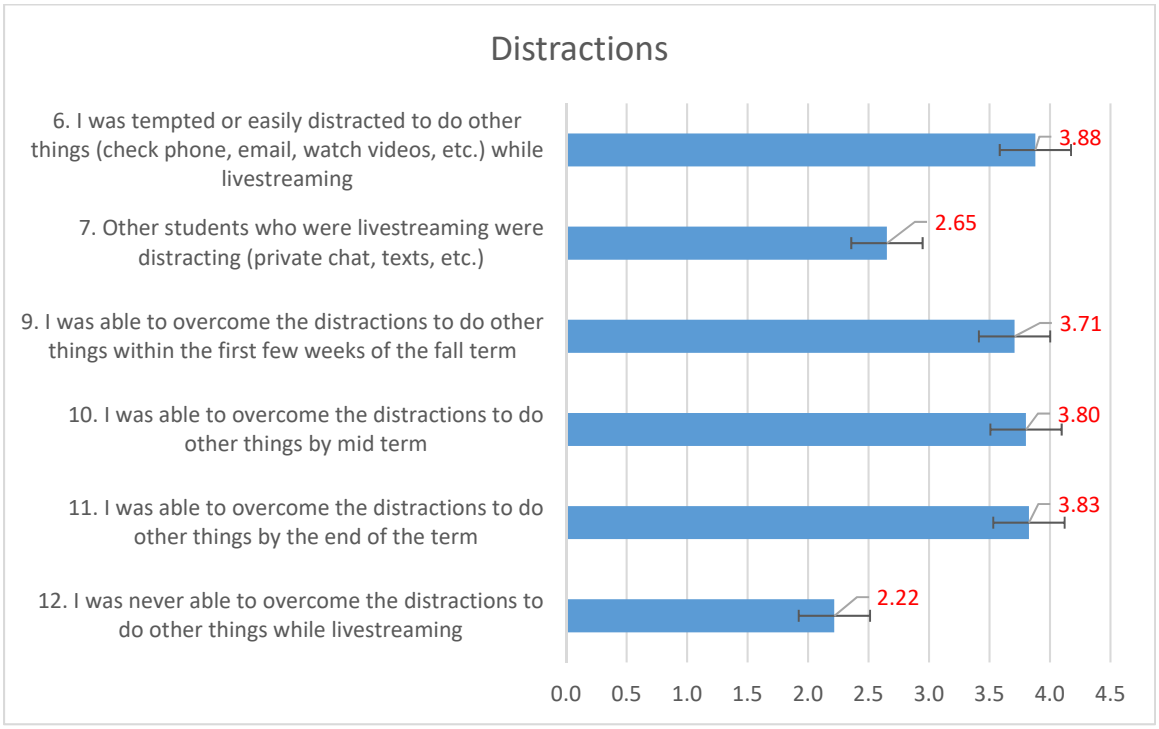

Figure 2: Distractions

Students were alert to the fact that nearly every lesson was recorded and livestreamed. At the beginning of the lesson, instructors started the Swivl and iPad and livestreamed or were ready to livestream, even if the section was not split into alternating days of face-to-face or livestream. If a student was absent, this could signal that the student was in quarantine or just arriving late. Faculty chose to livestream in order to address this potential issue. The integration of the Swivl with the LMS allowed for cloud-based recordings, which students could access through the LMS. Instructors had the option of making these cloud recordings available if any student was absent. Some instructors used video editing software to remove extraneous material from the lesson and could easily post the edited video to the LMS. Nearly all students were enrolled in sections large enough to merit social-distance-motivated course splits, and these students knew their instructor was recording (4.35), Figure 3.

Students found the recordings useful (4.17) if they missed a lesson or just needed to see or hear it again. Students slightly agreed that some information on the recordings was difficult to read (3.75) but could get enough information from the recording for them to be useful. Of note, students felt every instructor who records should allow students to view the recorded lesson (4.54), and this survey item received the highest ratings on the entire survey. Student comments revealed that access to the recordings helped to reinforce the material, especially if they missed a lesson or did not understand it during the live lesson. Students understood that recorded lectures were not intended to promote passive learning, but appreciated the ability to review content later.

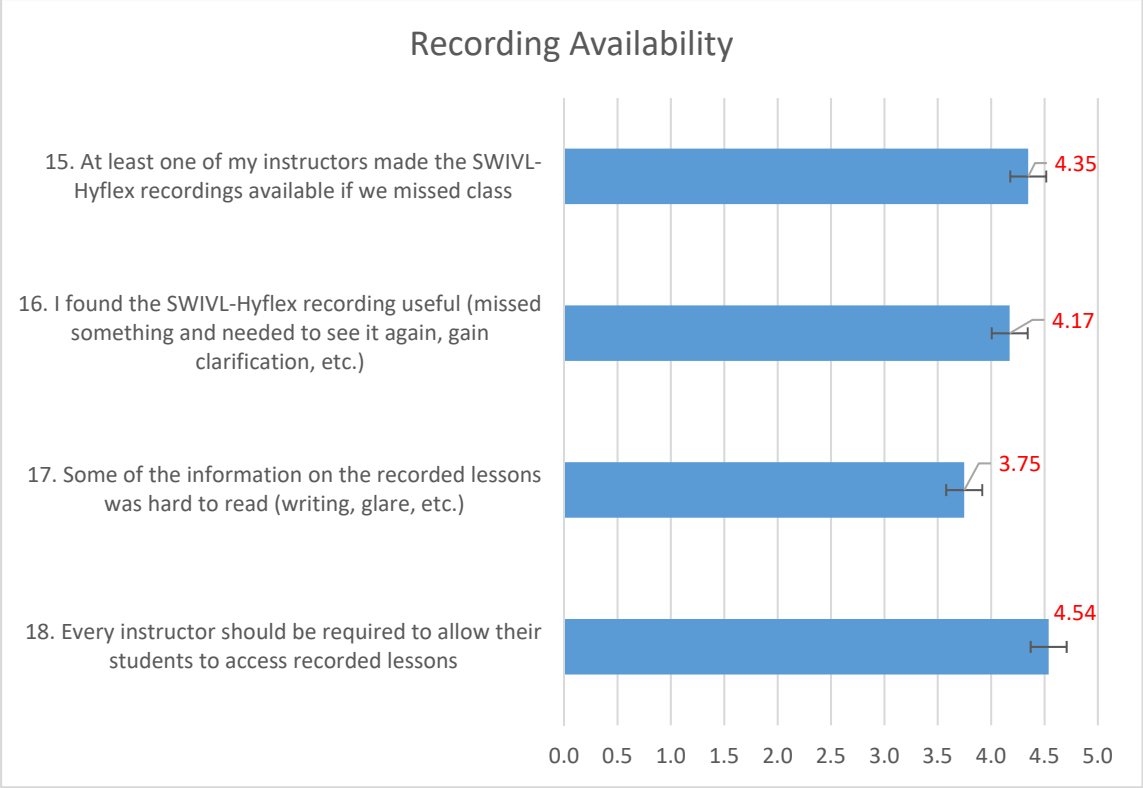

Figure 3: Lesson Recording Availability

These surveys show that students realize the value of instructor-student interaction, the undermining effect of distractors while livestreaming, and the opportunity to review material again through recordings.

Quantitatively capturing the emergent themes in their free-text responses, 47% of students surveyed enjoyed being able to select and control their learning environment during Hyflex-taught courses, with one respondent noting “I prefer livestreaming as I have always worked better from home/room compared to the classroom” and another student revealing “I [like being able to] work at my own pace and [can] get more done in my room.” Technical difficulties, audio lags, blurry visuals, and WiFi issues also emerged as key challenges which tracks with about 30% of students reporting some form of technical difficulty as something they liked least about

Swivl-Hyflex learning. One respondent noted: “sometimes the board has a glare and I can’t take good notes [from the Swivl-Zoom video].” However, review of some of the recordings showed less glare and students could use the recording to capture missed information.

Semester GPA Comparison

Table 3 below shows four semesters of GPA in three different majors: civil, electrical, and mechanical engineering. The table compares similar semesters but different academic years as the teaching modality changed. With similar courses offered each fall and each spring, the table displays any positive or negative changes in grades when the modality changed. The Citadel started offering construction engineering and computer engineering degrees in AY19; however, the sample size of these new programs was not significant for courses in these degrees as most first and second year students take math and science prerequisites and many of the general education courses. The table reflects four years of students in each of the three major engineering programs.

Table 3: Semester GPA Spring 19 – Fall 20

Term	Fall 19	Fall 20	Change		Spring 19	Spring 20	Change
	Pre-Covid	Covid			Pre-Covid	Covid	
Modality	Face to face	Hyflex			Face to face	Face to face & Remote	
Civil	3.024	3.169	+0.145		3.019	3.113	+0.094
Electrical	2.891	3.071	+0.180		2.720	2.961	+0.241
Mechanical	3.113	3.086	- 0.027		3.091	3.190	+0.099

The data among these three programs show only one program with a slight downturn (mechanical, Fall 20) from pre-Covid to Covid semesters. The other programs and similar terms reflect grades actually improving from pre-Covid instruction. Although the students reported the Swivl based Hyflex instruction and other forms of remote instruction less effective, their grades generally were higher compared to previous semesters with the same course offerings.

Revisiting our guiding questions:

(1) How effective is the SWIVL as a mode of course delivery compared to other formats?

(2) How can The Citadel best react to unplanned future course delivery shifts?

We find that students and faculty were remarkably candid in their observations as to what provided for the most successful classroom experience. What follows is a summary of those findings, including selected recommendations for all institutions.

Summary of Findings

1. Once the course delivery pivot appears likely, make a shared plan early and ensure commitment and follow-through at both higher and lower levels of the organization.
2. Consider secondary effects given the possibility of requested accommodations by faculty, staff, and students.
3. Develop and require faculty participation and completion of training modules for all members of the organization.
4. Training should be thorough and allow faculty to understand the student perspective when encountering Hyflex/hybrid courses.
5. Seed faculty mentors throughout the organization who can assist with technological, instructional design, and logistical questions.
6. Repeat questions and answers from both face-to-face and livestream students so both can hear.
7. Engage livestreaming students with questions. Ask for them to share their screens, especially in classes such as CAD or programming. All students can see and learn from good and incorrect examples of work.
8. Be aware of the livestreaming students' perspective through the Swivl. Move the Swivl to be in front of whiteboards that are used. This reduces glare and skewness on figures. This small acknowledgment helps remote students feel connected to the classroom.
9. Get comfortable with the technology. Different instructors in the same classroom may use different settings for sound levels, Swivl position, etc. Know your settings to ensure a quick setup. Do a sound and visual check with at least one remote student.
10. Use the recordings to improve your teaching. The recordings will highlight some of the instructor's good skills and areas for improvement. Recordings will help you see the classroom from the remote students' perspective. You will learn how long to stand next to a board so they can read and write.

Conclusion

This paper describes recent changes in classroom instruction to accommodate as much real time instruction and face-to-face interaction during a pandemic. Many students provided candid feedback and suggestions for improvement. Instructor response was limited to a small sample size that provided feedback, but these findings will be shared with a wider audience at The Citadel. The Citadel is teaching focused and seeks continuous improvement for all faculty. Improving remote instruction can be difficult, especially for students and instructors who are experiencing it perhaps for the first time. Any successful instruction is dependent on the motivation and competence of instructors, the school, and the students. Integrating technology and good instruction to drive student engagement are paramount. Instructors and students alike must strive to 'close the classroom gap' as both acknowledge the ideal or preferred face-to-face instruction. There are many opportunities to improve instruction during these times. Focusing on some of the most important factors from the student perspective that instructors and administration can influence (real-time interaction, reduction of distractions, and availability of recordings) are steps in the right direction**.**

Next steps

Going forward, our preliminary findings show the value of early decision-making; proactive course delivery planning; and maximizing faculty training and utilization of technology. The implementation of this survey provided a baseline of data and information about how to continue developing the Swivl-Hyflex instruction. The Swivl-Hyflex modality has shown numerous benefits, and continued, and even expanded, college support is vital. It is not easy to undertake such a large reform immediately and perform flawlessly. The Swivl-Hyflex modality results from this study will be shared in the School of Engineering and The Citadel's Center for Excellence and Innovation in Teaching, Learning, and Distance Education for wider dissemination. Use of the Swivl may not disappear from the traditional classroom even if institutions return to pre-Covid conditions. The Swivl can still be used to record classes for assessment and improve teaching. Additionally, recorded lectures can be easily edited to create short instructional videos for supplemental instruction, additional problem solving, flipped classroom, or even to give a lab orientation before the actual lab. Fully recorded sessions can also be made available to select students who missed classes due to job interviews, athletics, or illness. As campuses increased their technical capacity and capability, the talent and equipment can and should still be used so all are proficient before we must react to another tumultuous event.

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