Implementing the Flipped, Socially Distanced, Live-Streamed Classroom

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Abstract

A Strength, Weakness, Opportunities, and Threats (SWOT) analysis of a university identified the need to offer more online and hybrid courses without increasing faculty positions, more community partnerships, the ability to live-stream classrooms, and the institution of flipped classrooms as a best practice. Three forms of the university's course content delivery exist, traditional face-to-face, online, and hybrid. This paper presents a fourth alternative that allows students to participate in three delivery forms in the same course and provides additional accessibility to potential students with limitations. Included is a redesign of the classroom, incorporating the "flipped classroom" with an example of the budget. An additional need addressed is the social distancing now in practice and the space resources needed to satisfy the classroom's social distancing requirements. Finally, the flipped, live-streamed classroom can be leveraged as a resource to reach and become engaged with external stakeholders to include businesses and communities.

Keywords: flipped classroom, social distancing, blended learning, online education, live-streamed, COVID-19

Introduction

A Southeastern United States (SUS) university's mission statement clearly indicates that the university is focused on serving all of its stakeholders while providing a flexible, quality education to its student stakeholders by using multiple modes of delivery. One of the university's fundamental values is creating a student-centered environment.

University Mission Statement

The mission of the [university] is to provide quality and diverse educational opportunities at the undergraduate and graduate levels through the use of traditional and electronic delivery systems and to foster and support an environment conducive to teaching, research, scholarship, and collaboration with government agencies, our community, and other educational institutions(Montgomery, 2019).

Determining the need

In Academic Year 2018-2019, the university's enrollment stood at 5,211. There were 4,632 undergraduate and 579 graduate students. Women made up 65.5 percent of the undergraduate population and 66.8 percent of graduates. The student body was 43.8 percent White, 40.3 percent Black, and 2.3 percent Asian, and the age distribution was: under 18 (2.2 percent), 18 to 19 (25.4 percent), 20 to 21 (23.4 percent), 22 to 24 (21.8 percent), 25 to 29 (12.4 percent), and over 30 (14.9 percent). In terms of online enrollment, 1.2 percent were enrolled virtually only, and 35.9 percent were enrolled in some online courses (Univstats.com, 2020).

As the statistics indicate, a large portion of the registrants, 27.8 percent, are 25 or older and are generally considered adult learners (Kara, Erdoğdu, Kokoç, & Cagiltay, 2019) or nontraditional students. Most of them work in addition to attending classes. Yet only 1.2 percent of all students attend entirely online.

It has been suggested that online or distance education environments offer flexibility, increased knowledge efficacy, and lower cost (Fatahi, Shabanali-Fami, & Moradi, 2018). The online environment also benefits from self-directed learning (Fatahi et al., 2018), which is the preferred learning style of nontraditional students (Loeng, 2020). However, more than half of adult learners, 61.3 percent, indicate that they prefer face-to-face delivery based on survey results (Ho & Lim, 2020). If online learning is more convenient, why do they prefer face-to-face? Could it be a more intimate environment? Can the online class be constructed to make its environment as close to the face-to-face experience as possible? The proposed FC is designed to address this issue as it is more interactive, promotes active learning, which has been shown to increase student performance (Freeman et al., 2014), and has a face-to-face element if the student so desires.

The impetus for designing the flipped, live-streamed classroom presented here grew organically from an analysis of the university's strengths, weaknesses, opportunities, and threats (SWOT). Some of the opportunities identified are not surprising since many universities are most likely pursuing some of the same goals due to the current trends in higher education (Alexander et al., 2019; Brown, McCormack, Reeves, Brooks, & Grajek, 2020). The opportunities identified were the creation of more online and hybrid classes and more community partnerships, without necessarily increasing faculty count, the ability to live-stream classrooms, and the addition of more flipped classrooms (FC). However, the urgency required by the COVID-19 pandemic to move all classes online in March 2020 and then reopen campus in the Fall prompted the need to design a socially distanced face-to-face classroom while still accommodating the standard number of students enrolled in that type of class. All while maintaining student engagement and striving always to enhance the quality of education.

Literature review

Andragogy

The word "andragogy" originates with a German teacher in 1833 named Alexander Kapp, who used it to explain parts of Plato's theory of education. The term itself is Greek in origin with "andr," meaning "man," and "agogus," translating to "leader of" (Smith, 1996, 1999, 2010); however, a framework for the concept was not created until the 1960s by Malcolm Knowles (Mews, 2020). The framework initially evolved as four principles related to the characteristics of the adult learner: 1) the learner's maturation from dependence to self-direction, i.e., their self-concept changes over time, 2) the ability of the learner to draw on their experience and collaborate with others to create new knowledge, 3) based on the usefulness of the content, the learner is ready to learn, and 4) the learner's time perspective changes over time from future to the immediate application of knowledge, moving from subject- to problem-centeredness (Smith, 1996, 1999, 2010). Since the framework's inception, two principles have been added. They are 1) the adult learner needs to know the value of the subject, and 2) adult learners have greater motivation to learn driven by life factors such as career needs, self-esteem, quality of life, example setting for children, and self-satisfaction (Ho & Lim, 2020; Mews, 2020). Kahu, Stephens, Zepke, and LeachKahu, Stephens, Zepke, and Leach(2014, p. 524) defined "mature-aged students" "as over 24 years." The learning preferences and behaviors of adult learners were studied by Ho & Lim (2020).

The authors found that 78.7% preferred self-directed study, i.e., studying independently, and they liked reading, listening, and doing as the best learning styles for them. The bulk of this population, 65.2%, indicated that study between 8:00 p.m. and 12:00 a.m. was when they had the time to spare. As to the lesson delivery method, 61.3% indicated that face-to-face was their preference. Loeng(2020)suggests that the adult education field should differentiate between the techniques associated with self-directed learning, as defined by Knowles, and the self-directed learning that involves a change of consciousness within the learner, which translates into a desire to control what they learn. However, to give full reign to self-directed learning in an institutional setting, the student must have the appropriate self-confidence and skills to be successful. Otherwise, autonomy is useless. Possession of judgemental skills is critical. Given the characteristics of adult learners, traditional teacher-centered classroom design might not be appropriate. A switch to a learner-centered approach might be warranted for these students. Galustyan, Borovikova, Polivaeva, Kodirov, and Zhirkova(2019) indicate that open access to educational resources for all is the foundation of modern andragogy. The research question is, to provide equal access to all with the same quality of learning, how can adult learner characteristics and preferences be accommodated along with less mature student characteristics in the same class using the same course content?

Distance education (DE)

Definitions of distance education

In chapter one, Simonson, Smaldino, and Zvacek (2015, p. 6), define DE as:

"Institution-based, formal education where the learning group is separated and where interactive telecommunication systems are used to connect learners, resources, and instructors."

Moore and Kearsley(2012, p. 2), in Chapter 1, define DE as "….teaching and planned learning in which teaching normally occurs in a different place from learning, requiring communication through technologies as well as a special institutional organization."

While Kentnor (2015, p. 22) takes up Roffe's(2004) words and defines it as "….a method of teaching where the student and teacher are physically separated. It can utilize a combination of technologies, including correspondence, audio, video, computer, and the Internet."

Finally, Dr. Pam Johnson and Dr. Mike Albright (Simonson, 2013) narrate a podcast that defines DE this way: Formal, institutionally-based educational activities where the teacher and learner are normally separated from each other in location and where two-way interactive telecommunications are used to connect them to share video, data, and voice instruction.

Brief history

The first generation of DE was done through correspondence and was called "home study" in for-profit schools, while universities referred to it as "independent study" (Moore & Kearsley, 2012). Second generation DE was done through radio, which began in 1919 at the University of Wisconsin, and television, which started in 1934 at the University of Iowa (Kentnor, 2015). Anderson and Dron (2011) suggest that this era and the first generation are marked by cognitive-behavioral pedagogy with the teacher as the creator of content and the subject matter expert. The distance education conceptual framework offered by Taylor (2001) for this generation is the "Multi-Media Model."

Two educational projects are the hallmarks of the third generation of DE. The concepts of course design teams and distance education as a "total system" were represented by the Articulated Instructional Media (AIM) Project at the University of Wisconsin in Madison. And the genesis of single-mode teaching institutions, in particular, open universities where only distance education is offered, first instituted as Great Britain's Open University project (Moore & Kearsley, 2012), respectively.

The fourth form of DE in the 1980s was based on teleconferencing technology innovation and was designed for group use. The Star Schools Program Act, legislation passed in 1987, provided funding to promote telecommunications education focused on science, math, and foreign languages in K-12 schools (Moore & Kearsley, 2012; Simonson, 2013). While the open universities in other parts of the world exploded, the United States did not develop a keen interest in them until this era (Moore & Kearsley, 2012). This generation is consistent with the Flexible Learning Model conceptual framework offered by Taylor (2001), and, according to Anderson and Dron (2011), constructivism was the predominant pedagogy in use. Constructivism pedagogy calls upon the instructor to be a guide and discussion leader.

Fifth-generation DE, online education (OE), began with the University of Phoenix in 1989, using CompuServe. Two years later, the Web was unveiled, allowing documents to be accessed from computers of all types, and in 1993 Mosaic, the first web browser appeared.

(Kentnor, 2015, p. 30) stated that "Online education is the fastest growing form of distance education." It all began with the genesis of the World Wide Web (Web). The Web has not remained the same since its birth. It has grown into the Web 2.0. O'Reilly (2005), in the title of the article, Design Patterns and Business Models for the Next Generation of Software, has succinctly provided a visualization of the Web 2.0 platform "as a set of principles and practices that tie together a veritable solar system of sites" that exhibit some, or all, of a core set of principles. Those companies that display these principles are considered 2.0 companies. Based on O'Reilly's concepts, Marshall (2018, p. 261) describes the Web 2.0 platform as "where value is found through collective social engagement."

These advancements in DE, along with the advent of the Web, have provided the means to answer the question: How can DE address the needs of both mature and less mature students in the same class?

The flipped classroom concept

"…what we originally called the flipped classroom is just a stage leading to what we were really promoting-flipped learning." (Bergmann & Sams, 2015, p. 5).

Definition of flipped learning

In their book on flipped learning, Bergmann and Sams(2015) describe flipped learning as students reading and watching instructional videos, in their case, video lectures, outside of class. They then perform homework and activities inside the class where the educator guides their learning and explains difficult concepts that students have problems understanding. This arrangement is where flipped learning begins, and the authors have called it "Flipped Class 101" (Bergmann & Sams, 2014, p. 20; 2015, p. 6). The activities performed in-class require spaces where students can work individually and in groups for collaborative assignments to learn from each other. Thus, individualized learning is provided to meet each student's needs and learning style.

Figure 1 provides an infographic of the concept.

Figure 1.Infographic adapted from FIC (2020) and Bashir et al. (2020).

Theoretical basis

Benjamin Bloom's Mastery Learning (1978, 1986) is the theoretical basis for the flipped learning concept. The idea is to get to higher orders of critical thinking and problem-solving so students can apply what they have learned and, by doing so, engrain the knowledge and use it to solve similar but different problems independently. The theory advocates a student-view of learning with the educator as a guide that seeks to provide the best learning conditions to meet the students' needs so that mastery of the course material is attained (Deng, 2019). Because students are active participants in their learning rather than passive listeners as in the traditional classroom lecture format, the FC format's result is that they learn from their interactions with other students, and they learn more deeply (FIC, 2020). Access to the education resources for the entire course online at the beginning of the course allows students to manage their workload and time. Taking responsibility for their learning, which suits the adult learners while still requiring deadlines for out-of-class work to be completed before performing in-class activities, will keep the less self-directed students on track to complete all work in the allotted term and engaged until they begin to take responsibility for their learning. Access to all resources at the beginning of the course also allows students to move through the coursework at their own pace, speeding up as concepts come easily to them and slowing down when more time is needed to grasp the idea(s). This approach reflects the Flipped-Mastery Model, as described by Bergmann and Sams (2012).

Instructional design

OE within the field of andragogy was studied by Galustyan, Borovikova, Polivaeva, Kodirov, and Zhirkova (2019). They conducted a field experiment in which teachers were taught the same course, "Teachers' Activity in Creating Electronic Educational Environment,"(Galustyan et al., 2019, p. 151) within a traditional face-to-face system (n=79) and within an e-learning system using Information Communication Technology (ICT) in the classroom (n=78). The teachers were assessed pre and post using four ICT Competence components, Analytic, Search, Design, and Creative. The experimental e-learning group showed a "significant dynamic of the development of ICT competence"(Galustyan et al., 2019, p. 153). The results suggest that teachers responsible for creating e-learning environments should be taught using ICT in that environment to develop competence. Perhaps as a starting point for instructional course design of the flipped, live-streamed classroom discussed in this article, the designer should be well versed in e-learning and Information Communication Technology. This competence provides the ability to address the International Society for Technology in Education (ISTE) Standard for Educators, #5, Designer (ISTE, 2017). It is also in line with Technological Pedagogical Content Knowledge Framework (TPACK) for much-needed 21st-century human resource skills (Trilling & Fadel, 2009).Narayanaswamy (2017) provides a book review of a guide to online course design essentials that may be a resource to those new to OE.

It has also been suggested that teachers be trained in developing teacher-student relationships, coaching, and mentoring skills to attain positive relationships that can impact deeper learning, the attainment of higher levels in Bloom's Taxonomy, and student long-term career goals (Bergmann & Sams, 2014).

The course would be synchronous with live-streaming and closed captioning when needed. All class sessions would be recorded and posted to the Learning Management System (LMS) for all students to review as needed.

Pedagogy

Keeping in mind the FC concept depicted in Figure 1 adapted from FIC (2020) and Bashir, Ahmed, and Marouf (2020), the overarching pedagogical approach is flipped learning, where the learning space transforms from a group learning space into an individualized learning space. The classroom becomes dynamic and interactive (Bergmann & Sams, 2015). Other approaches still exist within the course, such as extrinsic motivation sources, examples include grades and exams, and the subject matter is chosen by the instructor. However, students have more responsibility for their learning, and they have multiple resources available to them to suit their learning style. This approach is more reflective of andrological theory.

Content

Creating content for the FC requires that the educator consider how best to use face-to-face class time, virtual or in-person. What to take out of the traditional face-to-face content and what to add or what should remain. Sams and Bergmann (2013) suggest that conventional lectures can go as they can easily be converted to videos or narrated PowerPoints with video to be viewed out of class as little is lost in translation. The authors recommend short 10-15 minute videos that can be viewed at the student's convenience and on multiple devices. Overviews of course topics or units and posing questions to be reflected upon can also be done through videos out of class. In-class content can include live discussions related to the course material.

Students may be required to come to class with questions about the subject matter, from the assigned readings or reviewing the videos they did not understand to prompt discussions (Sams & Bergmann, 2013).

Bashir et al. (2020, p. 1) constructed a graphic that visualizes proposed components of pre-class, in-class, and post-class activities. They have listed pre-class activities as an introduction to a concept, videos or audios, online tutorial,PowerPoint, while in-class activities are: group discussions, debate, project-based learning, and analyzing, and post-class activities are: student checking understanding, revising key concept, or getting help from a source, the source could be the educator or their peers.

The learning objectives of the course should be taken into account when deciding on specific in-class activities. For example, a study on group versus individualized face-to-face activities demonstrated a difference in test scores (Rawas, Bano, & Alaidarous, 2020). Overall, the group participating in the group activity scored higher than the individualized group. However, particular domains were affected differently. The group activity had better scores in the foundation knowledge, application, and integration domains than the other group. In contrast, the individual activity group had better scores in the human dimension and caring domains.

Academic outcomes

Chen et al. (2018) performed a meta-analysis of forty-six studies with a total of 9,026 participants comparing FC to lecture-based (LB) environments. The analysis "revealed inconsistencies in FC efficacy between different study designs: cohort or quasi-experimental studies, but not RCTs [randomized, controlled trials], showed a significant advantage of the FC over the LB condition."(Chen et al., 2018, p. 920). A greater improvement in higher-level learning outcomes was observed.

Talan and Gulsecen (2019) compared FC to blended and face-to-face environments in a controlled experimental study design. The authors note that both blended and FC integrate technology in the course design. The study indicated that overall academic achievement, as assessed with pre and post-tests, academic engagement, and teacher-student interaction, was significantly higher in the FC and blended groups than in the control group. There wasno difference in weekly quiz scores across the groups. Pre and post-surveys were conducted to gain information in areas outside of academic performance. Course engagement, difficulties encountered, or active learning among the groups was not significantly different. The blended learning environment had significantly higher feedback than the control group. Finally,the students in the Experimental group-I [FC] "were more satisfied with the method implemented, asked for the other courses to be designed like this and advised others about this course."(Talan & Gulsecen, 2019, p. 51).

It has been postulated in a meta-analysis that the FC may be better for some subjects as opposed to others (Cheng, Ritzhaupt, & Antonenko, 2019). Strelan, Osborn, and Palmer (2020, p. 3) posed the research question, "Does the flipped classroom effect differ across discipline?" and found, quantitatively, that there is an overall moderate positive effect in scores of half a standard deviation compared to LB. However, there were weaker effects in some disciplines, such as health sciences, possibly related to how structured the field is inherently. Rathner and Schier (2020) observed that in physiology education, a flipped class andragogy environment delivers improved learning performance and suggest in their conclusion that student "buy-in" may have more to do with the effect than subject matter.

Social distancing

Unfortunately, due to the current health situation in the US, social distancing is necessary, in general (CDC, 2020a) and especially in the classroom, for the safety of the students. This issue presents a particularly difficult problem for the FC, where collaboration and interaction are core principles. Center for Disease Control (CDC) guidelines call for wearing face coverings and six feet of distance between individuals (CDC, 2020a). Classrooms that are not used by the same students for the entire day should be cleaned periodically during the day, ideally with every new group of students. The cleaning is the lesser of the two problems as a fogger, using a non-toxic disinfectant (Recalde, 2019) from the CDC disinfectant list (CDC, 2020b), can clean an approximately 25 by 25-foot classroom, with 16 rolling desks and a teacher podium, with a computer keyboard and mouse in about 15 minutes.The cleaning includes fully fogging each desk, and an additional two to three minutes for the mist to dry should be allowed (personal experience). The bigger problem is how to remain socially distant while still collaborating and maintaining an intimate and inclusive classroom environment? The classroom design proposed here is offered to address this issue.

Classroom design

Bergmann and Sams (2015) point out that specific components facilitate the creation of asuccessful flipped learning space. They indicate that support from administration is needed related to resources and professional development to understand more about FCs and the administration's embracement of the idea itself. Support from the Information Technology department is also essential, as are collaborations with other colleagues who are using the FC concept or are considering implementing it. Others include "adequate time for implementation" and "thoughtful reflection"(Bergmann & Sams, 2015, pp. 10,11). As to the learning space itself, the authors suggest that it is essential to make the space student-centered and optimized to enhance group and individual learning. The structure proposed can accommodate face-to-face, synchronous and asynchronous DL, and hybrid learning in the same course.

Physical structure

In terms of the classroom's physical structure, Figure 2 shows the optimal design taking into consideration social distancing while encompassing flexibility. The minimum space needed to keep 16 students six feet apart is 576 square feet (BTP, n.d.). If the instructor is added, that goes up to 612 square feet. The 25 x 25 square foot room depicted in Figure 2 is 625 square feet. This configuration can be scaled up or scaled down depending on the class and classroom size. Although a class size of 16 seems small, the actual class size can be twice, three times, or more, than that size with live-streaming technology. Live-streaming capability can extend the class out into the virtual world, accommodating online students in synchronous classroom sessions, students with disabilities who have transportation issues, or those who would find education more accessible with this delivery model. The format still would maintain a feeling of belonging to the class, which has been shown to enhance learning and increase retention rates (Peacock, 2018). Live-streamed classes can be closed-captioned through the services of an Artificial Intelligence Media (AI) company. A diagram of the layout can be found in Figure 2. The FC requires easily movable furniture that can be rearranged to accommodate various activities. An image of the recommended seating can be found in Figure 3.

Figure 2. Physical Characteristics of the Proposed Classroom

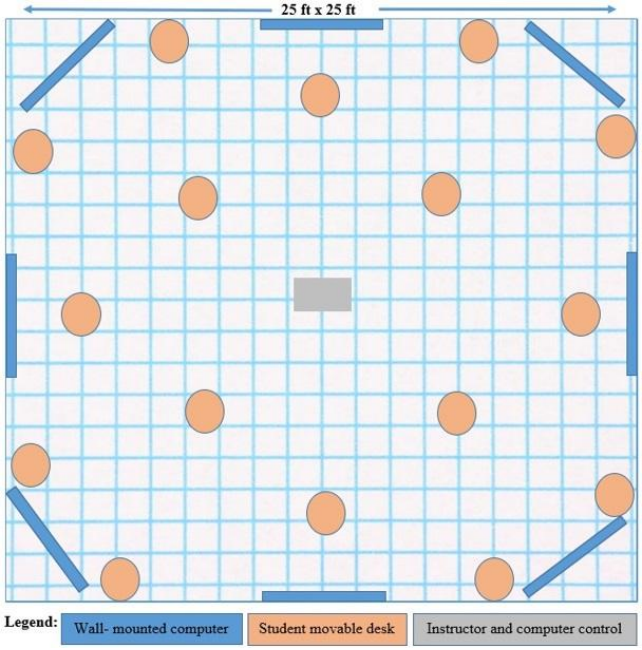

Figure 3. Rolling Student Desk

Budget

Sourced from an AI company, the example budget items for ongoing services that may be required and the appropriate classroom equipment can be found in Tables 1 and 2, respectively. The budget is for one FC classroom. All classrooms do not have to be redesigned at the same time. One classroom at a time can be converted until the desired number of classrooms is achieved.

The SUS university already has T-1 network connection capability and an Information Technology department. Therefore, it is not anticipated that there would be extensive costs associated with computer connections for the classroom. The university also has a Zoom account, so that a streaming service should be unnecessary. However, the service cost is included in the ongoing service's budget at a monthly rate, using Samba Live pricing for a total annual fee of $900. Live-captioning will only be required if a student with a hearing disability is enrolled in the course. The expense incurred for live-captioning would be $3,160 per 16 week semester. The equipment budget total is presented both with and without rolling integrated seats with desks. The total equipment budgetary cost with 16 rolling desks was calculated as $30,235.51; without rolling desks, the price was $23,462.71. Funding could come from the university or college budget, or the local business community could contribute to a "Fund a Classroom" campaign.

T-1 network connection capability and an Information Technology department are required as a starting point. If the organization does not have a live streaming service already, the budget includes example pricing for a Sambra Live account at a monthly rate, for a total annual fee of $900. An example budget for a flipped live-streamed classroom is provided in Tables 1 and 2.

Table 1.
Ongoing technological support services budget.

Item Description	Qty	Price each	Total
Live-captioning service (AI)*****per 16 weeksemester	2	$ 3,160.00	$ 6,320.00
Live-stream capability (e.g.Zoom, Samba Live, Wiz IQ)	12	$ 75.00	$ 900.00
			$ 7,220.00

*****This cost is only incurred if needed for student accessibility in any one semester.

Table 2.
Technological equipment required for the classroom

Item Description	Qty	Price each	Total
Rolling student desks with integrated seating	16	$ 423.30	$ 6,772.80
Broadcast Stereo headsets	18	$ 151.36	$ 2,724.48
4-channel headphone micro amplifier	8	$ 17.99	$143.92
Headphone holder wall mount	18	$ 14.99	$ 269.82
10 ft headset extension cables	18	$ 6.34	$ 114.12
10 ft microphone extension cables	18	$ 10.87	$ 195.66
wireless keyboards with integrated mouse	17	$ 38.00	$ 646.00
10 ft mini to phone cables	8	$ 5.59	$ 44.72
Large computer screens	8	$ 289.37	$ 2,314.96
Full motion computer screen wall mounts	8	$ 69.99	$ 559.92
Studio monitors with bluetooth (speakers)	8	$ 172.46	$ 1,379.68
Computer hard drives	8	$ 759.00	$ 6,072.00
Hard drive mounts	8	$ 15.96	$ 127.68
HDMI gold cables	8	$ 17.95	$ 143.60
2-bus mixers	8	$ 111.74	$ 893.92
Classroom video cameras	8	$ 129.12	$ 1,032.96
Bookshelf speaker mounts	8	$ 30.25	$ 242.00
Hard drive for teacher console	1	$ 759.00	$ 759.00
Monitor for teacher console	1	$ 746.47	$ 746.47
Studio monitor (speaker) for teacher console	1	$ 172.46	$ 172.46
Microphone for teacher console	1	$ 86.80	$ 86.80
Microphone stand for teacher console	1	$ 10.12	$ 10.12
Photo cables, connectors and accesories	1	$ 1,000.00	$ 1,000.00
Wireless keyboard for teacher console	1	$ 38.00	$ 38.00
Video camera for teacher console	1	$ 129.12	$ 129.12
Sit to Stand teacher console	1	$ 3,615.30	$ 3,615.30
		Total	**$ 30,235.51**
Without rolling desks		**Total**	**$ 23,462.71**

Discussion

Internal Benefits

The format proposed has many advantages that speak directly to the university's mission statement and core values. Particularly the fundamental core value of student-centeredness. In fact, it has been stated that the FC "makes students become the center of the courses" (Deng, 2019, p. 1353). Deng came to this conclusion based on the works of Aaron Sams and Jonothan Bergmann (2012, 2013). Sams and Bergmann have a substantial body of work on the beneficial effects of flipped learning and the FC based upon Benjamin Bloom's (1986) concept of mastery learning. Mastery learning, introduced initially as learning for mastery, assumes that it is within nearly every student's capacity to master any given instructional task. FCs with live streaming would allow students in a face-to-face class to form groups with other students who are not on campus. Groups can work on class projects or activities together, in real-time, in-class to learn from each other and get immediate feedback on their understanding of critical concepts in the course(s). Online students who cannot attend the live sessions can review the recorded class sessions, provide additional thoughts, and get feedback through online discussion boards. If their schedule permits, online students could "dropin" to the class session virtually to participate, especially for any course content they find challenging in their pre-class studies. The format can also accommodate guest speakers for face-to-face and online students.

Live-captioning of the class sessions would allow students with hearing impairments to participate, eliminating the need for transportation to and from school or coming to class and being unable to participate effectively because of their impairment. The expense of live-captioning could be eliminated if no students registered for the course need it.

All of these scenarios could play out simultaneously in one class, which would free up physical resources to allow for social distancing, accommodate more hybrid courses, serve more online students, and keep class sizes primarily the same while addressing social distancing. The format could also impact the lower retention rate of online students (Simplicio, 2019)by fostering more student engagement to create a "sense of belonging" to counter feelings of isolation (Peacock, 2018). Feelings of isolation have been shown to affect retention rates (Budiman, 2018; Lake, 1999; SazmandAsfaranjan, Shirzad, Baradari, Salimi, & Salehi, 2013).

External Benefits

The live-streamed classroom could also be used to reach out to the community and other external stakeholders. Senior high school students could be offered the opportunity to attend a live-streamed class session in the field of their choice to get a feel for the discipline(s). The first class session is recommended, as that should contain an overview of the importance of the subject and what the course will cover.

Projects that help the community without physically being there could be offered through the live-streamed format when a classroom is available. This author has a "Tablets for Seniors" project that would be perfect for this format. It would benefit the elderly and provide good publicity for the university. Other classes to help the community could be developed and delivered. Examples include Nutrition and Wellness seminars (College of Nursing), Study Habits (College of Education), Online Learning Technology (Faculty Development Institute), Personal Finance (College of Business), and Resume Writing (College of Business).

Future Research

Given the questions surrounding the effectiveness of FC across disciplines (Cheng et al., 2019; Strelan et al., 2020) and the discrepancies related to study design and consistency of results (Chen et al., 2018), further study on when and in what disciplines the FC concept can be used to its fullest effect is recommended. Exploring nuances that allow for improved learning even in the face of no significant differences in active learning across control and experimental group, as in the Talan and Gulsecen (2019) study, might provide additional guidance as to ideal course design and pedagogy for the FC.

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Statement on open data, ethics, and conflict of interest

This article does not contain any empirical data analysis, and no information was collected from any human subject(s). As a result, a university IRB exemption was approved on December 03, 2020.
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