High Enrollment and HyFlex: The Case for an Alternative Course Model

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Classroom space limitations and increasing student enrollments push universities to the development of alternative course delivery models. The authors describe how a high-enrollment, general elective course was converted into a HyFlex model. A HyFlex course provides flexible participation, allowing students the choice of attending face-to-face class sessions or the option to complete course activities online without physically attending class.” to meet student enrollment demands and institutional space constraints. The redesigned HyFlex course featured a number of innovations to ensure learners in online (OL) or face-to-face (F2F) formats had equivalent opportunities to succeed. Student satisfaction with the HyFlex format was high (70% OL students), and student enrollment increased by 29%.

The HyFlex model design is one alternative that institutions may consider to balance the demands for course availability, instructional innovation, and classroom space.

Introduction

Different motivations drive universities to explore technological innovations that can address the demands placed on 21st-century higher education classroom settings. Space limitations and growing student enrollment, along with mounting pressure to increase retention and
matriculation within a four-year time span, prompted traditional higher education institutions to respond by implementing new learning formats beyond traditional face-to-face (F2F) courses. These new delivery formats have integrated the use of online learning resources to complement the F2F format and enhance the teaching environment. The prevalence of these alternative delivery formats in higher education is growing. For example, over 90% of public four-year and two-year institutes offer online (OL) courses with over 5 million students taking at least one OL course (Allen & Seaman, 2013). This number has grown since the early 2000s and continues to grow today, with 70% of institutions committed to online learning as crucial for their long-term education strategy (Allen & Seaman, 2013). With the advent of alternative course delivery formats, such as OL courses, and their increasing popularity among students, some still question whether the quality of student online experiences (performance, satisfaction) lags behind those of students in the F2F format. However, research demonstrates student performance to be equal or better in OL than in traditional F2F courses (Cohen, Carbone, & Beffa-Negrini, 2011; Means, Toyama, Murphy, Baki, & Jones, 2009).

Although blended, hybrid, and online course delivery formats have emerged as popular alternatives, less is known about the HyFlex format. The HyFlex course design incorporates both online and F2F teaching, allowing students the option whether to participate in F2F course activities or to complete those activities online without physical attendance in a classroom. The appeal of a HyFlex course is more than being a “one-size fits-all approach” to traditional teaching; it allows students to customize their learning experiences based on a host of variables, such as impacted schedules and limited classroom space (He, Gajski, Farkas, & Warschauer, 2015; Kyei-Blankson, Godwyll, & Nur-Awaleh, 2014; Mirzaie & Griffy, 2016). Although there is no established formula when creating a HyFlex course, the instructor is still responsible for the learning objectives, structure, content, assessments and activities in both an online and in-class modes. Students are able to personalize their learning by choosing the format that best promotes success for them (Mirzaie & Griffy, 2016). Initial research on HyFlex suggests that student learning is not negatively impacted (Beatty, 2007; Mirzaie & Griffy, 2016).

The goals of this article are twofold. First, we detail the innovative strategies and technological integrations used to design, deliver, and evaluate a HyFlex course for a high-enrollment undergraduate course at the University of California, Davis, a research-intensive, public university. We discuss course innovations and practices that the authors implemented to address the situational factors for a course that enrolls nearly 3000 students.
per year. Specifically, we detail logistical matters related to enrollment management, course format, technological tools used to deliver content, role of the learning management system (LMS), variety of instructional strategies (both in-class and out-of-class), and assessments of student learning. Second, we measure student satisfaction to better understand their preferences within the HyFlex format. We close with a discussion about student satisfaction and implications for future practice and research with the HyFlex format.

**Literature Review**

While there is a growing emergence of literature about technology-enhanced course delivery models (for example, blended, flipped, online), a dearth of literature exists on the implementation and impact of HyFlex models in higher education. Many benefits of attending class (for example, student-faculty and student-student interaction, sense of community, increased academic motivation) are essential for students’ success in college (Pascarella & Terenzini, 2005). For this reason, providing different modes of learning could increase the overall performance of a class by permitting students to tailor instruction to their educational needs (Mirzaie & Griffy, 2016). However, the onus is then placed on the instructor to carefully integrate online tools in order to develop a course that can provide all the benefits of a traditional course in an online format and to assess the impact on student learning outcomes.

Given the scarcity of research on the implementation of HyFlex models in higher education, it is not surprising that studies examining the impact of the model are also limited. Much of the research that exists on the HyFlex model explores student preference with the class format—OL or live-lecture (LL), for example (for instance, Bassili, 2006; Beatty, 2007). Among the limited literature about performance, Inglis, Palipana, Trenholm, and Ward (2011) found that students who attended the LL version of a course had higher levels of achievement than students who primarily utilized the OL version of the course. However, Miller, Risser, and Griffiths (2013) found that there was no difference in performance for students who enrolled in a hyflex section versus a traditional lecture section. They also found that high student satisfaction with the HyFlex course was likely due to the access provided to the recorded LL for review of materials, a similar result reported by Mirzaie et al. (2016).
Instructional Methods

We next describe the background and content of the in-person course, Nutrition 10, and how it was adapted into a HyFlex model.

Course Background

Historically, the overarching goal of the traditional F2F Nutrition 10 course has been to present the concepts and rationale of nutrition in the context of personal, cultural, and world aspects of human nutrition. Nutrition 10, a high-enrollment, General Education (GE) course offered to undergraduate students across all majors, was converted into a HyFlex format. High enrollment in this course has persisted for nearly two decades and is offered every quarter with an approximate enrollment of 550 students per quarter and 2000 students per academic year in 2014. Nutrition 10 provides fundamental nutrition knowledge, is offered to all educational levels, and is a GE course that satisfies the Topical Breadth in Science & Engineering (Scientific Literacy) requirement with no prerequisites required. Some examples of course topics include the introduction of nutrients and establishing nutrient requirements, homeostasis, body composition and fluids, and digestion; the cultural influence on nutrition and health; and nutrition labeling and dietary guidelines for optimal health. When adapting the F2F course into a HyFlex model, limited changes were made to topics covered.

During lecture, concepts are presented using a variety of pedagogical approaches. Scientific concepts are presented using dynamic, multi-media PowerPoint presentations and are translated into diverse forms, such as personifications, analogies, pictorial models, diagrams, animations, real-life examples, and videos. In order to foster student engagement in a large-classroom setting, the professor regularly quizzes the students throughout lecture. Because the video lectures for the online students are recordings of the live in-person lectures, the same pedagogical approaches are applied to the online lectures.

HyFlex Adaptation

Two factors led the course instructional team to explore additional instructional modes: increasing enrollment and lack of classroom space. The University of California, Davis (UC Davis) is part of a statewide system that has a Regents’ sanctioned enrollment plan to increase enrollment by state residents to upwards of 1000 new students per year until 2020. Given these ambitious goals, UC Davis faced new demands on campus
infrastructure (instructional spaces), that made it necessary to explore alternatives. Given these constraints, the instructional team chose to adapt the traditional in-person course to a HyFlex course because it gave the students the greatest flexibility in terms of enrollment options. With the HyFlex model, the students could choose a desired delivery mode (traditional F2F or online) that suited their preference and accommodated their scheduling challenges (such as time conflicts with other courses, employment, co-curricular activities, athletics). This allowed the course to reach a larger proportion of students who previously could not take the course because of space limitations and schedule constraints.

To inform students of the course delivery options, an e-mail was sent out to all wait-listed and enrolled students one week prior to the start of instruction. The e-mail detailed a complete description of the course and potential for research, including an informed consent approved through institutional review boards at UC Davis. Students interested in the study were allowed access to a pre-course questionnaire.

Course Design and Format

Nutrition 10 was redesigned for the HyFlex model. During the redesign process, the instructional team consulted with instructional designers and education specialists at the institution’s Academic Technology Services (ATS) and Center for Educational Effectiveness, respectively. The instructors and support staff used principles of backwards design (Wiggins & McTighe, 1998) to reexamine learning objectives, assessments, and activities to determine how each could be incorporated into the HyFlex model. For example, the in-person extra credit game show was converted to a similar online experience to ensure that content for both was reviewed in an engaging manner. The overall goal of Nutrition 10 was to present the concepts and rationale of nutrition in the context of personal, cultural, and world aspects of human nutrition.

All activities were redesigned for a HyFlex model and piloted during the six-week Summer Session II quarters in 2012 and 2013. After piloting the course over these two summer sessions, the instructional team used feedback from course evaluations and reviewed and refined all material before officially introducing it as a HyFlex course in Winter Quarter 2014. Table 1 presents a summary of the course activity formats offered as part of the redesigned HyFlex course during the 10-week Winter Quarter of 2014.
Format Choice

The HyFlex model used in the course is unique in that students were able to self-select to enroll as a F2F or OL student after sampling both formats and determining their personal preference during the first week of instruction. This approach is dissimilar to some HyFlex models (for
due to space restrictions and the need to make classroom reservations weeks in advance, the instructors could not allow simultaneous F2F and OL attendance throughout the course. Students chose either in person or online attendance to class activities for the entire 10-week quarter and could not switch to the other format. Access to the lecture hall during the first week was on a first come-first serve basis; students who could not attend lecture F2F were advised to watch the video-recorded lecture online. Although this approach did not allow all students to experience the F2F format, we agreed that because students have had prior experience with F2F courses (via other university courses and high-school), they are aware of the pros and cons of the F2F format before beginning the course.

The self-selection process began via an e-mail briefly describing the online course options sent by the course instructor three weeks prior to the first day of instruction. This information was reiterated during the first lecture, and all students could access past e-mails and course information on Smartsite, the online learning management system (LMS). All students were able to watch two video-recorded lectures during the first week of instruction. During this time, students were told to watch video-recorded lectures on their personal devices (computer, tablet, smartphone) and to choose their preferred learning format. At the end of the first week, each student chose to continue the course either in the F2F or OL course format. After format selection was finalized, F2F students were not allowed access to video-recorded lectures (the LMS provides for group-only access to specific modules), and OL students were encouraged not to attend in-person lectures.

**Instruction and Technology**

The 10-week course included two 80-minute lectures per week that were filmed live from 10:30-11:50 am on Tuesdays and Thursdays, for a total of 18 lectures. The instructional team and support staff from academic technology services discussed the importance of instructor presence (Garrison, 2007) for the streaming lectures and embedded the instructors’ image on-screen (see Figure 1). Asynchronous and synchronous video capture of lectures were available by Mediasite and Crestron-Streaming technologies. Asynchronous viewing was available after the lecture was complete, but it was limited to a seven-calendar-day window. The instructional team made this decision to encourage students to keep up with course material. Lectures were also audio-podcasted to an MP4 file and
Figure 1
Slide and Video Feed of a Lecture From Mediasite

IRON ABSORPTION

3. Bioavailability

B. Form of iron in food
• heme - meats (flesh), blood
  20-30% Bioavailable
• non-heme - plants (beans, grains), meat (portion), dairy
  1-10% Bioavailable
available to all students throughout the quarter to give students further flexibility and options to learn and review. Furthermore, the availability of the instructor audio may help those who are English-language learners (Wang & Vasquez, 2012). The numbers of total views and unique views were available to instructors via the Creston Streaming technologies. According to piloted data, Creston’s use paralleled that of Mediasite and is used here to show the trend of viewing throughout the 10-week quarter.

**Learning Management System**

Smartsite, the LMS for the course, played a central role in the HyFlex model. Course resources were posted to SmartSite and included the following: the course syllabus, audio lecture podcasts and archived e-mails from the professor, direct access to the online question and answer forum, access to video-recorded lectures (for OL students only), and quizzes (used for questionnaires and extra credit). Teaching assistants (TAs) and the university’s ATS continuously managed Smartsite throughout the quarter. This format created an organized design to display relevant course material to all students, and it allowed easy access to video-recorded lectures for the OL students. This is an important note, because course organization, especially on the LMS, has been shown to improve student-faculty interaction (Lonn & Teasley, 2009).

**Instructional Support**

*Professor and Teaching Assistant Contact*

In addition to two traditional lectures each week, students were encouraged to seek additional help from the professor and the six TAs during in-person office hours hosted on campus. All TAs were current nutritional biology graduate students. Each TA held one office hour per week, and the professor held five office hours per week, for a total of 12 hours of optional office hours per week. During office hours, students could receive clarifications of course concepts, preparation guidance for midterm exams, and review of previous midterm questions to ensure they adequately understood the material.

*Online Student Support*

An online question and answer forum called Piazza (https://piazza.com) was embedded within SmartSite. Piazza is a free tool that instructors can use to expand student interaction within the course and build a
sense of community. Piazza was adopted as a way to increase response consistency between all TAs and the professor and decrease duplicate student e-mails. In addition to logistical management, such as course announcements and reminders, the teaching staff used Piazza to post critical-thinking questions on current lecture topics. Students were encouraged to use Piazza to post questions about course concepts to enhance their knowledge retention and respond to other students’ questions (see Figure 2). Everyone enrolled in the course could both pose and answer questions, while the professor and TAs could endorse student responses, allowing for instructor feedback on content. The integration of Piazza was well received by students; we detail the findings in the Results section.

Assessments

A number of integrated assessments were used in the HyFlex course as well as more traditional means (for example, a final exam). The implementation of the assessments in both the F2F and OL format is described in the following section.

Exams

In keeping with the university’s academic senate course instruction policies, all exams were completed in-person. Two midterm exams were given during the fourth and seventh week of the course. These exams were taken on campus during the regularly scheduled class time or at a prearranged evening time the same night. A comprehensive 120-minute final exam was taken at the 10-week course.

Diet Project

Students completed a hand-written, personal, three-day food diary to assess their individual dietary intakes. This project allows students to reflect on their diet composition and compare their diets to the USDA’s 2010 dietary guidelines (https://health.gov/dietaryguidelines/2010/). For this project, students were required to record all food and drinks consumed in a three-day period. Calorie and nutrient profiles of foods were determined using approved sources to provide an average daily caloric and nutrient intake as a percent of recommended intake. The project was graded as pass/no pass, which was based upon students’ fully filling out all three food record forms along with an evaluation of their own personal food intake relative to the USDA standards.
Both OL and F2F students could also partake in a knowledge game called “Nutrition Jeopardy” during the sixth week of instruction. This extra-credit option was designed to provide formative assessment and serve as a tool to review midterm exam material. Wolf Science (http://www.wolfescience.com) is an educational site that contains free tools for teachers, including a “Build Your Own Jeopardy” game, which enabled us to create a game show board for OL students that was identical to that provided to F2F students.

For OL students, a quiz created in SmartSite was available to open during the sixth week of the course (F2F students were playing “Nutrition Jeopardy” on campus during a designated time). This quiz included detailed instructions on how to receive extra credit and a web link to the “Nutrition Jeopardy” game. Students had a total of one hour to complete the game show online; however, most finished in well under that time.
Supplemental Lectures

Two different incentive lectures (extra credit points earned for participation) on global nutrition and supplement use were offered in lecture for F2F students and video-recorded for OL students. These lectures were designed to enhance and expand students’ knowledge about nutrition topics not covered in the course. After the lecture, F2F students completed a quiz on a university scantron sheet as a way to record attendance. OL students answered the same questions in an online quiz located on SmartSite.

Format Satisfaction

The second goal of this study was to gain an understanding of students’ satisfaction with the HyFlex format. As part of the HyFlex course evaluation, a web-based pre-course questionnaire was made available to students for seven days during the first and second week of the quarter. The web-based questionnaire consisted of 10 multiple-choice and ranking questions on students’ age, prior online course experience, and preferred learning format. A web-based post-course questionnaire was administered in the last week of the quarter and included 19 questions on lecture attendance/use, course format experience, and overall format preference. Questionnaires were created with the help of the Center for Educational Effectiveness (CEE) staff, who provided consultation on matters of reliability and validity. Data collected from the questionnaires were submitted anonymously by using each student’s individual study code provided during the first week. Answers were not analyzed until after the academic quarter was complete.

Results

There were a total of 691 students enrolled in the course. Of those, 592 students (209 OL students and 383 F2F students) consented to the study (see Table 2). The majority of students in the course, 73.6% of F2F and 74.2% of OL students, had not previously taken a course with video-recorded lectures. OL students were more likely to be in their third or fourth year of college education, while there was an equal distribution of first- to fourth-year students choosing the F2F format. According to the pre-course questionnaire, preference to work from home (46%) and scheduling conflicts (25.3%) were the two main reasons students planned to take the OL compared to F2F format (see Table 3).

Students ranked their preferred learning format at the start of the course
as follows: attending in-person lectures (59.0%), viewing video-recorded lectures (11.4%), reading the textbook (9.4%), and discussing topics with TAs (8.5%). When looking at the groups separately, OL students indicated a preference for attending F2F lectures (38.9%) over viewing video-recorded lectures (26.5%), while F2F students had a greater preference for attending lectures (69.3% vs. 3.8%; see Table 4).

At the conclusion of the 10-week course, the top three preferred-learning-formats for all students were attending in-person lectures (57.2%),
viewing video-recorded lectures (19.9%), and reading the textbook (10.8%). Among F2F students, 70.4% preferred attending in-person lectures as their primary learning format, 6.8% preferred viewing video-recorded lectures, and 11.2% preferred reading the textbook (see Table 4). For OL students, 44.4% of students preferred watching video-recorded lectures, 32.9% preferred in-person lectures, and 10.1% preferred reading the textbook. Acquiring course information from classmates, TA’s, tutors, Piazza, and other online resources (such as Google) were all ranked low as a preferred learning format. This is to be expected, because those formats should be viewed as supplementary tools for obtaining course content, while attending/viewing lecture and reading the textbook are more primary methods.

The satisfaction rating for the OL format by OL students was positive overall. Seventy percent (149) of the OL students agreed that they learned more in the course by using the video-recorded lectures than if they were not available, and 88% (198) reported that the video-recorded lectures were a convenient way to access course material. However, 16 OL students disagreed that the video-recorded lectures were beneficial for learning course material, and 19 students thought they were an inconvenient means to access course material. This number of dissatisfied OL students coincides with the number of OL students who claimed not to view the video-recorded lectures and returned to F2F participation.

**Student Engagement**

A closer look at the viewing habits of the students reveals some interesting behaviors regarding how they engaged with the content. Sixty-eight percent of OL students reported watching only video-recorded lectures, while 32% reported attending lectures in addition to watching video-recorded lectures. Of those who both enrolled online and attended lecture,
Table 4
Student Rankings of the Most Effective Learning Format Before and After the 10-Week Course

<table>
<thead>
<tr>
<th>Learning Format</th>
<th>Pre-Course</th>
<th>Post-Course</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F2F</td>
<td>OL</td>
</tr>
<tr>
<td></td>
<td>N (319)</td>
<td>%</td>
</tr>
<tr>
<td>Attending in-person lectures</td>
<td>221</td>
<td>69.3%</td>
</tr>
<tr>
<td>Viewing video-recorded lectures</td>
<td>12</td>
<td>3.8%</td>
</tr>
<tr>
<td>Reading the textbook</td>
<td>32</td>
<td>10.0%</td>
</tr>
<tr>
<td>Listening to lecture podcast</td>
<td>7</td>
<td>2.2%</td>
</tr>
<tr>
<td>Looking up concept on online resources (e.g., Google)</td>
<td>3</td>
<td>0.9%</td>
</tr>
<tr>
<td>One-on-one discussion with TAs or instructors</td>
<td>23</td>
<td>7.2%</td>
</tr>
<tr>
<td>Discussion with classmates</td>
<td>5</td>
<td>1.6%</td>
</tr>
<tr>
<td>Receiving help from tutor</td>
<td>2</td>
<td>0.6%</td>
</tr>
<tr>
<td>Student resources (e.g., notes, practice exams)</td>
<td>11</td>
<td>3.4%</td>
</tr>
<tr>
<td>Asking questions on Piazza</td>
<td>3</td>
<td>0.9%</td>
</tr>
</tbody>
</table>
86.6% (58 students) claimed to attend at least 15-18 lectures. Nineteen OL students out of the 209 total reported viewing no lectures online in the 10-week course. Thirty-eight OL students reported viewing the lecture recordings after they attended lecture in order to create or complete course notes, and 11 students used the lecture recordings because English was not their first language.

Data on attendance at in-person lectures were not recorded throughout the course; however, the amount of unique views and total views of individual lectures viewed appears in Figure 3. The most-viewed lecture was the first, with 101 unique views and 141 total views, coinciding with when viewing was open for all students. There was a steady decline in both unique and total views of lectures until the ninth week of the course, which was before the last week of the course and final exams. On average, 25-35% of the lectures were viewed a second time. Midterm review sessions and extra credit lectures were watched more than course lectures, particularly the final exam review session, which had 128 total views and 53 unique views.

Piazza Participation

Out of the 692 total students enrolled in the course, 672 students enrolled to use Piazza. There were 848 contributions throughout the 10-week course, including questions, responses, edits, and follow-up responses, with 184 students creating at least one unique contribution. There were 265 questions asked during the quarter, with 99% receiving responses and an average wait time of 31 minutes. The percent of questions that received instructors’ responses or students’ responses was 83% and 27%, respectively. Of those students’ responses, 49% were endorsed as being correct by the professor or TA.

Discussion

Choosing to teach a course in a new, technology-enhanced format may seem like a “traditional versus online” pedagogical issue. But the HyFlex course model can provide a cohesive course delivery format for both settings (F2F and OL) while allowing students the flexibility to choose their desired learning format. The approaches are designed to enhance the learning environment—for both instructors and students. Incorporating computer-based and online activities in lieu of classroom seat time provides flexibility for today’s higher education learners. Instructors select and integrate the appropriate learning tools such that the class can provide all the benefits of a F2F course in an online format making sure
to align course learning objectives, assessments, and instructional activities (Stansfield, McLellan, & Connolly, 2004). The flexibility provided by online courses can broaden the university’s reach to students outside their original demographic, improving enrollment capacity and reducing commuting time, coupled with increased ability to accommodate students’ work schedules and increased accessibility to course information and materials, can aid in attracting students to online courses.

Note. Creston streaming was the backup lecture recording service. According to piloted data, Creston’s use paralleled that of Mediasite’s and is used to show the trend of viewing throughout the 10-week quarter, although the number of views may appear low. Data from the third lecture were not available due to a technical error with Creston Streaming on that day.
According to the pre-course questionnaire students completed, OL and F2F students preferred physically attending lecture to watching video-recorded lectures as their learning format. However, students choose the OL format due to scheduling conflicts and a preference for working at home. At the end of the quarter, the numbers of F2F students who indicated they preferred attending lectures versus watching video-recorded lectures had not changed. Interestingly, there was a rise in the number of OL students who preferred video-recorded lectures from 26.5% to 44.4% after the quarter completed. OL students also reported that the video-recorded lectures were a convenient way to access course material and aided in their knowledge, which could explain the rise in the amount of OL students who prefer video-recorded lectures. Viewing of video-recorded lectures followed an attendance pattern similar to in-person lectures: high attendance at the beginning of the quarter and prior to exams.

The goal of the course design was to aid in student success by providing flexibility and agency in allowing students access to the course either in-person or online. The course was highly rated overall by both OL and F2F students. Because F2F students did not change their preferred learning format after the 10-week course (as indicated on the post-course questionnaire), it can be inferred that a “one-size fits all” is not ideal for all students’ satisfaction and success. F2F students prefer in-class participation, while OL students value the option and convenience of the OL format. A recent review (Cohen et al., 2011) reported that postsecondary OL nutrition courses are as effective as F2F for improving cognitive-based outcomes. However, the authors found that not all students prefer OL methods or are highly satisfied with OL learning, which supports that a “one-size fits all” approach to the modern classroom is not ideal (Cohen et al., 2011). High-enrollment courses can benefit from having a HyFlex model approach to accommodate the varying learning formats available to today’s students, their preferences, and the increasing demand for classroom space.

Lessons Learned or Implications for Practice—or Both?

While the students did rate the course highly, 8-10% of OL students began attending F2F lectures after deciding the video-recorded lectures were not a beneficial way to learn course material. To ensure that students fully consider the nuances of both formats prior to their self-selection, we have begun stressing the positives and negatives of each format and advising students that the OL format is very dependent on self-regulated learning. Because lectures are only available for 7 days, OL students must be able to self-motivate to keep up with course information. In addition,
some students are not aware of the distractions that can occur outside of the classroom, which could negatively impact their ability to learn. A number of requests were made by F2F students for access to one or all video-recorded lectures due to changing work schedules or other personal time conflicts with lectures or extra-credit opportunities. We could not fulfill these requests without providing all F2F students with access; thus, we now provide all dates for lectures and extra credit offerings during the first week of instruction and emphasize that students must consider their ability to attend on these dates if they choose the F2F format. A frequently asked questions (FAQ) document regarding details of F2F and OL has since been created and is provided to all students during the first week of instruction to assist in their personal decision in selecting the course format that best fit their needs. These aspects of each format are now clearly articulated to students during the first week of the course as we hope this will reduce the number of students who are not satisfied with their format choice after the first week of the course.

Providing full access to OL and F2F modules throughout the course would be ideal to allow students the ability to fully individualize the course to their needs. However, in a large enrollment course, most universities do not have lecture halls that can accommodate F2F activities if all students choose to attend. For this reason, room reservations for exams and extra credit activities had to be made early in the quarter, and format selection could not be extended past the first week of the course.

**Overall Success of HyFlex and F2F**

To date, the HyFlex format has been continually offered great success and with ever increasing enrollments. We think the HyFlex mode of delivery offers several positives for students:

- Viewing lectures remotely offers students tremendous flexibility in completing coursework.
- For non-native speaking students and those that may be academically challenged, re-watching videos can aid students in material retention through multiple exposures.
- Utilizing online tools such as Piazza offers students as well as the instructor more efficient means to address course questions and engage students.
- Integration of OL with the existing F2F LMS platform allows for consistency in course content delivery across formats.
The students’ main reason for choosing the OL format was a preference for working from home. This suggests that providing this option to students and allowing them to adapt the course to their preference is a reason why the HyFlex version was successful. One positive about the OL format is the ability to pause or re-watch lectures. Based on usage data, we found that about a third of video-recorded lectures were watched a second time. As mentioned previously, there was a technical issue with one of the video-recording services, and the video was not available on one of the streaming networks. Having two video-recording services (Mediasite and Creston Streaming) was beneficial for the course to ensure that a video-recorded lecture was available to OL students for every lecture.

Another strength in our course design was to integrate the OL (for example, Mediasite, Piazza, quizzes) tools into the current LMS site. Having one main site for all course information allowed students to seamlessly navigate course information without needing to learn a new site or juggle two LMS sites for one course. Piazza was a very effective tool for communicating to students and engaging the class. This cut down on the amount of e-mails received by students, while allowing a common forum to interact with multiple students at once. Although student satisfaction with Piazza was not asked, the instructors think this tool considerably aided in the management of a high-enrollment course for both an OL or F2F format. Beffa-Negrini, Cohen, and Miller (2002) state that personal control is important for maintaining students’ motivation in an online course. We think that providing an integrated LMS and Piazza in our HyFlex course has greatly facilitated satisfaction with the OL format for both students and instructors.

Due to the inability to randomize students into the formats and clearly segregate students into F2F or OL when it came to lecture attendance, we were unable to clearly delineate the effect of course format on student performance. Future plans to overcome these limitations are currently underway, because direct assessments on student learning are greatly needed in this area to better understand the effect of format choice on student learning. For example, the use of student ID scanners to monitor lecture attendance and the creation of questionnaires tied to identifying information in order to assess learning comprehension pre- and post-course could be used to evaluate more effectively the effect of learning format on student performance.

The ability to deter academic misconduct was a concern when creating this course. The nutrition game show and supplemental lectures were followed by an online assessment to receive credit. To confirm that OL students watched the lecture in its entirety, a code word was given in the
middle of the lecture. OL students had to enter the correct code word into the quiz in order to receive extra credit. Students who entered the incorrect code word were not given extra credit. A similar feature was embedded into the game show and as observed in the two previously piloted summer quarters; this was a successful technique to promote the viewing of the lecture in its entirety and the playing of the game show.

Compared to previous quarters, with the addition of the OL format in Winter 2014 we were able to increase the enrollment of the course by 150+ students (over 20%). Today, the course is offered in a fully online version as well as F2F to approximately 1200-1400 students combined per quarter serving all University of California campuses. About 60% of the students opt for the fully online version and both modes are continually rated highly by students. This course would also be considered a “high touch” course, meaning there is an elevated amount of professor/TA interaction with students. The interactions can be facilitated both in-person (office hours and reviews/extra credit lectures) and virtually (e-mail and Piazza correspondence). We feel that the “high touch” experience has added to the overall success in this high-enrollment course by keeping students engaged and informed of course expectation and deadlines. Instructors should continue to consider further technology enhancements that will engage students, while at the same time assist with challenges due to growing enrollment and space limitations.

Conclusions

The primary goal of this study was to provide a detailed account of the methods used in the development, delivery, and assessment of the HyFlex model course. With the increasing need to understand how the HyFlex model can be implemented, this makes substantial contributions to the literature. Issues of design and delivery persist, however, and have implications for further research.

When adapting an in-person course into a HyFlex course, a great deal of time and care should go into developing online tools and resources that mirror those of the traditional online course. Additionally, an emphasis should be placed on the value of piloting the course to a smaller class, if possible, as a means to receive valuable formative feedback from students before the formal switch to the HyFlex model. Adapting a high-enrollment, general education course from an in-person format to a HyFlex format can be daunting for instructors. However, with proper attention to student needs during development and support from pedagogical and technical resources on campus, along with increased teaching assistant support, the
process can prove to be a fruitful way to balance the needs of students given the demands placed on enrollments and space.

**Footnotes**

1The GE requirement adds to that depth a breadth of knowledge and experiences represented by coursework outside of the area of the student’s major. The GE requirement also trains the student in four core “literacies” that faculty consider crucial for success, not only to one’s profession but also to thoughtful, engaged participation in the community, nation, and world; 24-40 credit hours of general education is required to graduate.

2During the summer sessions, enrollment was between 200-300 students. “As of 2017, students in OL classes at UCD are able to take exams online via proctored services.

**References**


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