Looking at the Impact of the Flipped Classroom Model of Instruction on Undergraduate Multimedia Students at CSUN

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Abstract

Scholars and practitioners have reported the positive outcomes of a flipped, or inverted, approach to instruction (Baker, 2000; Lage, Platt, & Treglia, 2000; Bergmann, 2011; Wright, 2011; Pearson, 2012; Butt, 2012; Bates, 2012). While many of the reports are anecdotal, the sheer number of instructors that have reported successful implementation of the strategy provides some evidence of its powerful use as an instructional method. This study provides a detailed case in which one approach of the Flipped Classroom Model of Instruction was applied in two classes at California State University Northridge. Student reports suggest that the approach provided an engaging learning experience, was effective in helping students learn the content, and increased self-efficacy in their ability to learn independently. Additionally, challenges and potential solutions to those challenges are discussed.

Keywords: Flipped Classroom, Technology Integration, Instructional Videos

Overview of the Flipped Classroom Model of Instruction

Flipping the classroom involves providing instructional resources for students to use outside of class so that class time is freed up for other instructional activities. The Flipped Classroom Model is described and defended by Mull (2012). While not all of the principles Mull describes are utilized by all teachers who flip their classroom, all implementations include the idea that, "Students prepare for class by watching video, listening to podcasts, reading articles, or contemplating questions that access their prior knowledge" (para. 3).

Milman (2012) explains "the idea is that rather than taking up valuable class time for an instructor to introduce a concept (often via lecture), the instructor can create a video lecture, screencast, or vodcast that teaches students the concept, freeing up valuable class time for more engaging (and often collaborative) activities typically facilitated by the instructor" (p. 85). Milman goes on to note that formative and summative assessment should be incorporated as well as meaningful face-to-face learning activities.

Proponents of a Flipped Classroom provide many arguments for engaging students in the content outside of the class to free up time in class for other instructional activities. Milman (2012) identifies what could be considered the primary advantage: increased class time for more engaging instruction. Millard (2012) describes advantages such as increased student engagement, strengthening of team-based skills, personalized student guidance, focused classroom discussion, and creative freedom of faculty while maintaining a standardized curriculum. Fulton (2012) notes that Flipped Classrooms allow students to move at their own pace, access

instruction at any time, access expertise from multiple people, benefit from better used classroom time, and more.

While many educators who have flipped their classrooms tout the benefits they experienced, there are critics to this approach. Nielsen (2012) discusses concerns with accessibility to instructional resources being provided online, the growing move towards no homework, increased time requirements without improved pedagogy, lack of adapting the classroom environment to reflect the flipped classroom's ability to support student-centered learning (allowing students to learn at their own pace), and use of lectures to provide instruction with disregard to individual student learning styles. Mull (2012) addresses several of the common concerns which, in addition to some previously mentioned, include teachers concerns that their role will be diminished, the students experience with the out-of-class instruction will not be interactive, a lack of accountability for students to complete the out-of-class instruction, and the restrictive cost and time needed to produce instructional materials. Milman (2012) also notes several concerns with the Flipped Classroom approach, including poor quality video production, conditions in which the students view the video, inability to monitor comprehension and provide just-in-time information when needed, and use with second language learners or students with learning disabilities.

Given all of the benefits and drawbacks of the approach, it appears that there is a place for the Flipped Classroom Model for at least some instructional contexts. "Although there are many limitations to the flipped classroom strategy and no empirical research exists to substantiate its use, anecdotal reports by many instructors maintain that it can be used as a valuable strategy at any level, depending on one's learners, resources, and time" (Milman, 2012, p. 86). Milman notes that while the Flipped Classroom approach lends itself well to learning of procedural knowledge, it can also be used for the learning of factual, conceptual, and metacognitive learning.

Intended outcomes

The purpose of this study was to investigate the effectiveness of the instructional approach and, if deemed worthwhile, identify ways to improve upon it. The choice to implement the Flipped Classroom model in the ctva361 course of the Cinema and Television Arts department at California State University Northridge (CSUN) was made because it appeared to have the potential of addressing several challenges. These challenges were providing consistent learning outcomes for the class regardless of the instructor, engaging students with diverse technical expertise during guided instruction, and providing time for students to apply what they learn to various situations.

First, there was a need to ensure that all students taking ctva361 (which is focused on web design) would meet the same learning objectives to be sufficiently prepared for ctva468—the capstone course—regardless of who taught the course. This issue arose when ctva468 (which is focused on the development of browser-based digital games) was modified to use Javascript, jQuery, HTML5, and CSS rather than Adobe Flash as the development tool for the course. As a result, the skills being developed in ctva361 needed to cover many of the prerequisite skills needed for ctva468. Because of this shift, the varied methods of teaching web design amongst ctva361 teachers to meet the learning objectives needed to be more consistent. Specifically, students needed to learn the underlying code (e.g. HTML, CSS, and Javascript) and become less reliant on software that generates code for them (e.g. Adobe Dreamweaver). Providing instruction outside of the classroom was intended to facilitate this transition by providing a single source of baseline instruction that all ctva361 students would experience regardless of who the instructor for the class is while still providing the instructor a great amount of flexibility over in-class activities and assigned projects.

Also, there was concern that class time was not being used efficiently due to the diversity in ability level of students. Previously, class time was spent mostly demonstrating how to write code to achieve desired results in a website while students followed along on their computers. To ensure that no students fell behind, this often required the instructor to walk around and help students individually while all other students would just be waiting. Providing instructional videos that students could work along with at their own pace from home was intended to provide them with a much more efficient way of learning. The intention was to give students a learner-centric environment in which they could learn at their own time and at their own pace.

Consistent with the primary purpose of the Flipped Classroom model of instruction, the use of instructional videos also was intended to free up class time for learning activities that provide students with opportunities to practice what they learned and apply that knowledge to

different situations. In the previous semester, the traditional approach of providing direct and guided instruction in class, and then expecting students to practice what they have learned and apply it to solve new problems when working from home, was problematic. Students, new to the content, did not have the individual support they needed when applying what they had just learned. Providing students with support during the application of learned skills was the primary rationale for implementing the Flipped Classroom model.

Implementation

The Flipped Classroom model of instruction was implemented in two sections of ctva361 (50 students in total) during the Spring 2013 semester. To facilitate this, 40 lessons were created to provide students with instruction outside of the classroom. 38 of these lessons were instructional videos (13.5 hours in total) created by the instructor, and two of the lessons were assigned readings. Quiz prep questions were provided along with each lesson. The learning process generally followed the same sequence. First, prior to class, students were expected to watch two to three video lessons (approximately 1 hour of video). Second, during class, a short quiz was given. This quiz was created from a subset of the quiz prep questions to encourage students to complete the assigned lessons and to provide the instructor daily formative assessment. Third, after the quiz, students were provided in-class activities to reflect on, discuss, and practice what they had learned. These activities were often teacher led demonstrations. Because students were expected to already know the content, the instructor was able to rely on students (by calling on individuals) to explain what to do to complete the task. Other times, the classroom activity was not teacher led; instead, students (sometime in small groups) completed an assigned task while the instructor provided individual guidance as needed. Regardless of how the in-class activities were structured, they often provided students with a variation of the tasks they completed when watching the video, providing opportunity both for practice and transfer of learning to new situations.

The instructional videos were made available to students online where they remain at http://www.jacobenfield.com/allThingsWeb. For students who had difficulty playing the videos online, a download option was made available. The videos were designed with student participation in mind. It was expected that students would not just watch the videos but also take a more active role by working along with the videos.

The choice to create videos on my own instead of using videos created elsewhere was influenced greatly by my experience teaching the same course in the prior semester. In that course I was purposefully attempting to develop students into independent learners by showing them how to search for and analyze information online instead of giving them the answers outright. This caused a great amount of frustration among students who believed it was my duty to teach, not direct them elsewhere for information. As powerful as Google is to truly independent learners, the phrase "Google it" can infuriate students who believe they are paying for a structured education where the role of the teacher is to "teach" more than it is to facilitate learning in an independent learning environment.

Carolyn Durley had a similar experience in her first attempt at flipping her 12th grade biology classroom. She wrote, "I found that some students were angry at me when they showed up in Grade 12 and said, 'What do you mean you're not going to teach me. That's what you do. Come on.' They needed proof that I was still their teacher, that I do know the content" (Pearson, 2012). With her and my experience in mind, I decided to create my own videos despite the fact that all students at CSUN have access to professionally made lynda.com instructional videos. Also, like Carolyn Durley, I continued to provide some 'stand and deliver' lessons in class so that students would not feel that they were not receiving the traditional form of education that they have come to expect.

Experience of the Instructor

Much effort was put forth into the creation of the instructional videos. The videos were created without the use of a script and the videos were not edited. Therefore, each lesson took several takes. For cost efficiency, QuickTime player was used for screen and audio capture, and Miro Converter was used to compress the original mov files to mp4 and webm files for use on the Web via the HTML5 video tag. It is estimated that the production of the 13.5 hours of video instruction, the creation of the accompanying quiz prep questions, and the creation of the website to hold the videos and prep questions took approximately 50 hours.

While a great amount of time was needed to develop the video lessons, the amount of time to prepare for classes throughout the semester was

greatly reduced. The prep questions proved to be a quick way for the instructor to review before class what content was covered in the lessons. Additionally, assessment of student understanding was revealed quickly during in-class activities and student engagement during class appeared to be high.

The use of daily quizzes appeared to be a strong motivator for students to watch the videos. An evident drop off of engagement and attendance was noticed after the video quizzes ceased towards the end of the semester.

Administratively, the Flipped Classroom model of instruction proved to be valuable. Previously, when students were absent from class or needed remediation over a previously covered concept I would have to spend time covering the same material again either individually or with the entire class. Once the instruction was made available for students to watch at their own convenience and as many times as needed, it was much easier to direct students to a particular video to answer a question. While students would need additional assistance at times, the videos proved to be a valuable resource in terms of reducing repetitive instruction given directly by the instructor. In fact, the videos proved to be a useful resource for students from previous semesters who would ask for help on completing a task they had learned when taking the class. As hoped, no student voiced any opposition to the instructional videos for reasons that the instructor was not fulfilling their role as teacher. The students seemingly accepted the instructional videos as an extension of the teacher.

Experience of the Students

Survey data was collected from all students who were present the day the survey was given and agreed to participate (n=37). To investigate any relationships between students' performance in class and their survey responses, participants were placed into three groups. The *Top* group was comprised of students who received 90% or higher in the course (n=14). The *Middle* group was comprised of students who received 70% to 89% in the course (n=16). The *Low* group was comprised of students who received less than 70% in the class (n=7). To encourage students to answer honestly, the survey data was not made accessible to the instructor until after grades were submitted. Student responses were collected in regards to the (a) instructional videos assigned for out-of-class preparation, (b) the in-class instructional activities, and (c) the more general impact the course had on students.

Instructional Videos

Responses to survey items 1-12 were used to collect multiple-choice data on particular areas of interest in the use of instructional videos. Item 13 *(Please provide any additional comments related to the instructional videos used for this course.)* gave students the opportunity to provide further information in an open-ended manner.

All students reported that the use of instructional videos was either very helpful (62.2%) or somewhat helpful (37.8%) for learning HTML and CSS while none of the students felt that the videos were not helpful (see Table 1). Interestingly, the top performing students were less likely to report that the videos were very helpful (35.7%) than the middle (68.8%) and bottom (71.4%) students. Responses to item 13 ranged from "The videos were awesome." and "The videos were a great resource." to "Video [as an instructional medium] is too fast. Text may be better for code".

As shown in Table 2, while a small number of students (5.4%) found the content of the videos not interesting, most students found the content to be somewhat engaging (56.8%) or

Table 1: Responses to Survey Question 1: How effective did you find the instructional videos in helping you learn HTML and CSS?

	All (n=37)	Top (n=14)	Middle (n=16)	Bottom (n=7)
Very helpful	62.2% (23)	50% (7)	68.8% (11)	71.4% (5)
Somewhat helpful	37.8% (14)	50% (7)	31.3% (5)	28.6% (2)
Not helpful	0% (0)	0% (0)	0% (0)	0% (0)

Table 2. Responses to Survey Question 11: In general, I found the content of the videos to be:

	All (n=37)	Top (n=14)	Middle (n=16)	Bottom (n=7)
Very engaging/interesting	37.8% (14)	57.1% (8)	37.5% (6)	0% (0)
Somewhat engaging/interesting	56.8% (21)	42.9% (6)	50% (8)	100% (7)
Not interesting	5.4% (2)	0% (0)	12.5% (2)	0% (0)

Table 3. Responses to Survey Question 10: In general, I found the content of the videos to be:

	All (n=37)	Top (n=14)	Middle (n=16)	Bottom (n=7)
Too difficult	5.4% (2)	0% (0)	0% (0)	28.6% (2)
Appropriately challenging	94.6% (35)	100% (14)	100% (16)	71.4% (5)
Too easy	0% (0)	0% (0)	0% (0)	0% (0)

Table 4. Responses to Survey Question 2: The average duration of the videos was 20 minutes.

	All (n=37)	Top (n=14)	Middle (n=16)	Bottom (n=7)
Too long for the given content	32.4% (12)	35.7% (5)	31.3% (5)	28.6% (2)
Appropriate duration for the given content	64.9% (24)	64.3% (9)	62.5% (10)	71.4% (5)
Too short for the given content	2.7% (1)	0% (0)	6.3% (1)	0% (0)

very engaging (37.8%). Not surprisingly, the top performing students were more likely to rate the content as very engaging (57.1%) than the middle performing students (37.5%) and the bottom performing students (0%).

Almost all students (94.6%) believed the videos to be appropriately challenging (see Table 3). It is worth noting that 100% of students in the top and middle performing groups felt the videos were appropriately challenging while 71.4% of the students of the bottom group found the videos appropriately challenging and the remaining 28.6% of the bottom group found the videos too difficult. None of the students found the videos too easy.

While 64.9% of students reported that the 20-minute average length of the videos was appropriate for the given content, 32.4% felt the videos were too long and 2.7% felt they were too short (see Table 4). Several students made comments that the videos should be more concise and/or edited to remove errors, pauses, and redundant instruction. One student commented that videos felt long, suggesting "perhaps split them into smaller parts. Even though it would be the same amount of material, it would make it seem like less of a load."

How appropriate did you find the length of these videos?

Students were expected to watch about an hour of instructional videos between each class. Most students (73%) felt the amount assigned was appropriate while the remaining students (27%) felt it was too much (see Table 5). None of the students felt the amount of video assigned was too small. As might be expected, bottom-performing students were more likely to feel the amount of video assigned was too much (42.9%) than the middle-performing students (25%) and the top-performing students (21.4%).

For this content, was amount of video appropriate?

Students were encouraged to take notes on the videos, answer the questions provided with each video (in which all quiz questions were drawn from), and work along with the videos. Each of these strategies was found to be effective to the majority of students. Most students felt taking notes was very helpful (51.4%) or somewhat helpful (21.6%) in learning the content (see Table 6). Other students felt that taking notes was not helpful (16.2%) or did not attempt this strategy at all (10.8%). The strategy of answering questions provided with each video was reported by students to be slightly more helpful than note taking. Most students felt that answering the questions provided was very helpful (62.2%) or somewhat helpful (24.3%) in learning the content (see Table 7). Other students felt the questions were not helpful (8.1%) or did not attempt this strategy (5.4%). Working along with the videos was perceived by students to be the most useful of all strategies. While 13.5% of the students never attempted this strategy, all who did found that working along with videos was very helpful (75.7%) or somewhat helpful (10.8%) in learning the content (see Table 8). No students found working along with the videos to be not helpful.

Quizzes were given at the beginning of each class period over the assigned videos to encourage students to keep up with the instruction and be prepared for class. Most students (81.1%)

Table 5. Responses to Survey Question 4: Typically, you were asked to watch about an hour of instructional videos between each class session.

	All (n=37)	Top (n=14)	Middle (n=16)	Bottom (n=7)
The amount of video to watch was too much	27% (10)	21.4% (3)	25% (4)	42.9% (3)
The amount of video to watch was about right	73% (27)	78.6% (11)	75% (12)	57.1% (4)
The amount of video to watch was too little	0% (0)	0% (0)	0% (0)	0% (0)

*Table 6. Responses to Survey Question 5: Did you find **taking notes** while watching the videos helpful in learning the content?*

	All (n=37)	Top (n=14)	Middle (n=16)	Bottom (n=7)
I never attempted this strategy	10.8% (4)	14.3% (2)	0% (0)	28.6% (2)
Very helpful in learning the content	51.4% (19)	57.1% (8)	56.3% (9)	28.6% (2)
Somewhat helpful in learning the content	21.6% (8)	14.3% (2)	18.8% (3)	42.9% (3)
Not helpful in learning the content	16.2% (6)	14.3% (2)	25% (4)	0% (0)

*Table 7. Responses to Survey Question 6: Did you find **answering the questions provided** while watching the videos helpful in learning the content?*

	All (n=37)	Top (n=14)	Middle (n=16)	Bottom (n=7)
I never attempted this strategy	5.4% (2)	7.1% (1)	6.3% (1)	0% (0)
Very helpful in learning the content	62.2% (23)	64.3% (9)	50% (8)	85.7% (6)
Somewhat helpful in learning the content	24.3% (9)	21.4% (3)	31.3% (5)	14.3% (1)
Not helpful in learning the content	8.1% (3)	7.1% (1)	12.5% (2)	0% (0)

stated that they were more likely to watch the videos because there were quizzes. The remaining students reported that they were equally likely (13.5%) or even less likely (5.4%) to watch the videos because of the quizzes.

Technical issues (e.g. accessing, streaming, and downloading the videos) plagued many students (see Table 10). 32.4% of students reported that technical issues negatively impacted their learning. 45.9% of students reported that the technical issues were annoying at times but did not impact learning. Only 21.6% of students felt that technical issues were not annoying and did not impede their learning. Some of the variation in responses may be due to how students chose to watch the videos. Students had the op-

*Table 8. Responses to Survey Question 7: Did you find **working along with the videos** helpful in learning the content?*

	All (n=37)	Top (n=14)	Middle (n=16)	Bottom (n=7)
I never attempted this strategy	13.5% (5)	14.3% (2)	12.5% (2)	14.3% (1)
Very helpful in learning the content	75.7% (28)	71.4% (10)	81.3% (13)	71.4% (5)
Somewhat helpful in learning the content	10.8% (4)	14.3% (2)	6.3% (1)	14.3% (1)
Not helpful in learning the content	0% (0)	0% (0)	0% (0)	0% (0)

*Table 9. Responses to Survey Question 9: How did the use of quizzes impact your **motivation** to watch the videos?*

	All (n=37)	Top (n=14)	Middle (n=16)	Bottom (n=7)
I was **more likely** to watch the videos because there were quizzes	81.1% (30)	78.6% (11)	75% (12)	100% (7)
I was **equally likely** to watch the videos whether there were quizzes or not	13.5% (5)	14.3% (2)	18.8% (3)	0% (0)
I was **less likely** to watch the videos because there were quizzes	5.4% (2)	7.1% (1)	6.3% (1)	0% (0)

Table 10. Responses to Survey Question 12: How did technical issues (streaming, downloading, accessing from various devices, etc..) of watching the videos affect your learning?

	All (n=37)	Top (n=14)	Middle (n=16)	Bottom (n=7)
Technical issues of watching the videos **negatively impacted** my learning.	32.4% (12)	21.4% (3)	50% (8)	14.3% (1)
Technical issues of watching the videos **were annoying at times but did not impact** my learning.	45.9% (17)	57.1% (8)	25% (4)	71.4% (5)
Technical issues of watching the videos **were not annoying and did not impact** my learning.	21.6% (8)	21.4% (3)	25% (4)	14.3% (1)

tion of watching the compressed videos online or downloading the original full quality videos prior to watching them. Due in part to the large file size of the videos (even after compression), watching the videos online could be problematic, especially with slow Internet speed. Jumping forward or backward in the video often caused long delays in loading and at times would freeze the video indefinitely—requiring the user to refresh the page. Students who downloaded the videos did not have these issues and could jump around in the video without delay. The only disadvantage of downloading the videos is that it could take a long time to download. "Streaming was poor and videos were difficult to navigate" and "downloading took too long" were typical comments. One student suggested, "YouTube or Vimeo would be much appreciated.

In-class Activities

Responses to survey items 14-17 were used to collect multiple-choice data on particular areas of interest in the use of in-class activities. Item 18 *(Please provide any additional comments related to the in-class activities used for this course.)* gave students the opportunity to provide further information in an open-ended manner.

The in-class activities primarily included:

- Instructor led demonstration of new concepts (mostly the use of Photoshop to create photo manipulations and mock-ups of web designs)
- Instructor led demonstration of concepts previously introduced in videos (mostly HTML and CSS but also JavaScript, jQuery, and PHP)
- Group activities and tasks to practice concepts and skills previously learned
- Open lab time to work on assigned projects while instructor helped students individually.

Students were asked (in survey question 14) to rank each of these four activity types from 1 (most engaging) to 4 (least engaging). While some students ranked the items as expected (n=24), other students (n=12) scored each activity independently, giving the same score to more than one activity. Both sets of data proved useful.

For the students that ranked the activities, a rank score was calculated for each activity by using the following formula that gives a heavier weight to higher ranked activities.

Rank score = (number of students that gave the activity a score of 1) * 3

+ *(number of students that gave the activity a score of 2) * 2*
+ *(number of students that gave the activity a score of 3) * 1*
+ *(number of students that gave the activity a score of 4) * 0*

Therefore, with 24 respondents, an activity could have, at best, a rank score of 72 (if all respondents ranked it first) and, at worst, a rank score of 0 (if all students ranked it last).

In addition to a rank score, a mean score was also calculated using the responses from the 12 students who did not rank the activities but instead scored them individually. The mean score could have at best a mean score of 1 (if all students scored it at the highest level of engagement) and, at worst, a mean score of 4 (if all students scored it at the lowest level of engagement). Table 11 shows the rank and mean score for each in-class activity type.

Based on this data, it is clear that *group activities to practice previously introduced skills* was considered to be least engaging by students. Similar findings were reported by students when asked (in survey question 15) to rank the same activities from least helpful to most helpful (see Table 12).

It is worth noting that students were expected to work along with the activities during instructor led demonstrations (for both new concepts and previously learned concepts). To ensure that students did not fall behind, this involved regular pauses in instruction to help students who were having trouble with a step. One student commented on the slow pace of in-class instruction due to having to wait for students to catch up and another mentioned that one-to-one help is most helpful. This is consistent with the observations I made that some students who more easily kept up with the demonstration would become frustrated at students who often needed assistance. However, most students appeared to be very understanding of the continuous pauses and almost all students required assistance at different times, often because of very subtle syntax errors in their code or links to files not matching the actual file locations.

Additionally, for content previously covered, the instructor regularly called on students for what to do next instead of telling the students outright. So, while the instructor's work was al-

ways projected on the overhead screen for students to follow along, the instruction was often student led.

The practice of calling on students was used to increase engagement and to provide the instructor with formative assessment of student understanding. Most students found the practice to be **effective for learning the content** with 51.4% stating it was very effective, 37.1% stating it was somewhat effective, and 11.4% stating it was not effective (see Table 13). Also, most students found the practice to be **necessary in maintaining engagement** with 31.4% stating it was always necessary, 60% stating it was sometimes necessary, and 8.6% stating it was never necessary (see Table 14). One student commented that they were not very social and typically did not like to be singled out in class but that I (the instructor) did it in a manner that did "not make students feel stupid for not knowing the answer".

As mentioned, in-class activities over new material were mostly related to the use of Photoshop. Five students made comments that the Photoshop was not sufficiently covered (a sentiment I heard from several students prior to the survey as well) and one student noted that the pace of in-class instruction was too slow. While the in-class lessons could definitely be improved (as could the video lessons), my observations led me to believe that students became reliant on the video style of instruction that allowed them to work at their own pace. This hypothesis was formed from informal observations that students from the previous semester's class (before the flipped classroom model of instruction was introduced) appeared to do much better with the Photoshop lessons and assignments than they did with the HTML and CSS lessons (both of which were given in-class only) while students who experienced the flipped model appeared to do much better with the HTML and CSS lessons (provided in videos) than they did with the Photoshop lessons (provided in class). As further evidence of the shift in mindset, one student commented, "Need more time on Photoshop. [I was] confident in class but struggled once I got home."

I believe that one of the strengths of the course was that the in-class activities were almost always designed around what students had learned from the video. In the words of one student, "the in class activities always complimented what we learned at home and kept me on my feet in terms of making sure I knew the material."

General Impact of the Course on Students

Responses to survey items 19-21 were used to collect multiple-choice data on particular areas of interest in how students were impacted by taking the course. Item 22 *(Please provide any additional reflections about your experience in the course.)* gave students the opportunity to provide their general impressions of the course in an open-ended manner.

One of the reasons for adopting the Flipped Classroom model of instruction was a hypothesis that providing instruction out of class would help students become more confident in their ability to learn independently (without teacher instruction within a formal class). Helping students develop into independent learners is important in the area of Multimedia Production because the skills needed in this industry are continuously changing and industry professionals must have the wherewithal to keep up with this change. In the previous semester course, much effort was put into showing students how to find and use resources online to answer questions. This approach proved to be detrimental as many students showed frustration that the teacher was not teaching and they were just being told to "Google It". I saw the Flipped Classroom approach as an alternative method for more subtly getting students to use out of class instruction (albeit, instructional videos that I created) in hopes of promoting their self-efficacy in regards to learning independently. This hypothesis is strongly supported by the data with 73.5% of students reporting that they are more confident in their ability to learn a new technology without taking a formal course than they were before taking this course (see Table 15). Only 23.5% of students stated that their confidence had not changed and one student (2.9%) reported that they were less confident.

Another indication that students are more confident in their ability to learn outside of a formal classroom was their increased likelihood to watch instructional videos in the future. 61.8% of students reported that they were more likely to use instructional videos than they were prior to taking the course (see Table 16).

As shown in Table 17, all students felt that the content and skills learned in this class will be useful with 88.2% stating that what they learned will be useful both professionally (career related) and personally (non-career related). 2.9% of students believed the content and skills learned would be useful only professionally and 8.8%

*Table 11. Rank and mean score of **engagement** for each in-class activity type*

Rank (n=24)	Mean (n=11)	In-class activity type
52	1.33	Instructor led demonstration of new concepts
45	1.25	Instructor led demonstration of concepts previously introduced in videos
27	1.92	Group activities to practice skills previously introduced in videos
41	1.75	Lab time to work on assigned projects with individual instructor support

*Table 12. Rank and mean score of **helpfulness** for each in-class activity type*

Rank (n=23)	Mean (n=11)	In-class activity type
49	1.45	Instructor led demonstration of new concepts
47	1.27	Instructor led demonstration of concepts previously introduced in videos
21	2	Group activities to practice skills previously introduced in videos
41	1.55	Lab time to work on assigned projects with individual instructor support

Table 13. Responses to Survey Question 16: The practice of calling on students to perform tasks that were introduced in the video was

	All (n=35)	Top (n=14)	Middle (n=15)	Bottom (n=6)
Very effective in helping me learn the content	51.4% (18)	57.1% (8)	40% (6)	66.7% (4)
Somewhat effective in helping me learn the content	37.1% (13)	35.7% (5)	46.7% (7)	16.7% (1)
Not effective in helping me learn the content	11.4% (4)	7.1% (1)	13.3% (2)	16.7% (1)

Table 14. Responses to Survey Question 17: The practice of calling on students to perform tasks that were introduced in the video was

	All (n=35)	Top (n=14)	Middle (n=15)	Bottom (n=6)
Always necessary in maintaining my engagement during in-class demonstrations	31.4% (11)	42.9% (6)	20% (3)	33.3% (2)
Sometimes necessary in maintaining my engagement during in-class demonstrations	60% (21)	35.7% (5)	80% (12)	66.7% (4)
Never necessary in maintaining my engagement during in-class demonstrations	8.6% (3)	21.4% (3)	0% (0)	0% (0)

Table 15. Responses to Survey Question 19

	All (n=34)	Top (n=13)	Middle (n=15)	Bottom (n=6)
I am **more confident** in my ability to learn a new technology without taking a formal course than I was before taking this course.	73.5% (25)	76.9% (10)	66.7% (10)	83.3% (5)
My confidence in my ability to learn a new technology without taking a formal course has **not changed** since before taking this course.	23.5% (8)	23.1% (3)	26.7% (4)	16.7% (1)
I am **less confident** in my ability to learn a new technology without taking a formal course than I was before taking this course.	2.9% (1)	0% (0)	6.7% (1)	0% (0)

Table 16. Responses to Survey Question 20

	All (n=34)	Top (n=13)	Middle (n=15)	Bottom (n=6)
I am **more likely** to use instructional videos than I was before taking this course.	61.8% (21)	53.8% (7)	66.7% (10)	66.7% (4)
I am **equally likely** to use instructional videos than I was before taking this course.	38.2% (13)	46.2% (6)	33.3% (5)	33.3% (2)
I am **less likely** to use instructional videos than I was before taking this course.	0% (0)	0% (0)	0% (0)	0% (0)

Table 17. Responses to Survey Question 21: I believe the content/skills I learned in this class will be useful:

	All (n=34)	Top (n=13)	Middle (n=15)	Bottom (n=6)
Professionally (career related) **and** Personally (non-career related)	88.2% (30)	92.3% (12)	93.3% (14)	66.7% (4)
Only professionally	2.9% (1)	0% (0)	6.7% (1)	0% (0)
Only personally	8.8% (3)	7.7% (1)	0% (0)	33.3% (2)
Neither professionally or personally	0% (0)	0% (0)	0% (0)	0% (0)

of students reported that the content and skills learned would be useful only personally. No students responded that the content learned would be useful neither professionally nor personally.

Most of the comments made by students about the course were generally very positive. Several students expressed that they learned much and were engaged. One student stated they were "engaged by choice, not by force" and appreciated the "laid back learning environment." Another said they "learned a lot and had fun." Still another student stated "[This was] such a good class. [I] will remember everything. Very engaging." Students also commented positively on the instructional model that was used. One student stated that they have "never taken a class like this and really enjoyed it." Another student commented that they "like the hybrid approach a lot. Reviewing material was more efficient than having all instruction in class." Still another student said that they "became very motivated to learn material online."

While most comments were positive, some comments were made on the shortcomings of the course and how it could be improved. One student stated that "My personal learning and personal development was not taken into consideration" and another stated that they "would have liked weekly deadlines for digital art projects [instead of one deadline for all of them]." One student stated that they "enjoyed [the class], but [it is] not something [I am] interested in doing in the future." However, none of the critical/constructive comments directly informed the strategies used as part of the flipped classroom model of instruction.

Advantages

Flipping the classroom benefited the instructor in several ways. While much time was required prior to the beginning of the semester to develop the instructional videos for the course, there was a significant decrease in the amount of preparation time required for each class meeting and in the amount of time spent on remediation. Providing video lessons that students could watch as many times as needed greatly reduced the need for repetitive instruction. Administratively, the videos provided a good resource to direct students to when they were absent from class. The videos also provide the department with the option of providing the same core instruction to all students taking the course, regardless of the instructor. This could be particularly useful in the CTVA department that utilizes many adjunct instructors and with the ctva361 course that is intended to give students the prerequisite skills needed in a subsequent required course.

Based on the findings from this study, it appears that students also benefitted from the flipped classroom approach. Most students found instructional videos helpful, engaging, and appropriately challenging. They appreciated the ability to move through the instruction at their own pace and found note taking, answering questions provided, and working along with videos all effective strategies for learning the content provided in the videos. Additionally, most students found regular quizzes to be a strong motivation to keep up with the instructional videos that were assigned.

Students also report that the in-class activities were engaging. This is not surprising given the amount of involvement expected of students in the activity focused lessons; and even with the instructor led demonstrations of previously learned content in which students were regularly called on to tell the instructor what step to take next to accomplish a task. In this regard, most students believed that the practice of calling on students was both effective for helping them learn the content and necessary in maintaining their engagement during class demonstrations.

Lastly, most students reported that they were more confident in their ability to learn a new technology without taking a formal course, and more likely to use instructional videos, than they were prior to taking this course. The improvements in self-efficacy in regards to independent learning indicate that the flipped classroom model may be appropriate for preparing students for 21st century career that will require continued on the job learning.

Challenges

Several challenges were made apparent during this initial trial of the flipped classroom approach as well as during the analysis of the data collected in the study after the class ended. In terms of the videos, sufficient time must be spent developing the videos (or other instructional materials) or finding pre-existing materials that sufficiently cover the content. Also, technical issues should be addressed. Students should be able to access, watch, pause, and move back and forth in the videos without experiencing delays or other technical issues. While repetitive instruction is important in face-to-face instruction, it appears to be less important and sometimes frustrating for learners in video instruction. This is logical given students can easily replay parts of the video if they want instruction repeated.

Another challenge that must be met when developing online instruction is to ensure that the instructional materials comply with the Americans with Disabilities Act (ADA), Section 508 Amendment to the Rehabilitation Act of 1973, and other legislation protecting the rights of people with disabilities. The California State University system launched the Accessible Technology Initiative (ATI) in 2006 to assist campuses in carrying out the accessible technology provisions, including Instructional Materials Accessibility (ATI, 2013). The goal of ATI is "to make all instructional materials accessible and available in a timely manner to all learners to meet the accessibility requirements mandated by CSU Executive Order 926" (ATI, 2013). For instructional materials that are in electronic form (such as video presentations), compliance would involve providing learners with disabilities tools such as a screen reader or closed captioning.

Lastly, while students are relatively understanding of mistakes and pauses in face-to-face instruction, they tend to expect instructional videos to be edited so that there are no errors or unneeded pauses. Considering that many students (possibly over several semesters) will use the videos, the time required to edit the videos to be concise would be worthwhile. Besides being more efficient, editing the videos would give students a more clear and engaging learning experience.

In-class activities also need to be well planned. While students in this course mostly found the in-class activities engaging and helpful for learning, there is much room for improvement. For instance, the group activities (which students found least helpful) were often just given to students to work on without applying group learning strategies (e.g. assigning roles to team members, providing both group and individual incentives, etc.). During lab time, some students worked individually and only sought assistance from the instructor. Because I was able to only help one student at a time, this resulted in students waiting for long periods of time for help. While students still reported that lab time was useful, I believe that developing strategies for students to collaborate and support one another could make the lab time more useful. While the class time freed up by the flipped classroom approach provides the instructor with the opportunity to enrich student learning through practice and application of learned skills to new situations, this brings new challenges for teachers on how to effectively use this class time. This may be especially challenging for teachers who are accustomed to the tradition teaching practice of direct instruction.

Meeting Challenges: A Look Towards the Future

Despite this being my first attempt at creating a series of videos for a significant amount of the content of a course; despite never having attempted the flipped model; and despite implementing this in my first year of teaching this subject at the university level—I believe, the flipped classroom experiment was a success. Therefore, meeting the emergent challenges that come with the approach is worthwhile.

In this case, meeting the challenges will entail reproducing the instructional videos so that they are concise, edited, and distributed in a manner that all students have access and can use without technical issues. In addition, I intend to explore the use of video analytics to better understand how students use the instructional videos. Video analytics will not only let me see when and how many times a student accesses a video, but will also allow me to see when they are pausing, what parts of the video do they repeat, and how long it takes students to get through the video. The latter is a key piece of information for the videos I create because they were designed so that students will not just watch the videos but work along with them as well.

As mentioned, exploring effective use of class time is needed. This includes coming up with engaging activities and improving on the activities I have already implemented. Calling on students for guided demonstrations appeared to be an effective way to engage students with the content they have learned. Other strategies, particularly those that required students to work together, need to be better designed.

Making the videos ADA compliant so they are accessible by students with disabilities will involve providing captioning and/or transcriptions of the video.

> Captioning is the process of creating text to display during the audio portion of a video as it occurs. It not only benefits viewers with hearing impairments or deafness but also supports the concept of universal design by producing far reaching and often unanticipated benefits to others. Captioning can help reduce language barriers by making it easier to understand speakers with accents or instances where the viewer and speaker have different native languages. Another benefit of captioning is that it can facilitate more flexible use, for example in a noisy environment or for

> computers without the ability to playback sound. In addition, the captions can improve comprehension for some learning styles or for viewers with certain learning disabilities. It can also be helpful for topics that are complex or contain technical terms or for audio that was recorded poorly or in a noisy environment. (Captioning, 2013)

Adding captioning to, and/or transcriptions of, the videos could be especially helpful for instruction that involves text-heavy skills, such as the videos used for this class that provide lessons on how to write HTML and CSS code. As one student pointed out, "video is too fast. Text may be better for [learning] code."

The flipped classroom model is one possible step towards a more customized learning environment. The approach encourages students to move out of the classroom to learn anytime and anywhere. Students are allowed to move at their own pace through the instruction using whatever study strategies they find most useful. Providing students with alternative ways to learn is another strategy to promote personalized learning. Captioning and transcribing instructional videos is one way of achieving this personalization; providing students who have various learning styles more personalized choice in how to take in information.

A true look to the future of learning, however, must take into account the educational system that surrounds our classes. Fully implementing a learner centric approach will require rethinking the traditional school system that is built around semesters and credit units. While teachers have the flexibility within a class to employ learner centric instructional strategies, they are restricted by the current educational system, which requires that all students complete the learning objectives of the course in the same amount of time (typically one semester). Along with many other suggestion for a learner centered paradigm of education, Watson and Reigeluth (2008) suggest that this time-based system should give way to a mastery-based system that allows students to work at their own pace as long needed in order to achieve mastery of a topic. The flipped classroom model of instruction may be one strategy that works for our current educational systems and would fit well into a mastery-based education system.

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