Action research: The flipped classroom

Quentin Hammock

Wright State University

Abstract: new technological advancements over the last few years have opened up many new opportunities for teachers to flip their classrooms like never before. With multimedia and Web 2.0 interactive applications, students can now take their teachers home with them, virtually speaking. However, despite the leaps and bounds in technology, some teachers still struggle with the reality that not all students will engage with the content. This research first takes a look at numerous flipped classroom models tested and/or currently in use. To add to the literature, in an effort to truly see how engaged students might get in a flipped classroom environment, two eighth grade French classes participated in a two-part action research project to see how many students came to class prepared after acquiring the "lecture" at home the night before.

Introduction

The idea of "flipping" or inverting the classroom has been tried in one form or another for many years. With the explosion of mobile, media-rich technology in the last few years, those in the field of education are rethinking the entire flipped concept. Instead of simply having students teach themselves lessons at home by simply reading a section of the text book, or other course material, educators now have the capability to communicate with their students twenty-four hours a day, seven days a week, so to speak. This technology has made it possible for out-of-class learning to be an active, rather than a passive experience. Students can interact with course content in completely new ways. These breakthroughs are driving resurgence in the flipped classroom concept in today's schools. In this review, the flipped classroom concept is explored from a pro and con point of view through a review of literature on this topic. The literature included in this review was selected based upon the emphasis placed on using technology as a means flipping the classroom.

In a research article by Lage, Platt, and Treglia (2000) approached the use of the flipped classroom from a teaching style perspective, stating that lecturing is the only teaching style present in the traditional classroom. In this article, the authors address the issue of a singular teaching style by testing a flipped classroom model on a few of their course sections, and then presented the student and faculty observations as to how the flipped course went. These instructors, who teach in the economics department at Miami University, conduct this investigation in an economics introductory course. The investigation was set up rather similarly to the structure of the traditional economics lecture class; the entire class met two times a week, while being required to come to class fully prepared. Rather than using class time for lecturing

and taking notes, class time was instead devoted to farthing students' knowledge, through the use of class activities and group work.

Lage, Platt, and Treglia (2000) demonstrate the way in which they attempted to change their introductory economics course to include multiple teaching styles. In addition to reading the assigned text, students were able to choose from a few other materials from which to receive their instruction. Lectures normally given in class were made available through video recordings or narrated PowerPoint presentations. To access the video recordings of the lectures, students needed to provide a VHS tape to have the lectures dubbed onto. The narrated PowerPoint presentations were made available in a number of different ways. Students could access the presentations in the school of business computer labs, download the presentations from a website on the internet, or purchase a copy of a print version of the PowerPoints. Once students came to class, after fully reviewing the assigned material outside class, would participate in economic experiments and activities, as well as complete worksheets that would occasionally be collected to ensure students were coming to class fully prepared.

This piece of literature also presents the perceptions of the students and faculty that participated in this flipped classroom study. "To examine students' perceptions of the class, the instructors administered an end of the semester survey in all sections of principles of microeconomics taught using the inverted classroom" (Lage, Platt, and Treglia, 2000, p. 6). Students' overall impression of the flipped course was positive. The survey revealed that many students felt as though they learned more with the flipped classroom format, and that students enjoyed the group work and activities during class time. In addition, students also felt as though the workload in this flipped course was heavier than the other courses students were taking that semester. The two economics faculty that taught the course also felt very positive over the

experience. The instructors noted that it seemed as though the students in the inverted classroom were more motivated to learn the material. The authors of this article proposed an explanation for the students' performance, and cited, "…this type of classroom demanded that students take ownership of their learning. Because the flow of instruction was determined by the student, they felt more responsible for their learning" (Lage, Platt, and Treglia, 2000, p. 8). It was also noted by the two faculty that it seemed as though students learned from each other though the group work completed in class. Additionally, the instructors noticed that students seemed to feel more comfortable asking questions because of the increased opportunity for one-on-one interaction with the flipped classroom format. Another finding from this research is the distinction between male and female students in regards to satisfaction in the course. Overall, it was found that females generally felt they learned more from this course format, and were clearly more active participants in class.

Lage, Platt, and Treglia (2000) compare and discuss the requirements of the traditional and inverted class formats. It is noted that the inverted classroom might require a smaller enrollment number, which would allow for more faculty interaction with students, as well as the ability for faculty to monitor student performance more closely. This article also discusses the possibility and needs of converting a small scale flipped classroom to a large section. In addition, Lage, Platt, and Treglia (p. 1) discuss the various startup costs when creating a flipped course. Several resources were discussed that make the outside class work possible, including a website to host course materials, such as the PowerPoints and handouts. Recommendations are also made with regards to reducing the amount of startup costs, such as working with other faculty to develop course material in house, such as video lectures, rather than paying a company to create the files.

A corresponding article by Lage and Platt (2000) briefly describes the inverted classroom format, as well as how the out of class material that was organized on the internet. The website used to organize the content for the introductory economics course was divided into four different areas that simulated real student learning environments—the classroom, the desk, the coffee shop, and the library. The classroom page holds all resources that would normally be obtained in a face-to-face classroom setting, including online lectures (presentations) and instructions for how to obtain video lectures. The desk page on the website contains the students' problem sets, experiment debriefings, and grades for the course. The coffee shop page is used for communication, which includes discussion forums, emails, and bulletin boards. Lastly, the library page holds additional resources for students to study on their own, including links to other similar online courses, local library resources, as well as other internet resources on classroom topics. Lage and Platt (2000) state:

> The philosophical foundation of our Web site is that the Internet provides students with an excellent complement, not substitute, to their in-class efforts. The use of the Web in providing core content allows us to use experiments, group work, and other highly interactive in-class pedagogies without sacrificing course content. By integrating the Web as part of a larger program of teaching to different learning styles, we are able to reach a more diverse student population (p. 1).

Alternatively, Strayer (2012) conducted similar research in his courses with regards to the flipped classroom, or as it is referred to in this article, the inverted classroom. This study looks at comparisons between the traditional classroom and inverted classroom format in terms of student engagement in the material. It is hypothesized that the inverted classroom will allow

students to learn and understand the material outside the classroom, and come to the face-to-face class sessions and be able to engage in the material at a deeper level (Strayer, 2012). This study included two introductory statistics classes taught by the same instructor. One section of the introductory course was set up using the inverted classroom format, while the other section was set up using the traditional lecture format. Strayer (2012) notes that, "Students in both classrooms responded to the College and University Classroom Environment Inventory (CUCEI) (Fraser et al. 1986) to assess their perceptions of the learning environment (both what they preferred and what they actually experienced)" (p. 173). It was also noted that more data would be gather through the use of audio recordings, focus-group interviews, field notes, and journal entries.

The structure of the inverted classroom in this study follows the traditional flipped course format, in that students learn and understand the course material at home, and then come to class prepared to dig deeper into the content. Rather than using any multimedia, such as video recordings of lectures or sound with PowerPoint, the instructor for this class made use of an intelligent tutoring system. The intelligent tutoring system was designed to interact with student in the same way a human tutor would to help students learn the content. The ITS used in this study uses artificial intelligence to present content to the students, allowing them to essentially learn as they understand. Students would then come to class and work on activities based on what they had completed online prior to class. Some activities would last a few weeks, while others only one or two class sessions. Additionally, class time was also used occasionally for further content explanations and "mini-lectures". There were also opportunities for students to work with other students, as well as the instructor, to help strengthen their understanding of the course content. Conversely, the traditional lecture class used class time almost entirely to

introduce students to the material. After two or three class sessions, students were assigned book work to complete as homework.

At the conclusion of the semester, data was collected from the sources listed above. Quantitative data obtained from the CUCEI yielded a piece of data of particular interest. It was found through this data that, when asked what they (students) felt about their present learning environment versus their preferred learning environment. Strayer (2012) reports that, "Students as a whole felt that their actual learning environment was not measuring up to their preferred environment. Every mean for the actual version was statistically significantly lower than for the preferred version" (p. 177). Focus groups were held for those who chose to participate in the study, from both the inverted and traditional class formats. The results from these focus groups reveal strikingly differences between the two classroom formats. The flipped classroom students shared that, even though some because frustrated with the unstructured, loose classroom atmosphere, they found great value in the opportunities to help each other learn the course material. Additionally, the flipped classroom students also felt a disconnect with what was being learned outside the classroom online, and what was being covered in class. Conversely, the traditional classroom students shared that they enjoyed the "loose", laid back atmosphere in the classroom, as it held their attention better than other classes.

In addition to these results, Strayer (2012) also identifies a few limitations of this study. One limitation of this study identified was that the instructor was also the researcher, limiting the amount of field notes in person, but instead had to rely on audio recordings. Another limitation identified was that some students were hesitant to provide criticism for fear of their grade being affected by what they said. A third limitation was that students in both class sections were not randomly registered in either section. Strayer (2012) also recognizes a few recommendations for

those looking to implement the inverted format. First, it may not be desirable to use the inverted classroom format with introductory courses, primarily because students may not be interested in the content, which could lead to frustration. Another recommendation made is to have an online space for students to reflect and communicate with others learning or who have learned the same material. Lastly, it is also recommended that teachers make adjustments to the inverted classroom structure. That is, it may not be as advantageous to have all lecture content reserved for out of class work.

In an article by Tucker (2012), the concept of the classroom is explored through the use of digital video available on demand to students on the internet. Three educators are showcased in the article because of their use of digital video in the flipped format. First, there are two chemistry teachers at Woodland Park High School near Pike's Peak, Colorado that accidentally stumbled upon the flipped format. In an effort to keep absent students caught up with the class when the miss one or more lessons, these two teachers began recording their lessons and put them online. What these two teachers found was that not only were the absent students using the recorded video, but students that were actually in class were going back to review using the video. This caused the teachers to completely rethink how they taught lessons in class, thus leading to the flipped classroom format. One of the teachers shares a benefit of using the flipped classroom, which is that class time can now be used for more one-on-one interaction with students.

In an additional article, Flipping the Classroom (2011), the two teachers answer specific questions about how they incorporated the flipped concept, and the results they are seeing. In addition the information outlined in the previous section, the two teachers share that after the first year of introducing the flipped concept, and they decided to give students weekly goals,

instead of having a rigid daily due date schedule. They added that a student got injured and was out of school for a month. Because the video lessons (and tests) were online, the student came back after missing a month and only had a few labs to make up. It was also noted that one of these teachers was able to get through an entire textbook in the same time it took another teacher in another district to cover 2/3 of the same book.

Another teacher from the charter school E. L. Haynes in Washington D.C. is also making use of digital video to flip the classroom. This teacher acknowledges that creating video content for the flipped format creates opportunities to elevate teaching practices. Tucker (2012) quotes this teacher, "crafting a great four- to six-minute video lesson poses a tremendous instructional challenge: how to explain a concept in a clear, concise, bite-sized chunk. Creating her own videos forces her to pay attention to the details and nuances of instruction" (p. 1). All three educators make it very clear that the online video is only one element of the instruction. One point of interest is the emergence of the Khan Academy, which is a vast library of online instructional videos created by Salman Khan and supported by Bill Gates.

In a related article by Parslow (2012), where the implications of the Khan academy are discussed in terms of how it affects his teaching. Parslow (2012) states:

> We are now facing a new reality where conventional teaching is running into conflict with the way students are choosing to learn. My lectures currently attract a live audience of only 50% of the class and many of my colleagues report much lower attendances. The students have changed, not our lectures (p. 1).

As a way to cater to the various teaching and learning styles, Parslow (2012) now recommends to students that they view Khan's video lectures that cover course content. The feedback says that the Khan lectures helped students make sense of the content. The Khan academy has a

library of over 3,250 YouTube videos available at no charge. Khan does not script the lectures, giving them a live, spontaneous feel, feeding the academy's success. Khan believes that he has found a solution to the problems with the educational system. Instead of dividing students into grade levels, Khan proposes that each student should move at their own pace. The flipped classroom, utilizing video lectures like Khan provides, is what is thought to make this school model possible. However, there are critics of Khan's work, citing that the video lectures might assist students in basic skill acquisition, is substandard to what students should be taught.

This research was specifically designed to track student engagement when implementing the flipped classroom concept. Since the flipped classroom requires students to acquire the course material at home, it is imperative that students actually access and view/read the material to be ready for the next day of class. If students fail to complete the required work at home, they will fall behind and the flipped concept will not function properly. In conducting this research, I am also seeking to find the general level of student understanding in using the flipped concept. It is one thing for students to view/read the video at home, but it is an entirely different thing for them to grasp the concept enough to prevent teachers from having to go back and re-teach content.

Methods

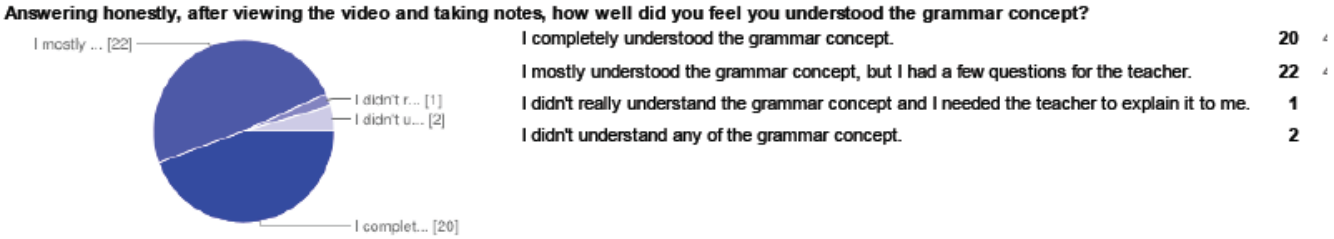
This research focused on implementing the flipped classroom concept in a Junior High French classroom with two-eighth grade classes. Both classes had access to the instructor's Edmodo learning management site, where they could access the online materials used in this experiment. For the first round, the instructor assigned a video for students to watch, instead of reading the textbook. Students were to then take some notes on the video; to assist them with the

classroom activities, as well as provide evidence they took the time to watch the video. The following day, students came to class and had a brief question and answer session, and then launched directly into classroom activities. Students were observed during the classroom activities in an effort to see how many accessed the materials. Following the observation, students completed a brief Google Forms survey about their flipped classroom experience. The data obtained by the observation and survey were analyzed by the French Instructor and myself to determine future action. Based on the results, we agreed that for the second round of the research, students would be given a choice between three learning activities: an online video, an online discussion via Edmodo, or just reading the textbook. The links and instructions were posted on Edmodo for students to complete over a weekend (due to the length of the lesson), again taking notes on what they learned to bring to class. Students then came into class on Monday, had a brief question and answer session, and then launched into classroom activities. Following this, students were again surveyed, via Google Forms, and the results were again analyzed by the French Instructor and me.

Results

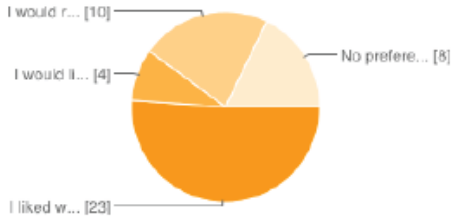
The results of this research will be presented in two sections, organizing the data obtained from both phases into separate segments. Looking first at the results from the first round of testing, students were both observed and surveyed regarding their experience. In observing, I found that out of the twenty-seven students in the class I observed; all but four students watched the video and took notes. Overall, there were a few questions for the instructor at the beginning of the class time, but an overwhelming majority of the students seemed to grasp the material from the video they viewed the evening before. After briefly discussion my observations with

the instructor after class, I learned that at least one of the students who did not take notes had technical difficulties that inhibited him from viewing the video. Following the observation, students were surveyed to find what they thought about this particular learning experience. The first question asked was in regards to the level of understanding students felt they had after viewing the video and taking notes. 93% of students said they completely or mostly understood the grammar concept after viewing the video, while 6% of students reported that they did not understand most or all of the material after viewing the video.



In an effort to gauge student interests, the second question on this first survey asked students how they would prefer to obtain flipped classroom material. In an attempt to keep the options manageable, two alternative options were given besides the online video: participating in an online activity or reading the textbook. The textbook option was given as a "backup" plan for those who experienced technical difficulties, allowing them to not miss out on learning the material. A majority (50%) of students expressed that they liked viewing the videos as a way of learning new material. Interestingly enough, close to a fourth of the students preferred to just read the textbook. The online activity appeared to not be a popular option, with only four students (9%) interested, and 18% of students had no preference. In addition, students were also asked if they had any technical difficulties accessing the online videos, to which 16% said they could not view some or all of the online videos.

If you had a choice, how would you prefer to learn new vocabulary and/or grammar concepts?



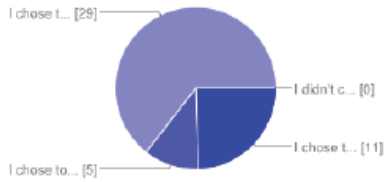
I liked watching the videos and I think it helped me understand.	23	51%
I would like to do some type of online activity to learn new concepts.	4	9%
I would rather just read the textbook.	10	22%
No preference.	8	18%

Did you have any technical issues when trying to view the videos?

Yes, I was able to view both videos.	38	84%
No, I wasn't able to view some or all of the videos.	7	16%

For the second round of testing, students were surveyed again after having a choice of watching an online video, participating in an online discussion on Edmodo, or reading the textbook. The first question on this survey asked which activity the student chose. Surprisingly, more than half of the students (64%) chose to just read the textbook, while only about a fourth of the students (24%) actually chose to view the online video. Only five students (11%) chose to participate in the online discussion on Edmodo. The last option was simply to see if there were any students who did not do anything at all, which no one selected.

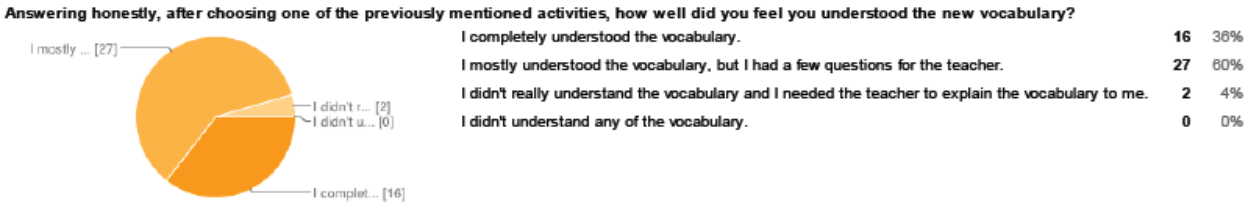
Which of the following did you choose?



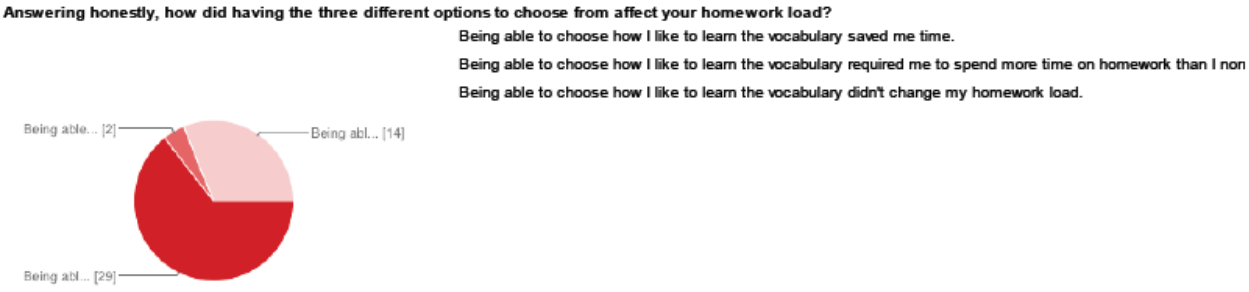
I chose to watch the 2 YouTube videos.	11	24%
I chose to participate in an Edmodo discussion.	5	11%
I chose to read the textbook.	29	64%
I didn't choose any of these options.	0	0%

The second question was again asked in regards to the level of understanding students felt they had after completing an activity and taking notes. This time, 96% of students felt that they

completely or mostly understood the material after participating in one of the activities, while only 4% of students reporting that they did not really understand the material and needed re-teaching.



The third question was to gauge how having the different options to choose from affected their typical homework load. 64% of students reported that having the choice of how they wanted to acquire the material actually saved them time, while 31% report that the choice did not change their homework load. Only 4% of students said that having a choice actually required them to spend more time on their homework than normal.



The fourth question was created to acquire a sense of students' opinion on having the ability to choose how they learned the new material. An overwhelming 89% said that they liked having the different options to choose from, while 7% said they thought there were too many options to choose from, and 4% said they thought there should be more options to choose from. In addition, those students who chose to participate in an online activity were asked if they had any

technical difficulties in accessing some or all of the content. This time, only 8% said that they were not able to access content, while 93% of students reported having no problems.

Which of the following responses best describes your opinion?

I liked having the different options to choose how I learned the new vocabulary.	40	89%
I thought there were too many choices to choose from.	3	7%
I wish there were more options to choose from.	2	4%

If you chose an online activity, did you have any technical issues?

Yes, I was able to access everything.	37	93%
No, I wasn't able to access some or all of the content.	3	8%

Discussion

In analyzing and discussing the findings of the results, we found a few interesting pieces of information worth noting. The first interesting piece that we found that relates directly to the topic of this research is student engagement. Even though the second assignment allowed students to choose alternative methods, the first phase of research suggests that, overall, most students will actively participate when flipping the classroom. The concern is that if students are to acquire the material at home, they must actually do it or they will fall behind and the flipped classroom concept will not work. That was part of the reasoning for giving students a choice as to how they wanted to acquire the material. Although the textbook option is not related to technology, we felt that there needed to be a backup option for those who could access the Internet, as well as allow the students to feel comfortable in how they acquire the material.

Another interesting piece of information was in regards to both the first and second phase surveys, where a majority of the students made it clear that they prefer to read the textbook over viewing an online video or resource. One reason for this might be simply that the students are accustomed to reading the textbook and find it to be the quickest way to get the homework done, rather than spending extra time trying to figure out how to make the online resources work for them. We felt that if students would be introduced to the idea of online resources from the beginning of the school year, they might be more comfortable and accustomed to using those methods, instead of the textbook.

As it has been made clear through the preceding reviews of literature and action research, the overall perception of the flipped (or inverted) classroom concept is positive. New advances in technology have made it possible for educators to rethink how they deliver instruction to their students. However, more work still needs to be done in order to determine how students acquire the course material. We found in this research that a majority of students preferred to use the textbook rather than a technology source. While we should not be "shoving" technology down the students' throats, so to speak, a longer research process might give more insight into whether this is just the students' way of finishing their homework without going through the trouble of trying something new, or if students generally prefer reading. As this new "information age" version of the flipped classroom concept begins to spread in this constantly changing world of technology, educators must be vigilant in their quest to incorporate technology in meaningful ways, both in and out of the classroom.

References

FLIPPING THE CLASSROOM. (2011). Educational Horizons, 90(1), 5-7.

Lage, M. J., & Platt, G. (2000). The Internet and the Inverted Classroom. Journal Of Economic Education, 31(1), 11.

Lage, M. J., Platt, G. J., & Treglia, M. (2000). Inverting the Classroom: A Gateway to Creating an Inclusive Learning Environment. Journal Of Economic Education, 31(1), 30-43.

Parslow, G. R. (2012). Commentary: The Khan academy and the day-night flipped classroom. Biochemistry & Molecular Biology Education, 40(5), 337-338. doi:10.1002/bmb.20642

Strayer, J. (2012). How learning in an inverted classroom influences cooperation, innovation and task orientation. Learning Environments Research, 15(2), 171-193. doi:10.1007/s10984-012-9108-4

Tucker, B. (2012). The Flipped Classroom. Education Next, 12(1), 82-83.