EXPLORING THE PERCEIVED BENEFITS OF THE FLIPPED CLASSROOM IN A
COMMUNITY COLLEGE MEDICAL TERMINOLGY COURSE

by

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DEDICATION

This paper is dedicated to my family, without whom I would not have been able to complete this degree. To my husband Kevin, who spent years hearing “I can’t do that right now, I have homework” and was understanding and supportive 100% of the time. To my children Doug, Alexa, and Emma, who surely sacrificed quality time with me in order to help me achieve my dream of a higher education. To my parents, who encouraged me to pursue this endeavor, and repeatedly told me they were proud of me. To my sisters Amara and Lorena, who had previously obtained degrees and commiserated with me when I thought that I was not going to survive the process. To my in-laws Gary and Sherral, who helped pick up the slack when I was unable to perform tasks around the farm. And to my Father in heaven, who started me down this path of Science and Education eight years ago. I often rested on the fact that if this was truly His will, I would achieve success. Thank you all. I love you so much!
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TABLE OF CONTENTS

1. INTRODUCTION AND BACKGROUND ................................................................. 1
2. CONCEPTUAL FRAMEWORK ............................................................................. 5
3. METHODOLOGY ................................................................................................ 16
4. DATA AND ANALYSIS ...................................................................................... 23
5. INTERPRETATION AND CONCLUSION ............................................................ 35
6. VALUE .................................................................................................................. 38
REFERENCES CITED .............................................................................................. 44
APPENDICES .......................................................................................................... 47

APPENDIX A Institutional Review Board................................................................. 48
APPENDIX B Baseline Survey .................................................................................. 50
APPENDIX C End of Unit Reflection Survey (Traditional) ........................................ 53
APPENDIX D End of Unit Reflection Survey (Treatment) ......................................... 56
APPENDIX E Topic Difficulty Survey ..................................................................... 59
APPENDIX F Instructor Reflective Journal ............................................................. 61
APPENDIX G Post-Research Interview Questions ................................................. 63
LIST OF TABLES

1. Summary of Study Timeline ...........................................................................................................18

2. Research Matrix ..............................................................................................................................21

3 Comparison of Formal Assessment Results .....................................................................................26

4. Comparison of Perceived Topic Difficulty and Benefit of Teaching Method .........................30
LIST OF FIGURES

1. Students’ Averaged Likert Responses .................................................................24

2. Benefits of the Flipped Classroom Demonstrated by Formal Assessment Methods.....27

3. Comparison of Pre-Implementation and Post – Implementation Results .................30
ABSTRACT

Students today are managing many aspects of life outside of school obligations, resulting in missed class time and less exposure to lecture material. Flipped classroom techniques have been said to influence students’ flexibility of personal time for learning, as well as academic achievement and overall course enjoyment. The purpose of this study was to identify benefits associated with the utilization of flipped classroom techniques, for both the students’ and the instructor, in a college level Medical Terminology course. Data collection tools were developed to identify trends in these focus areas. During a five-week time period, flipped classroom techniques (treatment) were employed alternately with the standard lecture style, while covering four units of material. During the treatment students’ watched short videos via the colleges’ learning management system on their own time prior to class. This freed up class time for interactive learning with the use of engaging peer-to-peer activities, and completion of what would typically be considered homework materials. On alternate units, lecture was delivered with the standard didactic method previously employed, and homework assignments completed on their own time. If, after lecture was completed and time allowed, interactive activities were implemented during class. Results indicate no difference in student academic success between the two teaching methods. Student enjoyment of the course was markedly improved (28%), as well as increased flexibility of personal time (22%) with the treatment. Instructor benefits included an increased enjoyment of teaching, increased curriculum flexibility, and improved instructor-student relations. The instructor preparation time associated with the initial use of the treatment initially felt prohibitive, but the resulting benefits for all study subjects involved negated this.
INTRODUCTION AND BACKGROUND

Over the course of the past few years while teaching at the community college level, the researcher observed that a significant number of students are often distracted by life’s many demands. This appears to negatively influence class attendance, which impacts their resulting knowledge and formal assessments. Student athletes and non-traditional students in particular tend to fall into this category. For example, during a previous term the researcher had a student athlete who was on the women’s softball team. Due to practices and away games, this individual missed a full 25% of her class time. It was noted that she struggled to maintain a passing grade, a disappointment as her career goal required high grades in her pre-requisite courses. The researcher worked with her outside of class as much as possible and encouraged her to get notes from friends. She did successfully pass the course, but the researcher felt that there had to be a more enjoyable and positive way for this to be accomplished, and optimally with stronger final course grades. In addition to student athletes and their struggles, Treasure Valley Community College (TVCC) enrolls a significant number non-traditional students. In the school year during which research was conducted (2015-2016) the full-time cohort consisted of 18% nontraditional students, and this number is on the rise. In the 2016-2017 years full-time cohort, 31% of the students are over the age of 21. Many of these appear to be single parents who are working to boot strap themselves into a better financial position by obtaining a degree. As they are stretched between the obligations of parenting, working, and schooling, it often becomes increasingly difficult for this group to maintain their attendance record as the term progresses. As the researcher had also
been a non-traditional student, she was sympathetic to this struggle. As an instructor, first-hand observations of these roadblocks propelled her to seek alternative teaching methods that would afford her students a higher quality of education.

The researcher cannot recall at what point she first heard of the “flipped classroom.” It was a concept that intrigued her, and upon reflection, she decided that Medical Terminology (MT) would be the perfect course for the application of this method. Of the courses she was currently teaching, MT is the one in which she specifically noticed a negative impact on her students if they missed class lecture. This particular course is front-loaded with substantial foundational information regarding structure and function of the human body. In order for the students to accurately make cognitive connections between the terms they will learn, it is necessary that they have a basic understanding of both the anatomical layout of the system being studied, as well as how it functions. A prime example of this is in the second unit as students learn about body structure. If a student is familiar with the sutures found on the skull, i.e. coronal and sagittal, then they more readily to make the appropriate associations of the coronal and sagittal body planes. This is because the planes divide the body in the same direction as the cranial sutures run.

As there is not a pre-requisition for MT, some students do not come to class with this type of foundational knowledge. In fact, the researcher usually has a variety of students ranging from high school aged to those who have already taken Anatomy & Physiology and have been accepted into the nursing program. What she found was that she was frantically trying to get through the foundational information that some students
needed in order to reach the material that actually fulfills the course outcomes: medical terms. This again made the researcher reflect on what she could do differently - better - as an instructor in order to meet her students’ needs.

The researcher wondered how the use of videos available on her institutions Learning Management System (LMS), Blackboard, would aid those students who were unable to attend class due to other obligations. Would this method better support student learning of the course materials? How would their perceptions of the course change as time was freed up during class for more interactive activities and discussion? Would the availability of these materials increase performance for all students, just athletes and non-traditional, or any of them at all? And finally, how would she feel about moving from a mostly talking-head instructor to one who was more engaged and directly involved in the students’ learning process? These are the questions the researcher first considered as she began to explore this teaching method.

Flipped classroom techniques are defined by the Flipped Learning Network (FLN) as “...a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter” (2014, p. 1). In other words, the student is exposed to new material outside of class with the use of video lectures (or similar method), and class time is reserved for practical application of the material in ways that allow for active engagement with both peers and the instructor. This teaching method was developed by Colorado high school science teachers Jon
Bergmann and Aaron Sams in 2007 in an effort to improve their class interactions with students. They saw the opportunity to utilize technological advances to support this effort, and it has been an area of continued advancement and research since that time (Noonoo, 2012). Subsequently, the FLN was developed as a support system for instructors, on which Sams and Bergmann continue their efforts by serving on the board of directors (FLIP 2014).

The researcher began her exploration of this topic by reaching out to her colleagues at TVCC, a small college located in a largely rural, low socioeconomic county in Ontario, Oregon. She identified and interviewed three instructors who each implemented some flipped classroom techniques. This starting point provided enough information for her to determine that she would move forward with this method as the hub of my research. She anticipated that the implementation of flipped classroom techniques would result in benefits which were two-fold. First, those students who were unable to attend class would not miss out on the lecture materials. It would be available to all students in the course at their convenience. Second, class time would be freed up. This new-found time would allow for discussion of the video lectures, thus revealing misconceptions or questions on the material. Additionally, her students would have time to practice and apply both the building and dissection of medical terms, as well as to spend time on accurate pronunciation.

Based on this preliminary research, the researcher identified five questions critically tied to her own teaching values. In this study she sought to answer the following questions:
• In what ways do flipped classroom techniques affect student learning of course content?
  o What benefits, if any, do students perceive in the additional time available for group activities, discussion, and interactive learning during class time?
  o What are the students’ perceptions of the flexibility provided to them with regards to watching videos and taking follow-up online quizzes?
  o In what ways have flipped classroom techniques affected the students’ level of enjoyment for learning new material?
  o In what ways does this method benefit her as an instructor?

CONCEPTUAL FRAMEWORK

Theoretical Support

One of the clear advantages of flipped classroom (FC) is the ability to incorporate a broad variety of teaching methods. This is beneficial because it can then speak to every learning style, whereas the typical didactic lecture may leave some students floundering. Teaching practices in the FC incorporate active teaching methods which support the constructivist view of learning. According to Bergmann and Sams, inquiry and project-based learning promotes positive learning outcomes (Noonoo, 2012). The development of deep and active learning strategies in undergraduate students is a struggle, with surface learning approaches currently dominating the classroom. In this scenario, students’ simply memorize the information to pass their tests, meanwhile lacking understanding of both concepts and principals. The pedagogical teaching approach of the FC, however, may result in heightened interactions and engagement regarding the course material.
This is partially accomplished as the students reaching an understanding of their own learning styles and preferences (McLean, 2015).

Not only does the FC allow for a variety of teaching methods, it also provides for more time in class to engage in problem-solving activities which is thought to improve students’ higher order thinking skills. Students work collaboratively with their peers and have the opportunity to engage in critical thinking discussions which provides several benefits. The first is that encourages students to seek out solutions to problems in an environment where both their peers and their instructor are present to supply feedback. Collaboration in groups leads to students taking responsibility for their learning. It is interesting to note that students working together also help their peers who either did not complete or understand the pre-class material (Naccarato, 2015). Student discourse is a wonderful teaching tool, and it seems that group-work encourages this.

**Design and Methodology**

The premise of the FC is the provision of procedural knowledge and those pre-requisite skills needed for the course to be presented in a pre-class format utilizing a LMS (Naccarato, 2015). Most instructors do this primarily with the use of videos as well as providing supplementary documents as needed on the LMS or from a textbook. There is quite a bit of discussion whether an instructor should borrow videos from sources such as YouTube, or create their own. The majority of research read for this review supports the use of instructor made videos, which are a maximum length of 20 minutes and address the lower end of Bloom’s Taxonomy (NooNoo, 2012; Kim, 2014; Nematollahi, 2015; Naccarato, 2015; Sharma, 2015). According to Sharma et al., video clips or audio
material should not focus on detail and should cover only one or two concepts on each. These clips can be made with simple technology such as PowerPoint and a Microsoft sound recorder and do not require cutting edge technological knowledge (2015).

Class time is then spent on conceptual knowledge which directly connects with or supports the online portion of the course. This is done with a variety of activity types, according to research. In a study that addressed FC and language learning specifically, Evseeva and Solozhenko suggest that this class time was best spent on the clarification of grammatical concerns, lexical phenomena, making presentations, and peer-assessments (2015). In another study conducted in a Medical Sciences undergrad course, researchers spent class time engaged in debate, literature analysis, case studies, group projects and discussion (McLean, 2015). It seems that regardless of the course associated with the FC, the in-class activities all focus on peer-to-peer interactions in some form. For example, in an undergrad mathematics course the students participated in harder versions of the pre-class problems and more conceptual questions designed to build on the knowledge presented within the online homework. Instructors were available to assist the students as they worked through these applications during the face-to-face session (Naccarato, 2015).

When designing the FC there are several other important items to keep in mind in order to warrant success. The first step is to ensure that the students understand what to expect with this method in the terms of the course, and also what the advantages are for them. When students are primed, they achieve a higher level of comfort with what is potentially a new-to-them class format and are more likely to get on board (Sharma,
2016). There can be bit of a learning curve for some students as they become acquainted with this teaching style. Some students rapidly get into the habit of completing the pre-class online work, whereas others may take a few weeks or longer before this becomes habitual (Hotle, 2015).

Additionally, verifying that students are familiar and comfortable with your institutions’ LMS is an important component of the FC. Learning online is considered an important life skill in today’s technological age, moving from the idea of “educating for life” to “lifelong learning” for our students (Evseeva, 2015). Because of this, teachers should be sure that the online portion of the class is both friendly and engaging.

Finally, since the success of in-class time is dependent on student completion of the online portion prior to class, it is suggested that incentives are put into place that motivate the students to do this. Kim et al. observed in a study of 115 students that about 25% of the class did not watch the videos prior to class. As the instructor became aware of this lack of participation, “Online discussions (e.g., YouTube comments) with low-stakes grading appear to have motivated many students to engage the learning activities/assignments and problem solving” (2014, p.44). This method is supported by other studies in which only 1% of the overall course grade was tied to quizzes covering the videos, and yet this motivated the students to engage (Nematollahi, 2015).

Results

Research shows a range of mixed results when it comes to how FC’s affect the acquisition of knowledge. In a study conducted in an ESL language course, it was found that the FC improved the students’ motivation for learning a second language, as well as
their overall academic performance. Additionally, the authors found that because students are responsible for their own learning in the FC, they became more disciplined (Evseeva, 2015). In contrast, a study of 25 biochemistry students resulted in learning gains in the FC that had no significant difference as compared to the traditional classroom (Ojennus, 2016). Similar results were found in a study of 36 engineering students, where the FC scored slightly lower than the traditional course. However, the interesting part of this data analysis is that if the results were analyzed by gender, women performed better than men in the FC, whereas the opposite was true in the traditional setting (Hotle, 2015).

Other significant themes emerged during a study of 52 Medical Science students (previously mentioned). Primarily, the authors’ identified that the majority of students completed the online portion using a “just in time” learning approach, with most students viewing the material only once prior to class. It is unknown whether this acquisition of content just prior to class time is intentional and used as a retention tool, or due to students’ poor time management skills. Another noteworthy and positive behavior discovered was that students tended to multitask less and engage more during the online “content acquisition” phase of the FC, as compared to traditional lecture. For instance, during traditional lecture, many students will check email, text, or play games on their phones or computers. This is less likely to happen in the FC, as the students are engaged in quality learning activities. Finally, the theme of deep and active learning emerged. These included note taking, deep learning and reviewing. Nearly half of the students reported that they took notes by hand on the study guide, rather than typing. Videos can be paused, and handwriting allows students to proceed at their own pace, as well as to
reframe the information and jot down any questions they may have (McLean, 2016). Gross et al. reported similar findings, with students ultimately performing better in the course due to increased active learning in the classroom. This was especially true for those students who didn’t wait until the last minute to participate in the online portions. The more “cycles” of the FC that the students in this study experienced, the greater the positive impact was on their learning. The study additionally identified that, at least in this course, the women were able to perform equally to their male counterparts, which is not the result when employing traditional lecture techniques. Lower-performing students, regardless of gender, also realized a benefit from the FC format. The authors attribute this difference to the additional modes of interaction which provide a wider variety of learning tools than traditional teaching (2015).

Perceptions

Students

Student levels of satisfaction with the flipped classroom are positive overall (Evseeva, 2015; Hotle, 2015; Kim, 2014; McLean, 2016; Ojennus, 2016; Sharma, 2015; Wanner, 2015). Student perceptions and level of comfort improve over time as the students gain confidence in the method. The Millennial generation seems especially willing to move into this mode of instruction, being a generation that is very familiar with the regular use of technology (Hotle, 2015). Of course that is not true for every student; there are simply going to be some learners that this method does not speak to. Interestingly, Wanner and Palmer note that “Students felt they ‘had to engage’ (in collaborative learning) and were more compelled to be prepared for the face-to-face
classrooms by doing the learning modules” (2015, p. 364). Their research found that students enjoy the face-to-face time with peers and instructors, participating in collaborative work and learning activities. This enjoyment led to a higher level of class preparedness, resulting in more independent and self-regulated learners (2015). The perceived increased workload is the most common negative feedback received by researchers, along with internet issues (McLean, 2016; Sharma, 2015).

**Teachers**

Research shows that overwhelmingly the most prevalent theme for teachers considering the implementation of FC methods is the time invested in the design and construction of a course. Recording of lectures, development of both online friendly materials as well as collaborative classroom activities, identifying supplemental resources, and redesigning the course all must be addressed (Evseeva, 2015; Greener, 2015; Ojennus, 2016; Sharma, 2015). If an instructor is willing to commit to this, there are many cited benefits. Teachers enjoy the flexibility which is provided to them during class time, as well as the increased involvement with the students during the learning process. Also noted as beneficial is a teacher’s availability to address misconceptions during group work as well as to interact enough to identify an individual students’ strengths and weaknesses and provide guidance. Teachers also perceive benefits to the students, even if they are not academically based. Positive impacts such as learners taking responsibility for their own education through increased self-discipline are recognized as advantages of the FC (Evseeva, 2015; Ojennus, 2016).

**Other Benefits**
Although research in the area of academic gains has not yet provided a significant result either way, other values associated with the flipped classroom are widely acknowledged. For example, students have the flexibility to obtain procedural knowledge whenever and wherever they want. For instance, they can watch videos at home, at the library, on their phone, etc. They also aren’t constrained to a specific time of day or day of the week, as in the traditional lecture method. This is especially beneficial to today’s busy non-traditional student who may have to miss class. Additionally, videos can be paused or stopped and resumed later, allowing the student to progress at their own pace. With the acquisition of procedural knowledge occurring outside of class, class time becomes more interesting to the student, in stark contrast to the perceived ‘boring and monotonous’ traditional lecture (Evseeva, 2015). A trend of increased student attendance has also been identified, as well as course completion and program retention (Hotle, 2015; Ojennus, 2016).

Challenges

Two main challenges affiliated with the FC emerged during this literature review. The first is one not considered unique in the field of education; student motivation. Pre-work completion is often conducted in a “just in time” method or not at all (Greener, 2015; Hotle, 2015; McLean, 2016). Because these activities directly impact academic results, teachers must implement ways to motivate and encourage completion, even if with low-stakes quizzes and online discussion, as mentioned in an earlier section (Naccarato, 2015; Sharma, 2015). Another challenge to the FC is that the student is unable to ask the instructor questions on-the-spot when receiving foundational
information online. This is compounded by the student’s apparent hesitancy to ask these questions during the class time. The concern is that this may thwart deeper understanding, as class activities are focused on building on this procedural knowledge (Hotle, 2015). If the students’ have gaps in their foundational knowledge it is difficult to build on this

Conclusion

This literature review impacted the researchers Action Research project significantly and in a variety of ways. For starters, even though the FC does not reveal a clear academic benefit, there are other identified benefits to students. For her, knowing that incorporating a variety of teaching methods would reach a broader range of students was significant. She had previously utilized the didactic traditional lecture as her mainstay, and then collaborative activities with any class time that remained. Reading multiple papers that supported the use of methods that spoke to all learning styles was exciting to her. Research also showed that collaborative problem-solving activities with peers are perceived as more enjoyable to the student, and they improve the students’ higher order thinking skills. The researcher found that variety in the classroom keeps her more engaged as well, so this is a win-win.

The idea of presenting procedural knowledge or pre-requisite skills in video form on a LMS is what initially made the researcher consider implementing the FC. A number of papers showed that this is actually the material that is best to present in video form. This once again supports and validates the used of the FC methods in a Medical Terminology course. This is especially desirable based on the demographic of students
who take this course as previously mentioned. Presenting the foundational material regarding body systems online lends itself to reaching those without any background knowledge and providing the opportunity to take their time learning this material. They have the freedom to pause the video to take notes, and also to watch the lecture repeatedly. For those whom this is a review, they can give it a once through and move on. In this way, hypothetically, all students would come to class with the same basic knowledge needed for the conceptual material.

The researchers’ knowledge of how to build the videos was broadened substantially from this review. In general, most instructors support the making of their own videos, as it may take longer to review another’s work. Also, a twenty-minute video is considered to be the maximum length. You don’t need fancy software or hardware to create an engaging lecture, however, it is important that YOU make it engaging and interesting. The clips should only cover a topic or two and address only the basics. The upper levels of Bloom’s Taxonomy, analysis, synthesis and evaluation, would take place during the newly freed up class time. Initial concerns about whether her own videos were “fancy” enough were alleviated, as the research reinforced that the area of focus should not be on the tools, but rather on keeping the material engaging and interesting. The researcher will work to pepper her lectures with thought-provoking, real-life examples as well as pictures to aid this endeavor.

The researchers’ knowledge regarding how to spend class time was not altered much from her review. She had pretty well explored the types of activities that could be implemented with her particular course, and now she simply worked to develop these.
One thing that she did learn is that peers are willing to help each other out if a member of the group did not get the pre-work knowledge, which was refreshing to hear. She imagined that if a peer were to help another member of the group, the next time that student might be better prepared in order to “save face.” An important point was made in several papers that also must be considered by an instructor using FC pedagogical model: the students often fail to ask questions regarding the video material. It is important that students don’t move forward into the conceptual phase of the unit while trying to build on knowledge that they are unsure of or confused about. The researcher noted several ways to prevent this: Classroom Assessment Techniques (CAT’s) at the beginning of class, discussion of key points, or a quick review of the video are ideas that she may try to implement in her own classroom.

Another theme that came up several times in research studies is how important it is for the students to understand how the FC works and what the benefits are to them. Talking to the students at the very beginning of a course and ensuring that they are comfortable with the LMS is also critical. Most students will adapt quickly to this teaching method, but for others it may take longer.

Because many students incorporate a “just in time” approach with the pre-class work, putting a low-stakes incentive quiz or online discussion associated with the videos is advisable. This helps motivate the students to do the online portion, leaving them better prepared to participate and contribute to discussions, projects, group work, etc. during class time.
Students and teachers alike seem to enjoy the FC. For students, the biggest complaint is either the perceived work load or problems with technology. For instructors, the biggest challenge is designing the course, finding resources, and making videos. Both parties enjoy the interactive course time and the flexibility that the FC provides. I think that it is an important point that student perceptions improve over time, as their comfort level rises and they become familiar with the flipped method of learning.

A final noteworthy benefit to the FC is that student attendance and retention increases. Many students lose interest in required courses and withdraw from school. Keeping the classroom interesting is a great way alleviate this phenomenon. This was an unexpected benefit cited in several studies. So many undergrad courses are found to be tedious to the student, and the researcher love the idea of being able to engage her students and to make what is widely considered “a boring class full of memorization” instead fun and enjoyable.

The themes and trends identified in this research left the researcher certain that the flipped classroom method was one worth researching in her own classroom. In order to be confident that she was reaching the desired outcomes of this application, she identified five questions critically tied to her own teaching values.

METHODOLOGY

Demographics

To investigate the effect of flipped classroom, the research was conducted on 12 community college students who were enrolled in GSCI 161 OA, Medical Terminology I. For the purposes of this study she determined that of these, nine were traditional students
(began college directly after high school), and three were non-traditional (had taken some length of time off between high school and college). Another important facet of the study was to identify the students’ level of obligation outside of attending college. Of the twelve, only one did not participate in some area of collegiate sports, work, or have family for which they were caregivers.

**Implementation**

Research was conducted during six weeks of the term and encompassed four of the seven units of material taught for this course. The research methodology for the project received an exemption by Montana State University’s Institutional Review Board, and compliance was maintained for working with human subjects (Appendix A).

Prior research had revealed that one of the common approaches to the flipped classroom is the use of videos accessed by the student from a Learning Management System (LMS) in place of the standard lecture. Initially, the researcher visited with several individuals on campus, including Nila Stephens, the current LMS Administrator, and Darin Bell, a Business Instructor who implements some flipped classroom techniques in his own curriculum. These interactions better prepared her for the creation of the videos, as well as for how to make them available to her students. Mrs. Stephens suggested the development of video lectures with the use of Screencast-O-Matic 2.0, a free downloadable recording device. This tool allows one to record the images on their computer screen as well as to capture the audio of their voice. The researcher acquired a headset from the Technology Department on campus in order to obtain a crisper lecture sound and purchased a Wacom tablet on the recommendation of Mr. Bell. This tool
would allow her to “write” on the PowerPoints, resulting in the ability to more clearly illustrate important points of the lecture. At this point the researcher was ready to begin the process of making the videos.

The mainstay of the filmed lectures was the PowerPoints, which would have normally been utilized in class with a standard lecture format. The researcher strove to keep the video length shorter than 20-minutes based on Stephen Noonoo’s interview with the flipped learning method founders Jon Bergmann and Aaron Sams (Noonoo, 2012). For the purposes of this project, 7 videos were created, with an average length of 11 minutes. These videos focused on the foundational information of the topic at hand, leaving the class time free for discussion and practical application of medical terminology.

The term with Unit 1, which covers learning styles. The Baseline Survey was administered on the first day of class in order to establish some baseline information (Appendix B). For this unit videos were incorporated on Blackboard, the institutions LMS. The only grades for this topic were for participation. The intent was to make students comfortable with the new technique as research had indicated this was beneficial (Sharma, 2016). For the remainder of the study, the researcher switched back and forth, by unit, between the traditional lecture style and the treatment as outlined in Table 1.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Summary of Study Timeline</th>
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<tr>
<td>Unit 2 – 6 Days</td>
<td>Unit 3 - 10 Days</td>
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<tr>
<td>Medical Word Elements</td>
<td>Levels Of Organization</td>
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<tr>
<td>Traditional Lecture 1</td>
<td>Flipped Classroom Treatment 1</td>
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</tbody>
</table>
When utilizing the traditional treatment, lecture took place during class, incorporating the use of PowerPoints as well as the whiteboard while topics were explained. Students were provided with the PowerPoint slides via Blackboard, which they could access and print out in advance to write notes on if desired. The course curriculum allows for an average of three 50-minute class periods per unit (excluding exam day), with any class time left after lecture devoted to discussion and class/group activities. These activities included case studies, activity sheets for practice of the word roots, suffixes, and prefixes associated with the unit, board work, and the learning games Kahoot! and JeopardyLabs. There was typically had one class period per traditional lecture unit in which the researcher was able to guide these types of in-class activities.

When applying the treatment, at the onset of the new unit students were instructed videos that were provided on Blackboard. These videos covered foundational material and should have been viewed prior to class. As with the traditional method, the students had access to a printable version of the PowerPoint slides which provided a format for the student to take notes while watching the videos, as well a study resource for the exam. The videos were set up with follow-up quizzes with the use of adaptive release. This feature allowed the researcher to control the release of these two components. The students would watch a video and then the quiz would release. The quizzes had five questions each and were worth five points. These low-stake quizzes were designed to ensure that the students were grasping the core elements of the videos, and the quizzes required a 70% or better grade in order for the subsequent video to release. Students had the option to take the quiz an unlimited amount of times, and they could also watch the
video repeatedly. In this way, a high-achieving student had the ability to earn 100% on the quiz. The video and subsequent quiz portion of the course was considered to be the students’ homework for the unit. Each unit contained four videos and four quizzes. There were set due dates for quiz completion in order to earn a grade greater than zero. If students did not complete the homework prior to the due date, they did not forfeit the ability to watch the videos and take the quizzes. However, they did not receive any points for their efforts. At the next scheduled class time after the videos became available, the researcher led a quick review of the videos and addressed any questions or misconceptions revealed in the discussion. This typically took no more than thirty minutes. The balance of that class period as well as the remaining two class meetings were free to devote time to interactive learning. This time was spent in engaging activities, including observation and discussion of structures located in preserved animal organs or human cadaver, observation and discussion of system models, use of flash cards to study medical word elements, board work, work sheets, JeopardyLabs, Kahoot!, case studies, and pronunciation activities. The researcher was particularly excited to implement this variety of teaching methods as she is a firm believer in addressing all learning styles.

**Instrumentation**

The researcher developed a variety of data collection tools outside of the standard formal assessment to facilitate gaining answers to her questions (Table 2).
Table 2
Research Matrix

<table>
<thead>
<tr>
<th>Data Collection method</th>
<th>Baseline Survey</th>
<th>Formal Assessment</th>
<th>End of Unit Reflections Survey</th>
<th>Topic Difficulty Survey</th>
<th>Instructor Reflective Journal</th>
<th>Post-Research Interviews</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action Research</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Questions:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In what ways do flipped classroom techniques affect student learning of course content?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>What benefits, if any, do students perceive in the additional time available for group activities, discussion, and interactive learning during class time?</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>What is the students’ perception of the flexibility provided to them with regards to watching videos and taking follow-up online quizzes?</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>In what ways has flipped classroom techniques affected the students’ level of enjoyment for learning new material?</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>In what ways does this method benefit me as an instructor?</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Throughout the research period, three different data instruments were administered. First was the *Formal Assessment*, or exam, which was implemented at the end of each unit. As one might expect, these teacher-generated exams were intended to measure the knowledge gained regarding the topic we had been covering. The subsequent two data tools were both quantitative and qualitative. The researcher constructed a five point Likert scale for each survey question, which was followed by an open-ended
question designed to collect qualitative responses from the student. The *End of Unit Reflection Survey* was administered immediately after the unit exam and focused on identifying students’ perceptions of the teaching method, whether traditional or treatment (Appendices C and D). Did they perceive any benefits regarding time spent in class, flexibility of personal time, or enjoyment of learning? The researcher felt it was important to capture this data prior to students receiving their exam grade in order to avoid any bias. At the next class meeting, the researcher distributed the *Topic Difficulty Survey* (Appendix E). Once again, this survey was implemented prior to revealing of the *Formal Assessment* grade. The intent of this particular survey was aimed at mining data that could later be triangulated with other instruments to assess any level of positive or negative impact of the teaching methods as correlated with the difficulty of the topic. The researcher was hopeful that the student responses to this survey would enable her to hone future lessons plans for this course in order to better meet the needs of both the students and herself, specifically regarding the time allocated for teaching each unit.

In addition to these instruments, the researcher herself was an active participant in the study, and as such she kept an *Instructor Reflective Journal* of observations she made throughout the research. In this journal she had three prompts directed at producing meaningful reflection on how the treatment appeared to affect the students’ learning, as well as the possible benefits of this method for her as an instructor (Appendix F). She responded to these prompts after every class period, or three times weekly.

Finally, at the end of the study the researcher interviewed two groups of students: three top scoring in one group and three bottom scoring in the other. Due to the small
sample size, these were quite literally the top three and bottom three scoring students. These students agreed to participate in the interview process when their help was requested. The researcher developed a list of six questions to ask each group, each one tying into one of her research questions (Appendix G). She was interested to determine if this technique benefited her lower scoring demographic in the same positive way that was reported in some of the literature she had reviewed (Evseeva, 2015). She also believed that having conversations with her students would be more revealing than the Likert scale surveys since many of the students were not likely to take the time to explain their answers in the space provided. The researcher anticipated that a closing interview would be just one more avenue to correlate data regarding student perceptions of the treatment method. By gathering data in several meaningful ways she was able to triangulate her data during the analysis process, thus ensuring that the resulting conclusions were valid. In order to insure her instruments were valid and reliable, the researcher mimicked data collection tools utilized in the peer reviewed papers included in the literature review. After developing surveys, interview questions, and journal prompts, she recruited a colleague to review and critique the questions. Specifically, she wanted to be sure that the students would be providing data which would address her five research questions. Finally, by administering surveys multiple times throughout the research period she collected a larger data sample which would help identify trends.

DATA AND ANALYSIS

At the completion of the research, the researcher began to process the information gathered via the different instruments she had developed. This included surveys, journals,
formal assessments and interviews. To make this easier, spreadsheets were developed on which she could compile student Likert responses and meaningful quotes that supported their answers. This strategy allowed her to identify trends in a more straightforward manner.

On the End of Unit Reflections Surveys that were administered after each unit, the students’ responded more favorably to the overall benefits of the flipped classroom as compared to the traditional style of lecture (Figure 1). Furthermore, a significant difference of both flexibility of personal time and course enjoyment is observed. Both of these are in favor of the flipped classroom.

![Students' Averaged Likert Responses to Three Focus Issues When Comparing Traditional and Flipped Classroom Teaching Methods Post-Implementation](image)

**Figure 1.** Students’ averaged Likert responses.

With regards to the overall benefit of the traditional lecture, survey responses include supportive responses such as, “I would’ve learned a little better more on my own with the videos, but liked the traditional lecture as well.” While another stated “Either
Contrast these ambivalent answers with the quotes written in support of survey answers after the flipped classroom treatment. One responder is quoted as writing “The PowerPoint and lecture videos are very helpful, easily understood, and good study tools” and another saying “It helps to know what we are going to be going over before class” and finally, “This allows me to come to class ready with questions.” On average, 65% of the cohort provided positive feedback of this nature. 20% declined to support their scale response, while 15% indicated that they had not watched the videos for one reason or another.

Further qualitative evidence was gathered in the Post-Research Interviews where the students universally indicated that they felt that there was a positive impact with having the lecture materials available to them in an unlimited video form. When asked if the video format affected learning, one student responded “I watched them once, maybe twice, depending on if I wasn’t understanding it quite right.” Another student said “I could back up if I missed something.” In a classroom setting a student might not speak out and ask an instructor to repeat a piece of information, but in this setting is able to do so without fear of embarrassment.

From a formal assessment standpoint, the students performed overall at exactly the same percentage when comparing the two units traditionally taught with the two units with the treatment (Table 3). During the treatment phase, the students scored higher on the exams, while during the traditional phase they scored higher on the homework portion. When both the homework and exams are factored in, both phases averaged out to 83.3%, indicating that there is no academic benefit to the FC technique. Although this
is interesting, results may differ with a larger sample size or with extended research period.

Table 3
*Comparison of Formal Assessment Results*

| N = 11 |  
| --- | --- |
| **Traditional Class Averages – Units 2 & 4** |  
| Homework | 87% |
| Exams | 79.6% |
| Overall | 83.3% |
| **Treatment Class Averages – Units 3 & 5** |  
| Homework | 83.2% |
| Exams | 83.4% |
| Overall | 83.3% |

However, when you take a closer look at the data (Figure 2), you can see that in fact this treatment yielded real benefits for some students. Eight of the eleven students scored higher grades on the treatment exams, with students numbered three, four, and five scoring 5%, 12%, and 14% higher respectively. Only three students of the eleven did worse on the treatment exams, with the worst of these being 1% less. Unfortunately, similar results were not seen on the homework portion of the class. Only one student, number four, demonstrated significant benefits, greater than a 50% grade difference, from the treatment method homework. In general, the majority of the class, 64%, scored better on homework assigned during the traditionally taught units. The only difference between the homework sets of the two methods was that addition of online video quizzes during the treatment. Initially I hypothesized that these low homework scores were due to students neglecting to take these quizzes, but this actually only accounted for 42% of the missing points. The remaining 48 points left on the table was attributed to missing case
incomplete work of the same nature accounted for 60 unclaimed points.

![Benefits of the Flipped Classroom Demonstrated by Formal Assessment Methods](image)

**Figure 2.** Benefits of the flipped classroom demonstrated by formal assessment methods.

Data compiled to assess personal time flexibility clearly indicates a high level of agreement that the students do in fact find the flipped classroom to provide more personal flexibility (Figure 1). This data was acquired by two different methods: the *End of Unit Reflections Survey* and *Post-Research Interviews*. The bar graph shows a fairly neutral response after the traditionally administered units, with student comments ranging from “I like the flipped classroom portion better because I can do it on my own time” to “It doesn’t matter,” and “I find ways to listen to the lectures or do homework in the same amount of time.” Of the students surveyed, 26% supplied feedback in support of the flipped classroom, whereas 42% remained neutral. In contrast, they responded that the model of video lectures gave them more personal freedom to the inverse question posed after Units 3 and 5. Feedback was received from various students who commented, “I
was able to listen to the lectures whenever I wanted and around my schedule” and “Let’s me view them when I am gone [traveling with the rodeo team].” Some students felt less strongly, commenting “I still have to set time aside for class either way.”

During the interview process, the six participating students overwhelmingly spoke highly of the flexibility provided with being able to access foundation lecture information in a format outside of the classroom. One full-time student who also works full-time said that he was “able to watch the videos and know what’s going on, but still deal with everything else, and balance everything out.” Additionally, one interviewee commented “If I was too busy running errands or anything, if I couldn’t even watch it, I plugged it in to my car and listened to it like a podcast...” Although one of the individuals interviewed thought “It would have taken me just as long to do the homework as listen to the videos....the (video) lectures were timed, so I knew [how much time to set aside],” indicating that she viewed this as a positive thing.

The End of Unit Reflections Survey additionally sought to measure the level of student perceived enjoyment of the course with the flipped classroom technique. As seen in Table 1, the average perceived level of enjoyment of the traditionally taught units was exactly neutral. Student feedback on the survey included a range of comments such as “It doesn’t matter” to “Flipped classroom (techniques) makes coming to class more enjoyable.” Whereas, at the conclusion of the two treatment units, the averaged student response score was somewhat higher at 4.1, or “Agree.” Of the student who gave feedback in support of their scale selection, there were three who gave some variance of the statement “I just like it.” One commented that the flipped classroom was “easier to
ask question and understand the material” while another enjoyed the increased level of peer interaction.

Post-research interviews also addressed this topic of student enjoyment of the flipped classroom. Of the six students interviewed, they all had some variance of positive feedback to give concerning the time gained to interact in class. The comments were especially positive in relation to the games, JeopardyLabs and Kahoot! One student told the researcher, “I enjoyed coming to class. I’ve taken classes where it’s just straight lecture, and it’s like...ugh, this sucks. And it’s not fun.”

Along with course enjoyment, perceived student benefits was an additional area the researcher wished to explore. Did the students notice gains with the use of the FC? The Baseline Survey was designed to gather pre-treatment information pertaining to the students’ perceived benefits of the flipped classroom, as well as data that would assist her in future refinement of her teaching. These survey results are compared in Figure 3 to the actual outcomes in three focus areas: overall benefit, flexibility, and course enjoyment. This table demonstrates that the students’ actual levels of personal time flexibility as well as course enjoyment exceeded their expectations.
Figure 3. Comparison of pre-implementation and post-implementation results.

The Comparison of Pre-Implementation and Post-Implementation Results was designed to determine if an increased amount of interactive class time was viewed as beneficial to the students. As the course units were taught, the student perceptions varied. When these results are compared to the students’ perceived difficulty level of the unit, it makes for some interesting correlations (Table 4).

Table 4
Comparison of Perceived Topic Difficulty and Benefit of Teaching Method. N= 8-12

<table>
<thead>
<tr>
<th>Action Research Question Addressed</th>
<th>Traditionally Taught</th>
<th>Treatment</th>
<th>Traditionally Taught</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 2 – Word Elements</td>
<td>2.5</td>
<td>2.0</td>
<td>3.1</td>
<td>2.7</td>
</tr>
<tr>
<td>Unit 3 – Body Organization</td>
<td>3.3</td>
<td>3.0</td>
<td>2.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Unit 4 – Integumentary System</td>
<td>3.5</td>
<td>4.2</td>
<td>3.2</td>
<td>3.8</td>
</tr>
<tr>
<td>Unit 5 – Digestive System</td>
<td>3.6</td>
<td>4.1</td>
<td>3.1</td>
<td>3.8</td>
</tr>
</tbody>
</table>

(Difficulty – 5 is hardest) (Benefits – 5 is most beneficial)
Units 2 and 4 were taught by traditional didactic lecture, with little time available for interactive class activities. The *Topic Difficulty Survey* demonstrates that the students were fairly neutral about the difficulty of these two units. A number of students mentioned that a lot of this material was review for them, with one student writing “Some of it was new material, but I recognized a lot of it.” The students’ responded somewhat higher than neutral regarding any benefit of class time utilized for additional methods of learning (board work, games, discussion, etc.). Unfortunately, none of the students surveyed gave any reasoning to support their scale selection.

When the treatment Units 3 and 5 are considered, the data indicated that these two units were perceived as more difficult, falling in the “hard” range of the difficulty scale. One student stated, “There is so much to learn in a short time. It can be difficult.” Another respondent commented in reference to the medical terms that there were “Confusing words. They were easy to mix up.” For these units, the students scaled the teaching sessions more positively, indicating that there were more opportunities to engage in active problem solving with their peers. Once again, those participating in the survey declined to explain their scale selection.

The *Post-Research Interview* with the high and low scoring students included a question regarding these perceived benefits as well. One student put it this way: “[The worksheets] forced you to really put together the words and Kahoot! and JeopardyLab forced you to want to study so you could win in class.” Another commented, “I liked the Kahoot! and I also liked the JeopardyLab. I thought those were fun and entertaining, but they also were instructional.”
The majority of this paper has focused on the flipped classrooms effect on the students, yet it is important to also consider another active participant in the research - the instructor. Does this teaching method benefit the researcher as an instructor? This is a difficult question to answer with the use of quantitative data, but quite easy to address with qualitative data. This information was captured mainly with the implementation of journaling thoughts and post-class journaling throughout the research (Appendix F). These reflections lead to the identification of three extremely positive benefits of the flipped classroom to the researcher as an instructor: overall increased enjoyment of the teaching experience, which is facilitated primarily via improved personal connections with students and curriculum flexibility. It is fair to say that since the researcher enjoys her students, increased interactions with them greatly contributes to this feeling. These three ideas are intricately woven into one; flexibility in the classroom allows for increased interactions, which leads to increased enjoyment of the researchers job. One of her journal entries exemplifies this, reading “Today’s student participation was excellent. We enjoyed 20 minutes of lecture review followed by interactive learning games. Quiet students were still quiet, but there was enough sharing that it was fun and engaging for all us.” Another read, “The best part about today’s lesson was playing JeopardyLabs, even though not all students had been studying their word elements. It was a great introduction to the medical terms and gave way to good conversation about making connections between the terms and medical words that we know.”

The most significant factor in the researchers’ escalated teaching pleasure was a greater level of engagement with the students. Increased direct student interaction
allowed for stronger personal connections, which she deems an important factor in student success. When considering her own role as a student, if she enjoys a rapport with my instructor, she is more comfortable asking questions as well as asking for help, if needed. In her own teaching environment, this is especially important due to the fact that college classes in Oregon are on a 10-week quarter system. This short time frame has previously left her feeling like she did not know her students at all and was therefore less able to help them achieve success. Lack of personal connection further amplifies the challenges associated with TVCC’s location in a low socioeconomic county where student retention levels are low. Several students enrolled in this course were experiencing difficulties in other areas of their lives and, in the researchers opinion, because they felt a connection with her and shared these trials, she was able to help them successfully navigate the course to completion. Her retention rate for this course was 92% out of 13 students as compared to the prior terms retention rate of 72% out of 18 students. The researcher strongly believes that being more than a talking-head at the front of the class contributes to this significant improvement. The students also seemed to enjoy helping her with her research. The researcher suspects that they may have felt more valued and in control of the educational process as she gathered feedback and ideas from them. Regardless, this success rate impacts her own feelings of accomplishment as an instructor. When she can make a positive difference in her students’ lives, the researcher feels that she is also contributing to her community’s success. She loves the feeling of giving back, and making her world a better place for all.
For the researcher, implementation of the flipped classroom resulted in curriculum flexibility that she found to be highly freeing and enjoyable. The ability to adapt each class’ activities based on informal assessments made teaching much more personal. Once again, this ties into ensuring student success and her own feelings of accomplishment. The class time that was freed up from the didactic style of lecture with the use of online videos allowed her to incorporate many other teaching methods, such as student led discussion, board work, and the use of a cadaver and other preserved items. It is encouraging to the researcher when she has the opportunity to observe her students making connections between material and real life. For instance, one day she recorded this note in her journal: “The best part about today’s lesson was the student’s willingness to engage and share personal experiences and stories which related.” On this day the class had been reviewing pathologies that affect the integumentary system. Usually there are at least a couple of students in class who work in health care as a CNA or EMT. Drawing on these scholars’ work experiences during class can help facilitate other students to develop meaningful connections between the topic and real life. Contrast this with a statement recorded on a traditional lecture day: “Today’s student participation was poor during lecture. I felt like the students were unengaged...(until) taking the students upstairs to observe the cadaver. The students finally seemed engaged in the lesson.” These types of comments are sprinkled throughout the research journal and are punctuated by remarks such as “This was so rewarding!” Finally, the flexibility allows for a level of freedom within the curriculum which keeps feelings of stagnancy at bay. It gives the researcher great pleasure to equip her students with increased tools for success,
which the flipped classroom did. The researcher found that affording certain students options such as online videos helped accomplish this task.

Although the researcher didn’t choose to track the time involved in making the videos, the number of videos for the two units totaled seven, with an average length of 11 minutes. After she successfully created the videos, which often required some edits, they had to be formatted and saved to YouTube and then embedded into the LMS system. Additionally, she created a five question quiz for each video and set up the adaptive release feature. All of this took a significant amount of time because her knowledge of the technology used was limited prior to this project. However, by the time she had finished her research she had streamlined the video making procedure. For the future her main concern is that videos and quizzes will need to be updated, but not regularly enough to maintain the fluidity of the process.

**INTERPRETATION AND CONCLUSION**

The over-arching question of this research probes the question “In what ways do flipped classroom techniques affect student learning of course content?” The subsequent questions sought to address specific benefits that other researchers had previously identified - specifically the benefit of additional class time for interactive learning, flexibility of time with the use of online video lecture, and course enjoyment. Finally, the researcher desired to identify ways in which the flipped classroom would benefit her as an instructor.

Surveys and interviews clearly demonstrated that the students perceived a benefit with the flipped classroom technique, as compared with the traditional lecture method.
Quantitative values indicate a 14% higher level of agreement that the students strongly agree with the benefits of the flipped classroom. Quantitatively, students’ comments and answers to interview questions illustrate that some individuals like coming to class prepared with questions on the topic as well finding the videos to be beneficial as a study tool for exams. One student mentioned that she could back up the video and listen to it again if she did not understand some portion. In addition, the option to listen to the lectures more than once was cited as a noteworthy benefit. One surprising outcome from the data analysis was that there was absolutely no difference in the resulting formal assessment grades between the two teaching methods. When this data was teased apart, it is in fact evident that some students benefited from the flipped classroom. Three students in particular realized significantly higher exam scores during the treatment. The researcher believes this was due to the greater amount of class time spent in learning activities. Certainly, one cannot make the case (at least with this cohort) that exam scores were lowered by the treatment. Each unit exam contained 50 questions. Sixty percent of these were foundationally related with the remaining 40% specific to the definition or creation of a correct medical term. Therefore, the exams were similar in rigor. The homework scores were a different situation, which the researcher thinks would require a larger sample size or a greater treatment time length to more fully explore. However, just because there was not value realized in this area for all students, does not mean that the treatment was without merit.

For example, the focus area that demonstrated the largest statistical change in data was personal flexibility of time. Here we saw a 28% difference of favorability, with
students largely preferring the treatment. From the comments on the survey, this method provided a much needed accommodation factor for some students, or didn’t make a bit of difference for others. Of the six interviewees, it was learned that some students would listen to the videos “on the go” on their phones, which was a benefit I had not anticipated. Other students appreciated that if they were unable to attend class, the videos allowed them to keep up with the course progress.

Course enjoyment was a factor that the researcher especially sought to improve, given the dry nature of Medical Terminology. A 22% higher Likert value was identified with the implementation of flipped classroom methods. Student feedback was strong in particular with regards to the incorporation of the learning games Kahoot! and JeopardyLabs. Increased peer interaction during class was yet another benefit noted by students’. Others simply indicated that class time was more enjoyable.

Finally, the application of flipped classroom technique resulted in the identification of both benefits and disadvantages for the researcher as an instructor. As mentioned earlier, the initial preparation time required for developing videos is somewhat time consuming. The researcher envisions that she will remake these every few years, as she may want to include new information, or simply revamp them as technology progresses. Although there was a large learning curve at the onset of this project, the researcher is now comfortable with the process of both producing the videos and making them available to the students. Learning how to best utilize her schools LMS Blackboard was a hurdle for her. This was especially true because she wanted to incorporate the feature of adaptive release. That being said, she absolutely delighted in being able to
spend more interactive time with her students. Add to this the advantage of curriculum flexibility, and the researcher gained an increase of personal enjoyment and fulfillment in her job as a teacher with this treatment method. For her, these benefits far outweigh the prep time required to incorporate flipped classroom techniques into her classroom.

This study demonstrated that students perceive the additional time available for group activities, discussion, and interactive learning during class time as beneficial. The formal assessments support this perception, with an exam advantage noted for 73% of students during the treatment units. Additional time spent during class on board work and learning games were key to this increase. Many students additionally appreciated the flexibility provided them with lecture being presented in the video format, as opposed to the traditional didactic method. However, it was noted that some students struggled with the completion of videos and quizzes in a timely manner. When students had to miss class, this treatment allowed them to stay current with the lecture material and not fall behind. An increased enjoyment for class was identified with the implementation of engaging learning activities and class work with peers. As an instructor, the researcher enjoyed both an increased level of active involvement with her students, as well as additional flexibility throughout the term.

VALUE

Implementation of FC techniques provided an opportunity to incorporate various teaching tools during class time. The ability to include techniques that appeal to multiple learning styles, such as kinesthetic learning, leads to a more engaging class time for everyone involved. The utilization of a human cadaver notably increased attendance and
participation in the knowledge acquisition of the various body systems. The incorporation of this teaching tool had not been possible in previous terms, simply due to lack of time. The students’ had the option to simply observe the body and participate in discussion, or to glove up and feel the thickness of the skin, identify how the connective tissue functions in the human viscera, or hold a heart. Without a doubt, these experiences made connections for the students between the course material and real life. Interactive learning activities such as board work, Kahoot!, and JeopardyLabs proved valuable in a number of ways. As we were nearing exam time, these activities were wonderful tools for the students’ to self-identify areas that they needed to spend more time studying. Additionally, the games brought out a competitive edge in many individuals, which made the class time more enjoyable. The laughter that accompanied these competitive games lent a lighthearted and fun atmosphere to the classroom. Along with freeing up class time for these engaging activities, the FC format allowed me as an instructor to steer the teaching as I desired, curtailing it to this specific group of students’ needs. I believe this is a valuable attribute of the FC, especially in a fast-paced course that contains students with varying degrees of foundational knowledge.

One of the goals of this study was to identify if the FC provided my students’ with an increased range of flexibility. Analysis of the data indicates that it does, if only for those who needed it most. I view this as a success. For those students who did not necessarily require this component for optimum navigation of the course, they still indicated that they liked having it. The before-hand knowledge of how long a video was going to last was convenient and allowed them to schedule their personal time more
easily. They appreciated being able to listen to the lectures repeatedly if they so desired, and even being able to play them in their car while driving.

Course enjoyment was another focus area where data showed improvement. Realistically, engaging class time would appear to be the element that most likely facilitated this improved experience. Relationships emerge, boredom is staved, and class time feels more value-added as the students are active participants in their learning. A direct correlation of increased student participation was my own pleasure in the classroom. I also was afforded the opportunity to work with the students, helping them succeed and to have a good experience in the process.

Implementing the flipped classroom added substantial depth to my teaching. Working at the collegiate level, where large amounts of information are delivered in a short ten-week term does not permit for much flexibility in the time spent as a group. The FC techniques handily made this more possible. With this newfound “extra” class time, I was forced to dig deep and research and explore new ways to teach. I stepped out of my own comfort zone in a big way, incorporating games during class. I went as far as to purchase bells for the teams to ring during JeopardyLabs, and provided candy to the winning teams. This all felt rather silly and foolish at the onset, but the student reactions told me otherwise. It seems that no matter the background, age, or gender of the student, only the especially reserved seem resistant, and even they eventually come around. In fact, one of my most reserved students turned out to be the most competitive and engaged students during these times. I found it very gratifying to identify an activity that pulled her out of her shell, so-to-speak.
One of the principal lessons I learned during this study is that any teaching method is not “one size fits all.” The Post Research Interviews included a question regarding how I could improve as an educator. I had several students share that they would like me to re-cap the information on the videos more thoroughly in class. It seems that I may have relied a little too heavily on the students’ ability to simply watch the videos and absorb the information. Also, I have learned that there are some topics that are just not as conducive to online learning. For instance, the circulation of blood through the systemic and pulmonary systems of the heart is a topic that could be introduced in the videos, but really should be taught in a format where the students can have increased guidance as they learn. In this way, questions can be asked, and positive as well as constructive feedback can be given, leaving the students with higher levels of confidence regarding the material. For future implementation of FC techniques, I will be very judicious in how I select materials that will be covered in video. During the interview process several students made comments that on the more complicated systems they preferred more in-class discussion to revisit the physiology portion. Based on this, in the future I will utilize videos as more of a supplemental technique for units loaded with material, as opposed to a blanket approach that covers all of the lecture matter.

As with any study, I identified some flaws during the research process, the biggest of which is situational and likely unique to this particular setting. Due to the fast-paced nature of this course, alternating between methods every ten days left several students feeling bewildered and lost. One student always forgot to watch the videos in time to earn quiz points during the treatment method. This particular student was a freshmen and
was still learning to navigate college. She seemed confused about the expectations during this unit, and in general overwhelmed by the study. If I was to repeat this study, I would do so in a different course where the units take a longer period of time to cover, or teach several units back-to-back with the traditional method, and then several units with the treatment. I think this would lessen the confusion felt by the students.

In conclusion, I certainly feel that both the quantitative and qualitative data supports the benefits of the FC for both the students and myself. The one area that was somewhat disappointing was the formal assessments. I truly expected to see exam scores rise during the treatment phases. However, if increased overall course enjoyment by the student leads to higher rates of retention and completion, I can still call this teaching method a success.

In the future, I will absolutely implement flipped classroom techniques, but in a modified manner. I foresee incorporating the use of videos for those units which are more challenging for the students. For example, in the Cardiovascular System unit, the students will watch video lectures and take quizzes on the straight-forward information on their own time. Class time can be spent on a quick review of that material, and then focus on lecture and discussion associated with the more complex matter. Interactive time spent on assignments during class is another practice that I would anticipate utilizing. I think it is valuable for the students to work together on these assignments prior to coming to me for help. Finally, I can see the value in the active involvement of students guiding their own learning. When I draw them into a situation where they have some control as to how the class time is spent, students seem to engage more in the
learning process. What I mean by this is, if I ask for feedback on a particular teaching method and then implement the student responses, they feel respected and know that I am listening and adapting to their needs. I appreciate the flexibility that this approach gives both myself and the students.
REFERENCES CITED


APPENDIX A:

INSTITUTIONAL REVIEW BOARD
INSTITUTIONAL REVIEW BOARD
For the Protection of Human Subjects
FWA 0000165

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c/o Immunology & Infectious Diseases
Montana State University
Bozeman, MT 59718
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MEMORANDUM

TO: Jaretta Shoemaker and Walt Woolbaugh
FROM: Mark Quinn, Chair
DATE: April 1, 2016
RE: "Students’ Grades and Perceptions of a Flipped Classroom" [JS040116-EX]

The above research, described in your submission of April 1, 2016, is exempt from the requirement of review by the Institutional Review Board in accordance with the Code of Federal regulations, Part 46, section 101. The specific paragraph which applies to your research is:

_ X_ (b) (1) Research conducted in established or commonly accepted educational settings, involving normal educational practices such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

_ X_ (b) (2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.

_ X_ (b) (3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

_ _ (b) (4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available, or if the information is recorded by the investigator in such a manner that the subjects cannot be identified, directly or through identifiers linked to the subjects.

_ _ (b) (5) Research and demonstration projects, which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.

_ _ (b) (6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed, or (ii) if a food is consumed that contains a food ingredient at or below the level found to be safe, by the FDA, or approved by the EPA, or the Food Safety and Inspection Service of the USDA.

Although review by the Institutional Review Board is not required for the above research, the Committee will be glad to review it. If you wish a review and committee approval, please submit 3 copies of the usual application form and it will be processed by expedited review.
APPENDIX B:
BASELINE SURVEY
Name______________________________

Please note that participation in this survey is strictly voluntary. Non-participation will not affect a student’s grade or class standing in any way.

Please check the most appropriate box for the following statements.

1. I am familiar with “flipped classrooms” and what this term means.
   __________ Agree ___________ Disagree

2. I have previously taken a course which has utilized flipped classroom techniques.
   __________ Agree ___________ Disagree

   If you have, please explain where and please let me know how you liked it?

Please rate each statement/question by circling the number which best represents your answer. If you do not have a strong opinion please circle “3.”

3. On a scale of 1 to 5 please rate your level of confidence utilizing the Blackboard format.

   Very confident 5 4 3 2 1 Not at all confident

   Please let me know why you answered the way you did.

4. On a scale of 1 to 5 how would you rate your level of enjoyment for traditional lecture during class?

   Very enjoyable 5 4 3 2 1 Not at all enjoyable

   Please let me know why you answered the way you did.

5. On a scale of 1 to 5 how do you think you would enjoy watching pre-recorded lecture videos as homework?

   Very much 5 4 3 2 1 Not at all

   Please let me know why you answered the way you did.
6. On a scale of 1 to 5 how do you think you will enjoy spending class time working in groups on what would normally be homework assignments.

<table>
<thead>
<tr>
<th>Very enjoyable</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>Not at all enjoyable</th>
</tr>
</thead>
</table>

Please let me know why you answered the way you did.

7. On a scale of 1 to 5 what is the likelihood that you will watch the pre-recorded lecture videos at home?

<table>
<thead>
<tr>
<th>Very likely</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>Not at all likely</th>
</tr>
</thead>
</table>

Please let me know why you answered the way you did.

8. On a scale of 1 to 5 how do you think your learning of the course material will be POSITIVELY impacted with the use of interactive class time?

<table>
<thead>
<tr>
<th>Very much</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>Not at all</th>
</tr>
</thead>
</table>

Please let me know why you feel this way.

9. On a scale of 1 to 5 how do you perceive that flipped classroom techniques would be a more enjoyable format for learning?

<table>
<thead>
<tr>
<th>Very enjoyable</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>Not at all enjoyable</th>
</tr>
</thead>
</table>

Please let me know why you answered the way you did.

10. On a scale of 1 to 5 how do you perceive your flexibility of time spent outside of class being POSITIVELY impacted with flipped classroom techniques?

<table>
<thead>
<tr>
<th>Very much</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>Not at all</th>
</tr>
</thead>
</table>

Please let me know why you answered the way you did.
APPENDIX C:

END OF UNIT REFLECTION SURVEY (TRADITIONAL)
Name

Please note that participation in this survey is strictly voluntary. Non-participation will not affect a student’s grade or class standing in any way.

Please rate each statement/question by circling the number which best represents your answer. If you do not have a strong opinion please circle “3.”

1. Having traditional lecture sessions during class helped me to understand the key concepts/topics we are learning in this unit.

| Very true | 5 4 3 2 1 | Not at all true |

Please explain why you answered the way you did.

2. I feel prepared to participate in class discussions / activities WITHOUT having heard lecture material PRIOR to attending the class.

| Very true | 5 4 3 2 1 | Not at all true |

3. The class sessions provided me opportunities to extend my understanding of the key concepts, ideas and issues through peer interaction.

| Very much | 5 4 3 2 1 | Not at all |

4. The class session provided me opportunities to extend my understanding of the key concepts, ideas and issues through teacher interaction.

| Very much | 5 4 3 2 1 | Not at all |

5. The traditional teaching session provided opportunities to engage in active problem-solving with my peers.

| Very much | 5 4 3 2 1 | Not at all |
6. I am motivated to complete worksheets and activities outside of class on my own after in class lecture.

| Very much | 5 4 3 2 1 | Not at all |

7. The traditional-style teaching format is more useful/effective for me as compared to the flipped-lecture style.

| Very true | 5 4 3 2 1 | Not at all true |

Please explain why you answered the way you did.

8. Overall the model of class lectures is effective in supporting me to achieve the learning outcomes.

| Very much | 5 4 3 2 1 | Not at all |

9. In comparison to the flipped classroom model, traditional lectures give me more flexibility in my personal time.

| Very much | 5 4 3 2 1 | Not at all |

Please explain why you answered this way.

10. The traditional lecture in the classroom makes learning Medical Terminology more enjoyable as compared to the flipped-classroom technique.

| Very much | 5 4 3 2 1 | Not at all |

Please explain why you answered this way.

11. I prefer to study and learn the word elements associated with the course on my own as opposed to in class activities.

| Very much | 5 4 3 2 1 | Not at all |

12. I would prefer that future class sessions to be delivered by the traditional lecture method.

| Very much | 5 4 3 2 1 | Not at all |
APPENDIX D:

END OF UNIT REFLECTION SURVEY (TREATMENT)
Name__________________________________________

Please note that participation in this survey is strictly voluntary. Non-participation will not affect a student’s grade or class standing in any way.

Please rate each statement/question by circling the number which best represents your answer. If you do not have a strong opinion please circle “3.”

1. Having access to lecture videos and corresponding PowerPoints PRIOR to attending class helped me to understand the key concepts/topics we are learning in this unit.

| Very true | 5 4 3 2 1 | Not at all true |

Please explain why you answered the way you did.

2. I feel better prepared to participate in class discussions / activities as a result of having access to lecture material PRIOR to attending the class.

| Very true | 5 4 3 2 1 | Not at all true |

3. The class time provided me opportunities to extend and apply my understanding of the key concepts, ideas and issues through peer interaction.

| Very much | 5 4 3 2 1 | Not at all |

4. The class session provided me opportunities to extend and apply my understanding of the key concepts, ideas and issues through teacher interaction.

| Very much | 5 4 3 2 1 | Not at all |

5. The teaching session provided opportunities to engage in active problem-solving with my peers.

| Very much | 5 4 3 2 1 | Not at all |

6. The access to material BEFORE class motivated my interest in the topic.

| Very much | 5 4 3 2 1 | Not at all |
7. The flipped-style teaching format is more useful/effective for me as compared to the traditional lecture style.

| Very true | 5 | 4 | 3 | 2 | 1 | Not at all true |

Please explain why you answered the way you did.

8. Overall the model of video lectures is effective in supporting me to achieve the learning outcomes.

| Very much | 5 | 4 | 3 | 2 | 1 | Not at all |

9. Overall the model of video lectures gives me more flexibility in my personal time as compared to the traditional lecture method.

| Very much | 5 | 4 | 3 | 2 | 1 | Not at all |

Please explain why you answered this way.

10. The flipped classroom method makes learning Medical Terminology more enjoyable for me, as compared to the traditional lecture style.

| Very much | 5 | 4 | 3 | 2 | 1 | Not at all |

Please explain why you answered this way.

11. I prefer to study and learn the word elements associated with the course in the classroom setting with my peers, with tools such as jeopardy labs and Kahoot, as compared to learning them on my own.

| Very much | 5 | 4 | 3 | 2 | 1 | Not at all |

12. The online quizzes help me validate that I am understanding the important topics of the video lectures.

| Very much | 5 | 4 | 3 | 2 | 1 | Not at all |

13. I would like future class sessions to be delivered in this way.

| Very much | 5 | 4 | 3 | 2 | 1 | Not at all |
APPENDIX E:

TOPIC DIFFICULTY SURVEY
Name ______________________________________________

Please note that participation in this survey is strictly voluntary. Non-participation will not affect a student’s grade or class standing in any way.

Please rate each statement/question by circling the number which best represents your answer. If you do not have a strong opinion please circle “3.”

1. Please rate the overall level of difficulty while learning the materials covered in Unit 2.

   | Very Hard | 5 4 3 2 1 | Very Easy |

   Please explain why you answered the way you did (i.e. What did you find difficult?).

2. Please rate the level of difficulty of the foundational material (Anatomy & Physiology) covered in Unit 2.

   | Very Hard | 5 4 3 2 1 | Very Easy |

   Please explain why you answered the way you did (i.e. Was there a particular topic which was difficult?).

3. Please rate the level of difficulty of learning the medical terms covered in Unit 2.

   | Very Hard | 5 4 3 2 1 | Very Easy |

   Please explain why you answered the way you did (i.e. What did you find difficult about them?).

4. Please rate the level of difficulty of the worksheets, case study, and other learning materials assigned in Unit 2.

   | Very Hard | 5 4 3 2 1 | Very Easy |

   Please explain why you answered the way you did (i.e. Which one was difficult?).

5. If applicable, did you watch all of the videos associated with the unit? Circle one.

   Yes  No

   If not, please explain why you were unable to.
APPENDIX F:

INSTRUCTOR REFLECTIVE JOURNAL
1. “The best part about today’s lesson was………..”
2. “Today’s student participation was……..”
3. “Things I would do differently next time are………..”
APPENDIX G:

POST-RESEARCH INTERVIEW QUESTIONS
1. What is your overall impression of the flipped classroom techniques? (Online videos which allows for more classroom interaction.) Did you like it, not like it?

2. Do you feel that having the foundational course material provided online with the video format impacted your learning of the course content? And if so, in what way?

3. Do you feel that the classroom activities and discussion were beneficial to your learning of the word elements and Anatomy & Physiology? Which items were most beneficial? Least beneficial?

4. Do you feel that the treatment format provided you with more personal flexibility for learning the course content and successfully completing the course? (Ex: watch videos at your leisure, flexibility for life events)

5. Do you think that the format made learning the subject matter more enjoyable than strict class lecture format?

6. What could I do differently or how could I improve the course in order to better support student learning in future classes (activities, in lecture videos, increased lecture / discussion in class, handouts, worksheets)?