

Running Head: FLIPPED CLASSROOM

A Review of Students' Perceptions, Engagement, and Academic Achievement in the
Flipped Classroom

by

Julie Bedi

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Supervisory Committee

Dr. Michelle Wiebe - Supervisor (Department of Curriculum and Instruction)

Dr. Todd Milford – 2nd reader (Department of Curriculum and Instruction)

Abstract

The flipped classroom is a pedagogical model designed to focus on a student-centered teaching technique that reverses the traditional educational arrangement. Short video lectures are viewed by students at home before the class session, instead of face-to-face lectures, while in-class time is devoted to homework, discussions, and increased one-on-one time with the teacher. There has been much controversy about whether or not this inverted teaching approach is a practical instructional method that improves learning experiences and knowledge base of students. Scholars who advocate for this teaching approach assert that flipping courses gives students more opportunity to take charge of their own learning and frees more class time for meaningful interaction between peers and teacher. Those that oppose this method argue that there has been very little research and evidence to support the efficacy and effectiveness of the flipped classroom and more research is needed to understand the impact on student learning. The purpose of this research is to (a) review the empirical research literature on the outcomes of blended learning and (b) discuss if and how the flipped classroom technique and use of technology has been used to enhance and support students' learning, examine student perceptions and engagement, and academic achievement. As teachers, we can witness student engagement when students are making connections with ideas, questioning, and reflecting. Increased student engagement can motivate students' interest in school, and

this can lead to increased academic success. The flipped class can create this deeper thinking with positive educational experiences; this may allow students to perform at their highest level and build practice for success in their future.

Keywords: flipped classroom, student-centered, inverted classroom, blended learning, ICTs (information and communication technologies), learning and engagement, student perceptions

Introduction

This review examines the relevance of the flipped classroom model in this era of 21st century schooling. Research shows flipped classrooms increase the one-on-one time teachers are able to spend with students and this creates a platform for students to ask questions and get the extra help needed with areas of difficulty (Bergmann & Sams, 2014). The flipped classroom also allows students to engage in active learning, such as peer work, and problem solving during class time, which allows students to be better engaged in both subject matter and their own learning processes (Trolden, 2015). The inverted classroom illustrates the importance of the involvement of students, teachers, and information and communication technologies in the learning process. Outside of class time, students are given the resources, such as videos or pre-recorded lectures, to familiarize themselves with the subject matter before class. Consequently, class time can be used for mastery of learning and this approach is gaining traction (Bergmann & Sams, 2014). Flipped learning is beginning to redefine the classroom paradigm. Because students have immediate access to content whenever it fits their schedule, instructors have more opportunities to work on problem solving and higher order thinking skills with students one-on-one. In the following, I begin by grounding this study in my personal

interest. I will then provide research studies that examine the effects of the flipped classroom model on student: perception, engagement, and achievement. Technologies are impacting education and with flipped classroom pedagogy, instructors are able to provide virtual educational resources along with the ability to support content delivery between themselves and students.

Personal Interest

I am a high school teacher who has been teaching for almost 20 years in secondary science and math. I had taught in the traditional classroom for over 10 years and over the last several years, I had noticed students' lack of engagement in science and math classes. The lecture style of information delivery to students had typically been the best way of transferring knowledge and also allowed teachers to cover the vast amounts of information that is mandated in government curriculum and on compulsory provincial exams. Students, however, have seemed to be unhappy with this content lecture style of teaching that allowed little flexibility to their learning. Many students desired an alternative teaching and learning environment, differing from mainstream pedagogy, where they could have more of their educational, social, and emotional needs met. The increase in the development of educational technology has allowed for alternative and new methods of teaching and learning, that can be provided to these students.

I now teach in a school that focuses on alternative education and employs the flipped classroom pedagogy. The school offers a blended learning approach, which strives to capture the best of online learning with the best of traditional classroom experiences. This practice seems to work well in responding to the learning needs of students living in today's more connected world. Millennial students, those born after the

1980's, have been exposed to information technology and digital media from a very young age. As a result, these students “think and process information differently from their predecessors” who were exposed to a traditional model of education (Prensky, 2001, p. 1). Due to this, the needs of the 21st-century student have changed. This change has validated the need to explore alternative forms of education that incorporate learning strategies to better engage students and increase student knowledge. This redesign can be exciting and challenging for educators. In an effort to restructure the classroom to focus on creativity, critical thinking, and collaboration using digital media and information technology, alternative methods of instruction, such as the flipped classroom model, are being used to prepare students for the future (Irvine, Code, & Richards, 2013). This type of learning can accommodate more than one kind of learning strategy over the one-size-fits-all lecture. For example, visual and auditory learners could do well with video content, whereas kinesthetic learners may do well with the one-on-one work in class. This learning model may facilitate many different learning strategies.

The goals of this teaching modality, for me, are to enable students to learn at their own pace and to maximize the amount of interactive learning possible in the classroom. In this way, the classroom activities become more “student-centered rather than teacher-centered because teachers can act as facilitators” (Halili & Zainuddin, 2015, p. 15). By having students prepare prior to coming to class, the teacher can help students engage in discussions and activities that create a deeper and more intricate understanding of the lesson, as opposed to using valuable time lecturing.

My personal interest is drawn to this technologically advanced 21st-century learner. Can we take advantage of students' attraction to technology by providing

learning opportunities through Information and communication technology (ICTs) efficiently in the classroom setting? I believe that the flipped classroom can provide this.

The flipped model is not limited to just one technique. The approach is unique to each teacher or school's teaching style. As a school, we have based our school teaching approach on the book *Flipping the Classroom* (Bergmann & Sams, 2014). These pioneers in the flipped classroom model promote student-centered learning environment by devoting class time to expand on mastering material through collaborative learning and outside class time is used to view video lectures. Our school has used some their research to understand what the best use of face-to-face class time is and how to increase student engagement.

My journey as a flipped-classroom teacher has allowed me to learn about who I am as a teacher and what I want my students to gain from my classes. In employing my own approach to the flipped classroom, some pedagogical questions I have contemplated are: how would students perceive viewing virtual lessons outside the classroom and participating in active learning in class? Would they find the opportunity to engage in technology for their learning, enjoyable and interesting? Does increased active engagement with instructor and peers help students to learn more effectively and does it improve grades? Having many trials, failures, and eventually successes with this flipped classroom teaching modality, has inspired me to further explore this pedagogy and these questions and determine if student engagement and achievement is improved and what student perceptions and experiences are with this technique.

Research Background

Bishop and Verleger (2013) stated that the flipped classroom is a new model, contrary to traditional learning, where students do not listen to the conventional style lecture in the class but receive lecture videos as a learning activity outside the classroom. Historically, the flipped model was termed the “inverted classroom” and was coined by a group of economics professors at Miami University to describe their use of the technique (Lage, Platt, & Treglia, 2000). The method has roots as an approach used by business and law schools where students are given materials to complete outside of class to prepare for in-class discussions and other classroom pursuits. In the K–12 education community, the inverted classroom is often known as the “flipped” classroom and has shown increasing interest stemming from the work of Colorado high school science teachers Jonathan Bergmann and Aaron Sams (Talbert, 2012). In 2007, Bergmann and Sams were instrumental in starting the flipped idea, by recording video lectures for supplemental student learning materials. Their idea came from their difficulty finding the time to re-teach lessons to students who were sick, absent, or could not attend class. With a small budget, they recorded their own videos and posted them online for students. Eventually, all of their students started accessing the flipped lecture video at home for review and reinforcement (Bergmann & Sams, 2012). This has inspired students and teachers throughout the world to use flipped learning and now it continues to evolve and has been developed and modified by educators of all levels (Tucker, 2012). This blended model represents a potential future for improved instructional efficiency. The flipped classroom can allow students to be better prepared for class, with the use of virtual content, and they can further develop these concepts and ideas in class with the help of peers and instructors.

To measure students' perceptions regarding the flipped classroom setting, several studies were examined that used flipped learning in science and math courses. Recent research highlights that many activities, such as watching videos before class and using class time for problem solving is positively perceived by students (Jeong, González-Gómez, & Cañada-Cañada, 2016). The ability to watch and re-watch class lessons have allowed students to overcome difficulties related with more complex concepts (Roach, 2014). A majority of students stated that teaching methods used in the flipped classroom setting were convenient and helped them learn more efficiently (Butt, 2014). This enables student opportunities to build abilities and skills beyond information recall. Thus, the inverted classroom represents a promising modernization of education.

Based on the available literature, several studies reported increased engagement in students. It was found that attendance to class increased in flipped classroom settings compared to traditional classes (Fredricks, Blumenfeld, & Paris, 2004). Engagement was further measured by the increase in videos accessed for each topic of curriculum being studied (Yeung, Raju, & Sharma, 2016). Item submission rates, including assignments and other work, were monitored after the implementation of the flipped classroom and were shown to have increased (Smallhorn, 2017). If this blended learning pedagogy can produce a more engaged learner, it has the potential to increase student retention at both the curricular content and course level.

A number of research studies have been conducted to determine if the flipped classroom has an effect on improvement of student cognition and learning processes. Flipped learning has resulted in some improvement in course marks compared to non-flipped classes but this research is varied (Chen & Chang, 2017; Smallhorn, 2017; Roach,

2014). Research suggests that blended learning has potential to yield successful learning outcomes. Flipped classroom activities such as transfer of factual knowledge outside the classroom, have helped to improve learning and engagement of students (Deslauriers, Schelew, & Wieman, 2011).

Research Questions

The purpose of the first part of this study is to review the empirical literature on the flipped classroom. Specifically, as suggested in the preceding sketch of the research background, the following questions guide the review.

1. How do students perceive and experience the flipped classroom?
2. Does the flipped class enhance student engagement?
3. Does the flipped class enhance student performance?

Definitions

Flipped classroom. Flipped classroom is defined as an instructional pedagogy that blends and reverses the traditional learning environment by delivering instructional content, often online, outside of the classroom. It moves more student-centered activities, such as individualized assistance on homework and hands-on activities, into the classroom (Bergmann & Sams, 2014).

Student perceptions. Student perceptions are defined as the perspectives, mental viewpoints, and outlooks students have when considering their flipped-classroom learning environment (Baker & Hill, 2016).

Student experiences. Student experiences are the nature of the engagement that students have with their flipped learning environment (Harvey, Burrows, & Green, 1992). This is essentially the student's formal learning experiences in and out of the classroom

and their overall experience of the methods used in the flipped classroom, such as watching videos outside of class time

Student engagement. In education, student engagement refers to the amount of attention, curiosity, and interest students' show when they are learning or being taught. This may extend to the level of motivation they have to learn and progress in their education (Hidden Curriculum, 2014). Student engagement may also refer to the ways in which educators involve students in the learning process, such as how often students access outside class content for their learning.

Student performance. Student performance measures the amount of academic content a student learns in a determined amount of time and how well the student has mastered the material presented. Students should be able to demonstrate knowledge gained from content and experiences given in and out of class and be able to apply the knowledge in new and different cases (Hull, 2007).

Research Pathway

To conduct my research on the flipped class, I used the University of Victoria's library website and Web of Science to look up books and articles, written on flipped classes. Major authors, leaders, and pioneers in this field are Bergmann, Sams, Fulton, Lage, Platt, and Treglia. To access further literature on this topic, I have focused my search in Google Scholar and Web of Science where I have used the search term flipped classroom. Other synonyms to flipped classroom such as "blended learning," "integrated learning," and "inverted classroom" also opened up several more articles for me.

I narrowed my research on specific topics about the flipped classroom by searching terms in Web of Science such as "flipped classroom engagement," "flipped

classroom achievement,” “student perception,” “student motivation,” and “student feedback.” Since I am a science and math teacher at the secondary level, I also sought out articles that focused on science and math specifically at the high school level. The articles collected about student perception,” “student motivation,” and “student feedback” were predominantly qualitative data and the student achievement articles were mainly quantitative data. Looking at studies that employed different methodologies has allowed me to work with different kinds of data and thereby enhance my understanding of this pedagogy while trying to offset the shortcomings of using each approach alone. There were a number of studies in the relevant academic literature to draw upon for research on the flipped classroom. I have collected thirty articles and two books to study and focus on my area of research.

In the following sections I (a) review how the flipped classroom has influenced student perceptions, engagement, and academic performance and (b) discuss the relevance of this pedagogy in today’s technology-based learning environment.

Literature Review

The purpose of this review is to examine literature on the flipped classroom at the secondary level, predominantly in math and science classes. Several studies have examined specific concepts related to students’ perceptions, engagement, and achievements in the flipped setting and many have shown to lead to successful school outcomes (Gilboy, Heinerichs, & Pazzaglia, 2015; Jeong, González-Gómez, & Cañada-Cañada, 2016; McLaughlin, Griffin, Esserman, Davidson, Glatt, Roth, Gharkholonarehe, & Mumper, 2013; Roach, 2014; Smallhorn, 2017). Three sections are presented in this literature review. In the following three sections, respectively, answers to the three

research questions are provided: (a) How do students perceive and experience the flipped classroom?; (b) Does the flipped class enhance student engagement?; and (c) Does the flipped class enhance student performance? First is a discussion of student perceptions of this instructional strategy. A number of different studies performed on the flipped-classroom setting have concentrated on areas that include students' increasing interest in the flexibility of this teaching modality, the virtual component of the courses, and viewpoints of the course such as course presentation and face-to-face time with instruction (Butt, 2014; Gonzalez-Gomez, Jeong, Rodriguez, & Canada-Canada, 2016; Roach, 2014;). The second section focuses on blended learning and its ability to engage students and keep their interest in the course by remodeling the way traditional classes and lectures are structured and making class time more effective using today's technology. When students embrace the idea of taking increased ownership of their learning, improvements are observed in student active engagement in class (Jeong, González-Gómez, & Cañada-Cañada, 2016, Smallhorn, 2017). The third section examines whether student achievement is affected in the Flipped Classroom environment (Abeysekera & Dawson, 2015; Clark, 2015; Gonzalez-Gomez et al., 2016). The question that must be asked is whether flipped instruction has produced more effective learning for its students. Based on the findings, academic performance in the flipped classroom setting is worth discussing. In the following subsections, I review the literature in view of three questions to be answered: (a) What are student perceptions and experiences of flipped classroom? (b) Does the flipped class enhance student engagement? (c) Does the flipped class improve student performance?

Student Perceptions and Experiences of Flipped Classrooms

In this first section, I answer the overall research question “How do students perceive and experience the flipped classroom?” The objective of this question is to learn how students’ perceive their experiences in the flipped classroom *from current literature*.

Introduction. There has been much enthusiasm surrounding flipped learning and the academic research on student perceptions of the flipped classroom suggests that general student opinion of this model tends to be positive, with a significant minority being opposed (Bishop & Verleger, 2013; Roach, 2014). Millennials have not known a world without technology, so their attitudes toward education are different than those of the previous generation (Irvine, Code, & Richards, 2013). These students are comfortable using technology in school to engage and learn, and that is an essential component of this teaching methodology.

Review. The majority of students agree that technology use is an advantage to shaping their learning using the flipped model of instruction. Students are able to access virtual class content through such things as videos, vodcasts, and powerpoints outside of class time anytime they wish to (Bergmann & Sams, 2014). Students also describe the use of online videos to be beneficial as they allowed for self paced learning (Roach, 2014). Additionally, with lectures moved to an online forum outside of class, student comments reflected how they were able to participate effectively in active learning activities presented in class, since this provided an increased opportunity to interact one-on-one with instructors and students in the classroom (Bergmann and Sams, 2012). After examining several studies that used surveys with students, such as Likert surveys and open-ended questions, it is possible to discuss three topics that affect student perceptions of the flipped classroom. The following sections highlight (a) the flexibility of learning

that technology brings to the flipped classroom, (b) the use of multimedia outside the classroom, and (c) how face-to-face instructional time affect student perspectives and experiences with this teaching modality.

Flexible learning with technology. Students highlight the flexibility that the flipped class provided, specifically the opportunities to access class content any place with technology and on their own time at a pace that conforms to their learning style (Roach, 2014). By providing online videos instead of in class lectures, educators give students the opportunity to learn when they want to. The majority of students agreed that they valued the flipped model simply for the accessibility and ease it provided (Butt, 2014; Johnson, 2013).

Students commented that they appreciated the flexibility of obtaining course materials on various mobile devices, such as cell phones, ipods, and tablets anywhere they could access the internet (Davies, Dean, & Ball, 2013). These mobile learning technologies offer students a more flexible approach to learning, as they can be accessed during times such as waiting for the bus, on public transport, during spares at school, and on field trips (Butt, 2014). The flexibility that technology has delivered has enhanced the flipped classroom experience for students since it can provide increased academic potential and learning opportunities that can enrich the learning process.

A limiting factor, concerning the technology for students was their concern about the availability of the Internet, since they should have access to all online material at home or somewhere outside the class. Some students reported that they did not have enough bandwidth or effective Internet connection, which prevented them from viewing the course material before class time (Chen, Wang, & Chen, 2014; Roach, 2014). In these

cases, students would be forced to find areas of free Wi-Fi or library Internet when available which could limit flexibility. This led to poor student experiences of the flipped class.

In sum, this review shows that the growth and use of technology as a learning tool has enhanced the desire for this pedagogical practice. Students prefer to use multimedia, such as tablets and laptops, because they believe that it makes learning more enjoyable and exciting with online lessons (Jeong et al., 2016). Inverted learning can engage “students in learning the material outside of class in a manner that is more attuned to their media habits,” and can enhance “student preparedness, which in turn allows for more efficient use of in-class time” (Roach, 2014, p. 78). Although, some students reported that poor internet access hindered the flexibility of accessing school content for learning, the majority of students supported the use of technology and commented that multimedia including video lectures, accessed with devices outside the classroom, proved to be effective in delivering course content to them anytime they needed it.

Learning with multimedia. Recent student surveys, found in academic literature, revealed perceptions on video usage to be mostly positive amongst students. Several studies concluded that the majority of students agreed that a major benefit of utilizing video lectures before class was that it allowed for self-paced learning and they enjoyed processing information at their own speed (González-Gómez et al., 2016; Olakanmi, 2017; Roach, 2014; Strayer, 2012). Academic students emphasized they could pick up information and content very easily, and not all content and problem solving questions required repetition. They felt confident in curricular content after viewing learning materials once (González-Gómez et al., 2016). After students felt they had mastered a

concept, they were able to move ahead in the course instead of repeating the same concepts multiple times for no additional gain in learning, which often happened when a topic was being taught in the traditional classroom. As well, these students' responses highlighted that video lessons were particularly useful in helping understand challenging and complex content (Roach, 2014). On the other hand, academically weaker students commented that certain concepts needed to be reviewed more than once in order to learn them more effectively. These students appreciated being able to review the content several times at their own pace without the pressure to learn at the same rate as everyone else, that exists in live classrooms (Roach, 2014; Strayer 2012). Students report that often times they are embarrassed to ask questions in the traditional classroom setting where it seems everyone understands concepts except them. Students commented that videos can be viewed repeatedly without feeling self-conscious about other students watching them (Baepler, Walker, & Driessen, 2014; Marlowe, 2012; Schultz, Duffield, Rasmussen, & Wageman, 2014).

In addition, many students also indicated that they had positive attitudes towards the use of web based video lectures, as they enjoyed this over textbook readings (Day & Foley, 2006, Davies et al., 2013). Providing this virtual material to students ensures that those who need more time with curricular content and make use of it, can master concepts, and move forward with the class without feeling left behind.

To better understand student experiences involving viewing video content outside the classroom, comments collected from various literature were studied. Some of the comments provided by the students were: "the possibility of watching the material at home before classes, gives us more time to think about the contents and to solve our

doubts in [during] class time,” “watching the video lessons at home before completing the in-class activities was much easier,” and “although some video lessons could be improved, in general they were very useful” (González-Gómez et al., 2016). Similar studies indicate that this opinion is common for this blended learning modality (Blair, Maharaj, & Primus, 2016; Davies et al., 2013). Viewing the multimedia material outside of class time can be of great help to those students who not only were struggling with curricular material, but also for students who have missed material due to such issues as illness, travel, or high-level sport (Bergmann & Sams, 2012). This gave students the opportunity to keep up with the class without falling behind.

Although the videos were helpful, some students commented that the flipped-classroom created a heavier course workload than traditional courses since the expectation was that it was essential to watch videos before class (Talbert, 2012). Another concern brought forward in the surveys was that some students felt that the virtual course materials were not well designed, lengthy, difficult to access, or boring (Jeong et al., 2016; McLaughlin et al., 2013; Roach, 2014). As a result, students reported not watching the virtual material provided to them. These concerns have negatively impacted student experiences in the flipped classroom setting. Student perception was that upgraded and refined videos could advance their learning and therefore improves their satisfaction with the course (Roach, 2014).

In sum, the reviews show that the use of multimedia in the flipped modality has many merits due the ability to support a self-paced learning style. Many students agree that the videos and online material allowed them to move through the material as quickly or as slowly as they needed to. This factor complements the current technologically

advanced millennial generation and has had a positive impact on the student experience of the flipped modality. However, some students felt overwhelmed and overworked with the criteria of having to watch video content before class. Another concern shown in the literature was that some students were not watching videos before class, which is an essential part of the flipped classroom. If students are unprepared before attending class, they admitted that they were not ready to participate in the activities such as peer teaching and discussion (Gilboy et al., 2015). These negative experiences did impact student experiences of the flipped class. However, if the video material was quality material that was structured and designed to relay the content in a short, clear, and concise manner, the majority of students were keen on using this content at a time convenient for them and at a place they could access the Internet (Clark, 2015).

Face-to-face instructional time. Academic reports indicate that student perceptions of face-to-face class time in the flipped classroom have been very positive and are an acknowledged benefit of the inverted classroom (Butt, 2014; Clark, 2015; González-Gómez et al., 2016; Roach, 2014). Its advantage is the ability to create time and space in an existing curriculum for educational innovations (Kachka 2012; Moffett, 2015). The role of the teacher shifts from being a lecturer to being a guide for a student centered inquiry-based teaching environment, where learning is about students in this blended classroom environment (Bergmann & Sams, 2014).

Students spoke highly of the fact that teachers could work more interactively with them during face-to-face time in the flipped classroom, thus mediating the environment for them, as opposed to behaving in an instructive manner, where the teacher's main job was to disseminate information (Baker, 2000; Clark 2015). When the delivery of content

was moved to an online environment, the classroom transformed into a place where students can experience a wide variety of evidence-based educational models, for example, experiential learning, peer-based learning, and problem-based learning (Kolb & Kolb 2005; Moffett, 2015; Roach, 2014). Students commented that lectures “were a one-way learning,” “the pace of lecture does not suit everyone,” and lectures “usually do not push us to think and be creative; instead, they sometimes fool us into the belief of having spent enough time studying until we reach the end of the semester” (Butt, 2014, p. 38). When the lecture was eliminated in the flipped classroom, students noticed instructors took time to tailor learning to meet their individual needs where teachers could help with simple problems as well as more complex concepts (Butt, 2014; González-Gómez et al., 2016). Students reflected that teachers in these student-centered classrooms seek the students’ points of view and correct misconceptions, as opposed to seeking the correct answer to validate student learning (Johnson & Renner, 2012). This new paradigm of teaching is one where the focus of learning shifts to how to learn, create, think, and develop with the ultimate goal being lifelong learning (Cheng & Mok, 2008). The majority of students acknowledged that face-to-face class time was a very positive experience of the flipped classroom.

A limitation revealed through the literature was that students felt overwhelmed when faced with having to actively participate in the learning process when they attended class (Amresh, Carberry, & Femiani, 2013). Many students were used to the traditional teaching approach that was used throughout their educational career. As a result, many commented that they felt uncomfortable and overwhelmed when face-to-face instruction required them to actively participate in the learning process (Gannod, Burge, & Helmick,

2008; Karabulut-Ilgu, Cherrez, & Jahren, 2017). This perceived impediment could prevent students from attending class as not all students thrive in these highly interactive situations. Students who do not feel comfortable openly participating in classroom activities may be unfavorably looked upon.

In summary, this review validates that students mostly favored the availability of individual instructor time created by this flipped modality during class sessions. The strengths of face-to-face instructional time were that students reported increased positive class dynamics since there was more time for class discussion and teachers had time to answer more questions. In addition, students valued the increased interaction they received from teachers (Roach, 2014). The perceptions of students revealed that many thought the flipped model of instruction was more effective and applicable because of the variety of teaching practices, such as hands-on activities, discussion, and discovery learning incorporated within this approach. These positive student perceptions also coincided with additional published studies which highlight that this methodology is generally well received by students (Blair et al. 2016; Love, Hodge, Grandgenett, & Swift, 2013; Roach 2014). Contrarily, some students indicated that a weakness of the flipped modality was that they were put in an awkward position when face-to-face instruction required them to participate actively in the learning process. Some students explained that they were uncomfortable because they were not used to this type of instruction, however they did like the one-on-one teacher time (Gannod, Burge, & Helmick, 2008; Karabulut-Ilgu, Cherrez, & Jahren, 2017). Ultimately, however, the majority of students preferred a classroom environment where a variety of instructional practices were utilized rather than one that only used direct instruction with lectures and

note-taking requirements. Students witnessed an increase in their classroom participation and communication, which they felt allowed them to learn and succeed.

Student Perception Discussion. This review examines whether the flipped classroom model of instruction enhances student perceptions and experiences of learning. Students were given opportunities to answer open-ended questions about the strengths and weaknesses of flipped class technology use, usefulness of online videos, and the face-to-face interaction of in class learning.

Students' perceptions on whether technology increases flexibility of their learning was measured by analyzing student comments in a number of studies that used students who were taught using the flipped classroom model. These were compared to groups of students who were taught using the traditional method. The findings of this research show that initially students reported neutrally about preparing for the flipped class by watching the online videos, however as classes progressed, students' attitudes towards the flipped classroom improved and they embraced the access of online content (Smallhorn, 2017). Students liked the convenience and accessibility of the video lectures twenty-four hours a day and they were able to participate in online learning during their free time on the spot using digital learning tools like tablets and smartphones. This implies that technology has helped in the growth of mobile and distance learning and the flexibility it provides has allowed learning to take place anytime. This means that the flipped class can use technology to its advantage since students support the technology as versatile, motivating, and an active learning tool. These studies connect multimedia use and flexibility with cultivating the learning process for students and suggest that the flipped

classroom has the potential to transform education, as students are able to learn when it is most suitable for them.

Regarding the area of learning with multimedia, the results of this research indicate that the majority of students reported that they are watching the video-lectures and found them useful. Students commented very positively on the ability to rewind the video to parts they were stuck on or go back and re-watch videos to refresh themselves on a concept (Butt, 2014). The literature suggests that this is a valuable benefit of flipped learning, since the majority of students commented that they are able to watch online videos at a pace that conforms to their learning style. This review proposes that the flipped classroom multimedia has the ability to scaffold material and differentiates by pace and level of understanding for students (Roach, 2014). These findings also imply that the flipped learning model is beneficial across student groups, and does not help or hinder only one set of students (Roach, 2014). Furthermore, this literature also suggests that asking students take responsibility to watch the virtual material to learn curricular content allows students to have some control in their learning (Blair, et al., 2016). This in turn allows them to recognize the knowledge they attain is a result of their own hard work, and this may help them to build confidence.

In contrast, some students reported that if they did not understand concepts while watching videos, they had to wait until the next day to receive clarification on concepts. Others found the video watching to be boring and time consuming and admitted that they did not watch the material provided to view before class time. If students were not watching required course material before class, then they were not getting the full benefit of the flipped classroom which requires students to participate in class with knowledge

learned outside of class (Bishop & Verleger, 2013; Butt, 2014). This suggests that students require some meta cognitive skills on knowing how to learn. Because the flipped classroom modality requires self-discipline, this literature implies that this type of learning may not be suitable for all types of learners. More specifically, learners who are not sufficiently organized or sufficiently mature do not manage the pre-class learning. This issue is one that needs to be addressed to ensure the success of this flipped modality. Some suggestions were to place the responsibility on the students themselves and offer such things as in-class quizzes before moving on to interactive activities (Bishop & Verleger, 2013; Butt, 2014). This could provide incentive for students to preview online material before coming to class.

In regard to face-to-face instructional time, a major strength of the flipped class conveyed by the literature, was the transfer of lectures online to create time and space in the classroom to improve learning for students. The majority of students surveyed agreed that the movement of lecture outside of the class allowed flipped courses to be more interactive (Roach, 2014). This data suggests the potential of the group when students are together to design collaborative, creative, student-centered activities and assignments to promote active instead of passive learning which can be a boon to educational development. Many studies published similar results, which supported this data (Clark, 2015; Roach, 2014). Moreover, the literature also implies that the one-on-one interaction between students and teachers in the flipped classroom allows teachers the ability to identify errors in thinking or concept application and can address these issues earlier than addressing them after an evaluation of students. These results also suggest that the use of a variety of activities, such as collaborative projects and discussions in the flipped

classroom, can be helpful in captivating student interests in the subject more than is happening in their other classrooms and class time could be used to master skills (Roach, 2014). Such use of class time could potentially give students the opportunity to learn how to think for themselves by being actively engaged in the curricular content and this allows students to gain skills they could use in the outside world.

In contrast, active learning can put students in a vulnerable position where perceptions of their understanding are being challenged by the learning activities teachers are asking them to perform. Many students may have never used these learning strategies before or simply desire minimal effort when coming to class. When we ask students to be active learners in a class, we are asking them to take new risks. As a result, students may not want to engage in these activities. This review suggests that the in-class portion of the flipped modality could create anxiety in students as well be the impetus that prevents them from attending class. These findings imply that perhaps further work needs to be done by teachers to incorporate activities that help reduce student anxiety and enable all students to feel comfortable enough to participate at their own level. The flipped classroom modality changes the student experience. Students are able to learn at their own pace and instructors are impacting this experience by removing the lecture and creating time to improve learning environments that are more oriented towards deeper approaches to learning.

Student Engagement

The second research question is: “Does the flipped class enhance student engagement?” This question reviews the role that the flipped-class performs in guiding

students to be inspired by the ability to connect course content through participation in the blended learning environment.

Introduction. The term student engagement is generally used to describe meaningful student involvement in their learning environment and student participation in class can be a predictor of personal development and learning. The flipped-classroom model allows students different opportunities to engage in the learning, both as active learners who take charge of their learning in class, as well as remotely at home, carried through in the digital experience.

Review. Research studies have examined the impact that the flipped classroom strategy has on student engagement. Predominantly, engagement has been defined in three ways. Behavioral engagement draws on the idea of participation, which includes such things as attendance and assignment submission. Emotional engagement involves reactions to the course, content, instructors, classmates, and academics. This creates ties between student and the willingness to do work to learn in the course. The final category is cognitive engagement, which depicts the idea of the effort and inclination students have to want to master skills necessary to comprehend complex ideas and learn the course, such as watching videos which is a requirement of the flipped class (Fredricks, Blumenfeld, & Paris, 2004; McLaughlin et al., 2013; Smallhorn, 2017). These three types of engagement will be discussed according to literature studied, in the following section.

Behavioral engagement. Scholars examine the impact blended learning has had on student engagement by analyzing surveys and attendance records before and after the implementation of the flipped classroom. Many results reported an increase in attendance in flipped classes compared to traditionally taught courses (e.g., Deslauriers et al., 2011;

Smallhorn, 2017). Similar results, found in other literature, also supported the increase in attendance with the blended model (Chen et al., 2014; Rutkowski, 2014). Furthermore, it was also determined that students logged into course platforms (e.g. Moodle) more frequently to access course materials compared to similar classes taken in the past (Chen et al., 2014). Engagement was additionally measured by the number of assignments that were submitted by students before and after the implementation of the flipped classroom. The literature reveals that there is an improvement in submission rates after exposure to flipped classes compared to similar classes taught traditionally (Smallhorn, 2017). These findings demonstrate that this blended learning modality does lead to increased behavioral engagement in students. Students' increase in attendance, assignment completion, and submission rates demonstrates that this teaching modality has clear meaning and immediate value to students. This evidence provides support for the hypothesis that the flipped classroom model leads to improved engagement with course content (Smallhorn, 2017).

Positive student comments were frequently recorded on the quality of engagement encountered in the flipped classroom. Some of these included comments such as "I felt like I could be more engaged in deeper discussions because I came to class with a basis of knowledge about the topic. It made me more engaged and interested in the material, and it made me more prepared to think critically and apply the things that I had learned" (McLaughlin et al., 2013, p. 200). Others included "I learned how to use the material with these teaching methods (screencast of lectures and active learning in class) of instruction more than I did when we used traditional methods (lecture only) of instruction," "I really enjoyed the interactive teaching technique" and students commented that they could have

had a better overall school experience had more courses been taught in this manner (Deslauriers et al., 2011, p. 864; Gilboy et al, 2015, p. 111). The transfer of lectures outside of class time encouraged students to engage with course content virtually; this further reinforced student engagement through active-learning exercises during face to face class time.

The studies reviewed in the preceding paragraph report positive engagement with the flipped classroom. However, it was noted that student experiences in the flipped classroom were varied (Strayer, 2012). In contrast to the positive comments, some students reported they “were finding it difficult to schedule time to watch the online video resources” that were required to view before class (Smallhorn, 2017, p. 47). Others felt disconnected without a teacher being present during the virtual online class so were unable to ask questions in the moment they needed to (McLaughlin et al., 2013, p. 200). This caused some discontent with the flipped class as some perceived it as a lack of teacher presence to guide and support students’ progress and as a result, this increased student disengagement in the course.

To summarize, the literature revealed that increased behavioral engagement was shown through, increased attendance, assignment submission, and increased access of videos and course materials. The studies presented this as a strength of the flipped class model. On the other hand, weaknesses of this blended approach materialized when some dissatisfaction was felt amongst students. This was due to frustrations with the inability to clarify course content difficulty with an instructor when viewing videos lectures. Students had to wait for class time to have these problems rectified. The overall effect on behavioral engagement, however, was positive and students reported that the interactive

one-on-one teaching was effective in allowing them to connect to course, teacher, and peers more frequently. When students become motivated and passionate about a subject, they will try to learn more thoroughly and their natural curiosity makes them actively seek new knowledge.

Emotional engagement. Based on the available literature, there was a general positive perception amongst students related to emotions as important dimensions in this learning environment. “Emotions act as a social glue that interconnects individual and collective interests and actions in the learning process” (Jeong et al., 2016, p. 748). Emotions are involved in all actions; this is what influences decisions that students will make in regards to their learning (Otero, 2006). Instructors who ignore the emotional aspects associated with the learning process may limit students’ ability to learn (Aydogan, Bozkurt, & Coskun, 2015). Teachers who support students’ self determination and show that they care about their learning tend to facilitate greater curiosity, engagement, and motivation in their students.

With the goal of measuring students’ emotions toward the flipped-classroom method, literature involving emotional engagement through student questionnaires and surveys was analyzed. Positive and negative emotions were sorted and some of the most frequent positive emotions that came up were such words as “fun” and “enthusiasm.” A negative emotion concerning flipped-classroom was “concern” (Jeong et al., 2016). There could be a concern for students that implementing a flipped classroom adds an extra workload on students because they are expected to watch videos before coming to class. However, in reviewing the literature, the highest scores overall were for word descriptors that were consistent with positive emotions. Favorable emotions can help support

students to desire further learning. Positive emotional engagement has the power to motivate students to be willing to do difficult things and take risks in their learning.

In sum, the literature on flipped classrooms shows that student emotional engagement involves reactions reported from students about whether they felt interested and motivated to learn, and if they felt that teachers valued them and their effort. A lack of emotional connection between student and instructor and subject matter can cause a chasm between instructor and students, which leads to student dissociation and ambivalence toward the subject matter. The flipped classroom studies convey that emotional engagement increases with this teaching model, as students appreciated feeling connected to the instructors and felt they were given more feedback with one-on-one instruction. This was a major strength of the inverted classroom.

Cognitive engagement. Cognitive engagement refers to students who engage in effortful tasks with purposiveness and strategy use. Accessing curricular content would be an educational responsibility placed on students. They would have to watch online videos on their own time to access lecture material. Flipped-class literature revealed that a high percentage of students were accessing videos to watch curricular content (Roach, 2014; Smallhorn, 2017). This data supports the idea that students are willing and able to take on the learning task at hand. These results align with other published studies, which reflected a high level of student cognitive engagement in flipped courses (Gonzalez-Gomez et al., 2016; Yeung et al., 2014).

Student comments reveal that the video lessons engaged them more effectively with course content and this fostered their participation in the in-class activities. They noted that the videos were easy to access and were helpful in learning the material. Also,

the videos allowed self-paced learning which was a boon to their educational development (Gonzalez-Gomez et al., 2016; Roach, 2014). These findings provide evidence that flipped methodology can be effective for cognitive engagement that enables learners to engross themselves in the learning processes. As well, “by engaging students with a media-type that they may appreciate more than the standard textbook it is entirely possible that course material is covered more quickly because the students have a better understanding of the material before coming to class, and thus deeper learning can occur in a short time period” (Roach, 2014, p. 83). The use of multimedia through this blended approach can engage students in learning the material outside of class time, in a mode that accommodates their media habits.

A limitation of cognitive engagement noted through the examination of the literature on flipped classrooms, was that it was not always possible to discern whether students actually watched the video lectures to completion, or simply let the video run without actually watching it (Smallhorn, 2017). This, then may not give a true indication of engagement as the questionnaires depend on the honesty of the participants (Roach, 2014). A suggested strategy to overcome this limitation could be for parents to monitor students while they watched the learning videos.

Another barrier to cognitive engagement was noted. Some students feel that the responsibility of learning was left to them, since they were forced to watch online content before they came to class. Some believe that flipped learning places a burden upon the student to take the lead in the learning process instead of the instructor doing so (Roach, 2014). Blended learning studies reveal that students who lacked metacognitive and organizational skills struggled with this flipped-classroom approach. They felt that they

were not being taught, but rather they were teaching themselves the material, and that the instructor was not doing his/her job (Karabulut-Ilgü, Cherrez, & Jähren, 2017). This could be opined by students since they did not have the instructor available to ask questions during the out-of-class portion (Avery, Huggan, & Preston, 2000; Gilboy et al., 2015). Some students may be resistant to the flipped method, because it requires that they be self-reliant and self-managed in learning new subject matter and then be prepared to participate in a variety of learning activities when they come to class. This perceived shortcoming of the flipped classroom left some students feeling uncertain and disengaged.

Studies also reported that some students felt unsettled with the variety of learning activities in a flipped classroom; but, as the class progressed, these students became more comfortable with the format (Strayer, 2012). The literature found that a variety of activities of active and collaborative learning during face-to-face instruction is beneficial to student cognition and retention. This suggests that the blended approach is helpful in cognitively engaging students more than is happening in their other classrooms (Gilboy et al., 2015; McLaughlin et al., 2013; Roach, 2014).

In short, the findings presented in this cognitive engagement subsection show that students acknowledged that the virtual materials provided by instructors were easily accessible and were useful in preparing for deeper learning of subject matter during class time. This is supported through student comments made such as, "I wish all classes were designed like this. I was able to truly learn what being an independent student meant and I learned how to study, a skill that is actually pretty difficult to develop" (McLaughlin et al., 2013, p. 5). The strengths of this approach gave students autonomy by enabling them

to “proceed at their own pace through lectures, guide themselves to additional content, and assess their own learning gains” (p. 5). This was a strength of cognitive engagement in the flipped classroom. A weakness, discovered through the literature, was that some students felt uncomfortable to watch and learn material on their own without the aid of the teacher and were uneasy with the responsibility of learning on their own. However, the studies also show that this type of learning cognitively engages students more than traditionally taught classes. Students’ self assurance increased because learning and finding information on their own allowed them to connect to course content and the direct one on one time with instructors increased their desire to learn.

Student Engagement Discussion. The findings from this literature review support and reflect positive student engagement associated with the flipped classroom model. The analysis revealed: (a) an increase in behavioral engagement, including increased attendance and assignment submission; (b) an increase in emotional engagement which corresponds to positive emotions that enabled students the desire to be a part of the flipped classroom; and (c) an increase in cognitive engagement notion which is shown in students taking educational responsibility, for example watching video lectures outside of class. In the following, I discuss each of these three dimensions from the perspective of the flipped class model of instruction.

Concerning the findings on behavioral student engagement, the results indicate that students who watch online materials prior to class were enabled to engage in active-learning exercises with more focus, confidence, and enthusiasm (McLaughlin et al., 2013). The one-on-one opportunities with instructor and the active learning offered during class time are an advantage to students since the studies show that this increases

classroom engagement. Flipped classroom studies imply that breaking up class time with activities may further engage students because students' minds start to wander after a several minutes during traditional classroom lecture. One-on-one and peer active learning offered in this modern teaching modality provide opportunities to increase student focus and attention span which keeps students engaged.

Because behavioral engagement is increased in the student body, this connects the idea that the active learning activities students are participating in must be well thought out intelligent activities that can develop deep understanding of important ideas to be learned. This then also suggests that successful engagement of students relies heavily on the instructor to be a facilitator and organizer of constructive learning experiences, that are designed around important learning outcomes to encourage students to think about what they are learning both in and out of the classroom. Without the quality and efficiency of the online material and class time presented to students by the instructors, enhanced behavioral engagement and learning would not be as effective.

In regards to emotional engagement in the flipped classroom, students spend more time on discussions and interactions between peers and their instructors. In this teaching modality, students feel satisfied that their teachers seem to care about their learning, take their questions seriously, and feel they are receiving more support. This rapport and connection built between student and teacher suggest that these social interactions help students to feel a sense of belonging and a connection to their learning environment (Kahu, 2013). Creating positive emotions in students connects to increased self-efficacy in students as well as a feeling of positive self-worth. Hence when students feel more emotionally engaged, they feel encouraged and motivated to do their best work.

The findings pertaining to cognitive engagement show some student resistance to the initial stages of the flipped experience. Since this learning model requires the student to assume responsibility for online learning prior to class, it makes some students feel that this teaching modality forces them to teach themselves the curricular content. This suggests the importance of blended learning instructors having honest dialogue with students explaining the intentions and goals of the flipped class. This unconventional way of learning is very implicit on the purpose and objectives of the flipped model, which is to free up class time to work on innovation skills such as problem solving, communication, and collaboration with peers. If the flipped classroom is able to instill these innovative skills, literature suggests that it will permit students to learn key material in an integrative and purposeful way. Students who are able take risks during active learning in class, think deeply about issues, and are inspired to learn; this demonstrates an increase in students' cognitive engagement. Because this model was able to increase student engagement, the literature advocates that this instruction is meaningful to students.

Student Achievement

The third research question is: "Does the flipped class improve student performance?" This paper examines whether the literature can validate the effects of the flipped classroom on student achievement.

Introduction. The purpose of this question is to investigate whether the flipped class approach results in higher-achieving and more knowledgeable students compared to the traditional classroom method. This question reviews the role that the flipped-class

performs in guiding students to achieve higher grades via the ability to connect course content through participation in the blended learning classes in which they are enrolled.

Review. This quality of the learning experience in the flipped classroom modality takes into consideration how educational materials are perceived, interacted with by students, and how the instructional methods were engaged by the instructor (Blair et al., 2016). To enhance academic achievement, educators are tasked with considering how they design learning environments to make a difference in student approaches to learning. Upon reviewing several flipped classroom studies, the evidence shows mixed results on student achievement (Blair et al., 2016). Although many of these studies did show an increase in retention and depth of knowledge using computer-aided instruction in the flipped method, little change to students' grades were observed (Abeysekera & Dawson, 2015; Roach, 2014; Smallhorn, 2017).

Studies were conducted involving science and math classes where students were separated into two groups; a control group who were taught traditionally and a treatment group who learned via the flipped approach. A comparison of academic performance was assessed. Data collected and reviewed showed statistical evidence that “the flipped students scored higher compared to [the traditionally taught] classroom students” on all assessments (Schultz et al., 2014, p. 1337). The researchers concluded that the flipped classroom created a student-centered environment. Moving direct instruction outside the classroom left more time for teacher support in the classroom, and opportunities to take control of learning were given to students. Students felt they had two opportunities to learn, once with videos and again in class (Chen & Chang, 2017; Schultz et al., 2014). The extra class time, in this study and others, allowed for creation of small communities

of peer learners which allowed students to learn a great deal by explaining their ideas to others and by participating in activities where students were involved in sharing knowledge, ideas, and experience with each other (Schultz et al., 2014; Sweet & Michaelsen, 2012). Scholars reported that additional teacher support and peer collaboration increased students' learning outcomes (Chen & Chang, 2017; Marlowe, 2012).

Other studies considered the cognitive load theory (Clark, Nguyen, & Sweller, 2005). This theory suggests that we have a limited amount of "working memory" to use when learning or problem-solving. Our working memory is subject to certain types of load and overloading our working memory impedes learning. They assert that the flipped classroom approach may provide opportunities to manage cognitive load, thus improving learning (Clark et al., 2005). Some bodies of knowledge require knowing foundational facts and the flipped classroom approach incorporates the idea of moving transmission of knowledge from teacher to student outside of the classroom (Abeysekera & Dawson, 2015). When students are viewing videos outside of class, they have the opportunity to manipulate the pace of these videos. Learners can pause, rewind, fast forward or skip any parts of a lecture video in an attempt to better manage their working memory. This may result in greater gains in learning and knowledge (Chen & Chang, 2017; Clark et al., 2005).

Another proposed benefit of flipped classrooms is that this approach altered the concept of homework by having students practice and apply their learning in the classroom, under the watchful eye of the teacher (Bergmann & Sams, 2012). Other scholars found that targeted, in-class opportunities for students to practice their skills and

homework with corrective teacher feedback showed increased student performance compared to homework completed outside the classroom (Beesley & Apthorp, 2010). This allowed teachers more opportunities to monitor students during practice which also led to increasing student learning.

Not all scholars are convinced about the success of the flipped model and feel that this may not become the dominant pedagogical model anticipated in education. The previous results are in contrast to other studies which report there are no significant gains in student learning (Blair et al., 2016; Butt, 2014; McLaughlin et al., 2013; Olakanmi, 2017; Smallhorn, 2017). The literature on the flipped classroom states that although this approach has become recently favored, it cannot yet be considered evidence-based since little research has been done using rigorous testing designs (Pawson, 2006). Other studies report that there are few credible studies performed on the flipped approach and a scarce number are peer reviewed (Abeysekera & Dawson, 2015; Bishop & Verleger, 2013).

A significant hurdle towards effective learning in the flipped classroom is monitoring students who do not view essential materials and videos prior to class attendance (Partridge, Ponting, & McCay, 2011). The transition from instructor-centred to learner-centred environments requires assistance in completing the preparatory work, and for students, this is neither easy nor automatic and depends on already existing levels of self-efficacy (McLaughlin, White, Khanova, & Yuriev, 2016; Pintrich, 2003). Flipped learning and acquiring academic achievement depends on self-regulated, highly self-motivated students who have the time management, organizational, and critical thinking skills from the provided pre-class information and the interactive in-class activities (Partridge et al., 2011). This mode of learning presumed maturity and responsibility of

learning on the student. Without this, students were not as successful in gaining knowledge with this pedagogical teaching method. This may also suggest that students may need to be trained in how to learn in the flipped classroom.

In addition, studies reported the flipped learning environment seems to favor the extroverted student who has skills to participate in group discussion and collaborative learning (Wanner & Palmer, 2016). Not all students thrive in these highly interactive situations, therefore teachers may be missing valuable contributions from students who do not openly participate in classroom activities (Faculty Focus, 2015).

Another critique of the method was that the flipped model required increased time demands which may decrease intrinsic motivation for students to complete the required preparatory work. As a result, students may become driven by extrinsic motivators, such as what will be assessed in their learning (Abeysekera & Dawson, 2015). These factors together made it difficult for students to achieve and gain knowledge at the level that was required by the courses being taken.

In summary, the literature is not clear on whether the flipped classroom does in fact improve student achievement. Some studies tout greater learning and increased test scores of students, mainly in higher level math and science classes, whereas an overwhelming majority of studies highlight little to no difference in student grade performance (Butt, 2014; Love et al., 2013; McLaughlin et al., 2013; Smallhorn, 2017). Some literature reported the use of video lectures, extra one-on-one interaction with instructor, and increased cognitive load were flipped classroom strengths that enabled increased student learning and achievement with this teaching modality. In contrast, other literature reported that students were not organized or mature enough to handle the

preparatory work needed to be successful in the flipped class, therefore many students were not comfortable in active face-to-face learning and interactive situations, so were not motivated to perform well academically. These factors may inhibit students from achieving higher grades than traditionally taught classes. Some scholars noted that there has been insufficient research performed to objectively document student grade scores, learning gains, or learner attitude as it relates to the flipped classroom, (Abeysekera & Dawson, 2015, Bishop & Verleger, 2013). As a result, increased performance for this modality was difficult to assess.

Student Achievement Discussion. The review on student achievement analyzes whether the introduction of this blended learning format improved the student learning experience in relation to overall improvements in grades. The results of this literature review found a lack of adequate evidence to support claims of improved exam performance and this review found no significant difference in average results between flipped and traditional learning (Blair et al., 2016). This section will discuss the types of classes that studies showed had academic improvement in the flipped classroom, student maturity level needed for this type of learning, and the appropriate methods to assess this mode of instruction.

In regards to the literature that indicated that students' performance did improve with the flipped classroom model, were predominantly from science and math classes (Bergmann & Sams, 2012; Chen & Chang, 2017). Similar results were found in a number of other studies investigating the impact of the flipped classroom on student success (Deslauriers et al., 2011; Schultz et al., 2014). The literature suggests that the flipped classroom approach may be best in subjects such as science, computer and information

technology, engineering, and mathematical sciences. This implies the flipped classroom may be more advantageous in subjects that focus on logical thinking, analysis, and accuracy rather than those that focus on aesthetics, feeling, and creativity.

Concerning the lack of preparatory work, flipped class literature shows that some students struggle with the completion of pre-class assignments such as watching video lectures before class. Studies revealed some students did not view material beforehand, despite knowing that they would not be given a lecture on this content (Roach, 2014). This connects to the maturity level of students as certain age levels of students may not be capable of completing this preparatory work on their own. This suggests that this modality would be a better fit to higher level students, as they require the responsibility that is involved in independent learning. This also indicates that perhaps the flipped class would be best suited for secondary and postsecondary students, as they would likely have the maturity to handle the self-reliant portions of this teaching model.

Assessment of flipped learning. Other findings in the literature show that “the average exam scores and final topic scores for both the traditional and flipped cohorts were very similar which suggests that student success was comparable” across both types of instruction (Smallhorn, 2017, p. 50). However, the flipped class instruction style is different than the traditional lecture style of teaching. It employs learner-centered instruction during class time which focuses on problem solving and one-on-one instruction while delivering course content outside of class. This difference may require that the flipped model utilize alternative evaluation beyond just grade assessment. This suggests exam scores or final topic scores should not be main measure for the flipped classroom model on student achievement (McLean, Attardi, Faden, & Goldszmidt, 2016).

Future studies of student learning and the flipped classroom should include student gains that include grades as well as increased student interaction amongst peers and teachers (Smallhorn, 2017). A major strength of this inverted classroom is the positive relationships between educators and peers which are vital in supporting learning for students. Presently, this is not included when measuring student learning in the flipped class, and therefore this is not translating into measurable academic gains.

The previous questions in this review discuss how the flipped classroom affects student perceptions and student engagement. These two factors should also be considered when assessing student achievement. Student perceptions were reported as mostly favorable for flipped classes. When it comes to their own learning, students are typically considered to be reliable and valid reporters on the amount they have learned and the ease or difficulty of their learning experience in the course (Gravestock and Gregor-Greenleaf, 2008). Additionally, literature discussing the flipped classroom also reported increased student engagement. This advocates that student evaluation of their own learning should factor in student achievement, along with grades, since this modality has created a classroom environment conducive to the learning process. If the flipped classroom is assessed with student perception along with how much student engagement has increased, this model proposes substantial benefits to students. In the traditional classroom, learning and achievement is based on the interaction between a student and a curriculum. The flipped model should base learning and achievement on the interaction between a student, the curriculum, as well as teacher-student interactions, which are a crucial and an essential component of learning (Boaler, 2002). From literature on blended learning observations, “it seems that students who spend more time interacting with the

instructor in a learner centered course may have a more positive view of the course” which suggests student motivation to learn (Sickle, 2016, p. 35). This increased interaction with a teacher implies that students’ increased interest and engagement in the course could lead to improved academic achievement and lifelong learning.

Most of the studies on the flipped classroom revealed that the flipped learning model does not indicate increased academic success over other teaching methods. Since the flipped class is an unconventional teaching method that involves the combination of active face-to-face learning and self-reliance of learning material with online video lectures, this ascertains that the flipped classroom model of instruction needs to be evaluated differently than traditional schooling. This model does not replace the teacher with videos, however by removing the lecture time, students can learn material outside class time. The major advantage is that the face-to-face class time promotes increased student engagement due to one-on-one interaction with teachers and peers. The results of the studies show that the range of different activities offered by this modality also provide a variety of different learning opportunities. When the flipped class is evaluated looking at all aspects of this modality beyond the traditional achievement measures, there is the potential for more students learning with an increased academic advantage.

Implications and Instructional strategies for Flipped Classroom Teachers

Introduction

While working on my Masters degree through the University of Victoria, I have concurrently been employed as a teacher in a flipped classroom setting. It has been an interesting process to study the literature on how the flipped model theoretically should flow in a classroom setting and how it actually unfolds on a day-to-day basis. During this process, I have made some important observations about my evolving classroom involving technology and the one-on-one time spent to guide students to engage in subject matter creatively. In a traditional instructional setting, individualizing instruction to a class seemed daunting and unreasonable. Now, using this blended learning approach affords an opportunity to provide students with a rich differentiated learning environment in a way I could not manage before. My main focus for studying this teaching method is to create a self-paced learning environment that involves mastery of learning and then connect these results to my implications.

In my previous literature review section, my research questions focused on (a) student perceptions of the flipped classroom, (b) student engagement in the flipped classroom, and (c) how the flipped class has affected student achievement. The findings have indicated positive results overall for both student perception and student engagement; however, they have shown little difference in measuring student performance. Since my current literature review and my own classes do not provide support for wide-scale student achievement with the flipped method of instruction, I feel future studies still need to explore this area. Therefore, the findings in the areas for

student perception, engagement, and my own personal experience will guide my reflections and examples of suggestions for advances in certain areas of the Flipped Classroom.

Prospectively, this review is important because it has established an understanding of how the flipped model of instruction has been used to support student learning. An increased understanding of student perceptions, increased student engagement, and effects of blended learning on student achievement have the potential to impact positive social change at a student, classroom, and societal level. First, individual students, in the reviewed literature, have expressed a greater sense of self-motivation and personal responsibility for learning, collaborating, and applying their skills. These skills are valued because they prepare students for the type of thinking and collaboration demanded in 21st century learning, living, and working (Irvine, Code, & Richards, 2013). Within the classroom, teachers can use the voices and experiences of learners to understand the impact of teaching practices at a more targeted level. The data garnered indicates that students benefit more with increased experience with the flipped model, so at a societal level, more students may benefit if more schools offered the flipped classroom (Overmyer, 2014). This study may impact positive social change by posing opportunity for more schools to support similar models. In the following two subsections, I briefly review the results from students' perceptions of the flipped classroom and the increase in student engagement in the flipped model and link these results and my experiences as a blended learning instructor to my implications. Based on my own experience and my literature review, I will present several suggestions and exemplars to address obstacles and offer suggestions that can improve flipped learning. These

recommendations along with the exemplars may be helpful to teachers who are thinking of using blended learning in their teaching environment.

Multimedia and face-to-face instruction.

My first research question guiding my literature review concerns the influence of student perceptions on the use of multimedia in the flipped classroom. Because student technological skills are evolving rapidly, this can be used as an advantage for learning in the classroom. Simply having the latest technology in a classroom does not necessarily mean that student learning is improved. However, if implemented effectively, the flipped class technique has shown technology can be used so that students can work to their full capacity (Olakanmi, 2017). My literature review identified several areas of student dissatisfaction while using the multimedia offered through the flipped class as well as concerns with the in-class component of the class. In this section, there are four areas of suggestion for improvement: (a) present clear structured videos; (b) offer a variety of learning videos; (c) be cognizant of student time restrictions; and (d) be receptive to student anxiety in regards to active instruction and learning. The purpose of these suggestions is to offer teachers guidance and exemplars on modifying their video lessons to reflect increased student learning and to be attentive to student needs both in and out of the classroom.

Videos with structure and clarity. The literature review reported that several students felt overwhelmed by repetitive, boring, and sometimes problematic videos that they did not have time or interest in viewing (Jeong et al., 2016). A suggestion would be to present shorter videos, no longer than 10 minutes, which are structured to deliver clear


and concise information. This will allow chunking of information. It is easier for students to work with smaller portions of new information because their working memory has a limited capacity (Ibrahim et al., 2012). Instructors should always keep the ability and age level of students in mind when making judgements on the length and type of videos.

Efficiency of technology also seems to be a major concern that students brought forth in the literature studied. As an instructor of this model of instruction, I have occasionally chosen videos for students that were longer and more complicated than they needed to be. Video selections that require additional software be downloaded in order to be viewed, such as JAVA, became a complication and hassle with which students would not bother. This would impede the motivation of students to watch the out-of-class material. To alleviate this roadblock, I learned to keep video lectures simple, such as Youtube friendly videos, which make it easier for the majority of students to access with no fuss.

Table 1

Guidelines to Follow when Choosing Videos

Choosing videos	Video-sharing website	Examples of good videos
20 minute video If I choose a longer video, such as the example shown, I often do not assign more than one video for that session	Youtube	Math video: Simplify radicals This video is popular with students because the instructor of this talking head video gives step-by-step instruction on specific math topics. She begins her videos by explaining the concept behind a specific topic then moves into examples on how to solve particular problems. Her videos are well organized and easy to follow.

		A worksheet will often accompany this type of video so students can follow and complete the problems with the instructor. This worksheet becomes their notes for this lesson.
10 minute video that shows problem solving from our school textbook. This follows math outcomes from the Alberta curriculum	Youtube	Math video: Intersection and Union of Two Sets These types of videos work well because the instructor follows the textbook we use and goes through each outcome by solving various math problems step by step
2-minute biology video 	Youtube	Biology video: Tree-Man disease This type of video easily entices students to watch the video because of the interesting visual that is first presented. A sheet would accompany this video to match biology outcome and ask simple questions such as what are the causes of this disease, symptoms, etc (Refer to Appendix A)

Variety of learning videos. A variety of video types are also important to consider. Lecture type videos worked adequately in higher-level classes but did not seem to get viewed in lower level classes. In my experience, I have found that students value flexibility and choice when learning curricular material. Providing a mixture of videos such as interviews, laboratory simulations, screencasts, talking head videos, presentations, lecture recordings, and classroom recordings for lessons ensures that more students are afforded the same opportunity to engage and learn. Students commented that many different learning styles could really get it when varieties of videos were provided for student learning (Roach, 2014). Presenting material in multiple formats provides opportunity to engage every student and address many different student learning styles including those with special needs (Laine, Myllymäki, & Hakala, 2015). The variety in

learning videos also establishes increased chances that every student is learning in the way that best suits their personality and style.

The following chart shows examples of different types of videos that can be offered to students. This may help teachers when deciding the type of online multimedia to suit the modality of the lesson being taught.

Table 2

Examples of Various Videos

Video Type	Lesson Recommendation
Talking head	Can be engaging if a subject matter expert is giving the presentation, also effective for story telling
Screencasts	Record a video of your computer screen These tutorial style videos are engaging because they introduce visual flow, movement, and extemporaneous speaking These videos work very well when teaching practical skills such as lessons on solving math problems
Classroom lecture recordings	If the lesson covers new terminology and/or complicated material which must be grasped, it is beneficial for students to play back the lecture at their own pace and look again at specific topics they may not have fully understood the first-time round (Roach, 2014). This is also very helpful for English language learners to re-watch video lecture to ensure they understand everything that is covered during a lecture
Lab Simulations	Simulation is the type of video that would imitate the operation of a real-world process I use this often for lab experiments such as dissections for Biology.
Animation videos	Serves the purpose of illustrating complex concepts through simple animation Animation is a brilliant and innovative way to communicate stories, ideas, and concepts in a creative and original way These are often used in lessons that require long explanations

Student time restrictions. In addition, the number of videos presented to view per lesson could be a barrier for students. As an instructor of science and math, I do try

and ask myself what it is that I want students to gain from watching the learning videos that I have chosen. For example, it is often easy to offer too many videos on a complicated math topic because I personally find all of them helpful and interesting. Taking into consideration how much time I should expect from a high school student per subject per night, allows me to be more sensitive to the quantity of material that I can expect be viewed. Students have found it helpful when I categorize online videos as must watch, additional help, and extra/fun stuff so they know what they absolutely need to do before coming to class, and the rest can be viewed if they have interest or the time. This expectation of what must be viewed and what is supplementary is also reiterated in class.

Provided below, is a sample of a portion of a Biology Unit. The videos are organized in three different categories to ensure the student knows what they are expected to cover each day. I predominantly use Youtube videos, as most students have no technological difficulties with them. I expect that students should watch about 10 minutes of video before class, and there are extra videos offered if students need. Teachers should note that links change, so be mindful of checking links on a regular basis. In addition, the videos are varied (Table 2) to increase engagement and are organised so that students know what is expected to be watched in preparation for class. Sometimes closed notes accompany the video to guide students to jot down a few notes while watching the video.


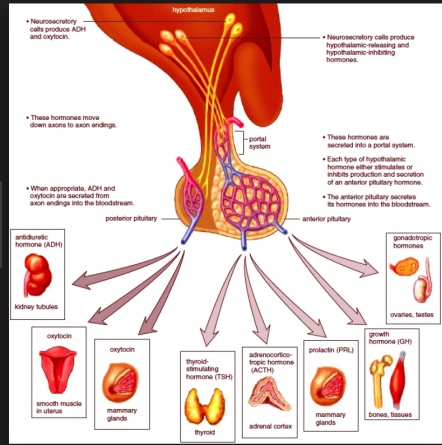
Instructions to students:

Please note it will take 5 days to complete this unit. Please ensure that you have viewed the **Must watch** section of the videos so you will be prepared for class. There may be a short in-class quiz on these video lectures in class.

Watch the **Additional Help** section if you feel you require some extra understanding. If you have time, view the **Fun stuff**. Online review material and notes are provided for preparation for the unit exam.

Table 3

Sample of a Biology Unit

<p>Unit 2 Endocrine system</p> 	<p>This unit will take 5 days to cover</p> <p>Notes posted here are intended to be a tool only, and are not intended to be a substitute for attending class.</p>	<p>Notes:</p> <p>https://docs.google.com/presentation/d/1ETVYsRuBfoWG_B0qaArUe9Hx8cvdDHjIEqb4jO5guLU/edit#slide=id.g35f391192_00</p>
<p>Day 1</p>	<p>VIDEOS: Must watch Crash Course Endocrine System #1: Glands and Hormones</p> <p>The hypothalamus and pituitary gland</p> <p>Additional Help Endocrine System Brightstorm</p> <p>Crash Course Endocrine System #2: Hormone Cascades</p> <p>Fun stuff Weird AI Pancreas Music Video</p>	<p>Introduction to Endocrine system: hypothalamus, pituitary, and negative feedback loops</p> 

Student anxiety with active instruction.

Since class time is alleviated of teaching basic concepts through lecture, more flipped class time can be spent on interactive activities such as problem solving, completing homework one-on-one with peers or instructors, and collaborative exercises

such as activities with real-world applications. This active learning instruction aims to foster critical thinking. Although active participation in class can become a motivator to learn for the extroverted students, it can be a barrier for quiet learners since they may find classroom discussion and peer work challenging. This could lead to stress and anxiousness in attending class, especially if they perceive that their introversion is interpreted as disinterest or confusion about the content (Karabulut-Ilgu, et al., 2017). In order to have success during this process, it is essential for the instructor to cultivate open and honest relationships with students. As the semester progresses, the instructor can explain the justification of what skills are gained through each activity. Letting students know why a particular exercise will be useful to them for their final grade or to become better citizens in the future generally helps them understand the purpose of the flipped class participation (Gonzalez-Gomez et al., 2016).

While teaching my blended learning students, I am cognizant that some learners who are introverted, shy, or from a different culture are not used to debating with peers or asking teachers or peers questions. They may certainly never speak without prompting. Their contribution to active learning might simply be listening and thinking and I understand that they are still knowledgeable interested learners. There are many different ways that students participate and add value to the class and I believe that all students must be acknowledged in the active learning setting.

Variation of the active learning activities in class can also increase the student experience. I have found that students dislike too much of one activity such as discussion, especially if few students continually dominate the dialogue. A variety of activities in class benefits both the extroverted and introverted students because different activities

will appeal to different kinds of students. I believe that teachers are instrumental in creating positive active learning environments by incorporating activities, which can help reduce anxiety (Lenczewski, 2016). Instructors should provide students with regular confidence-building exercises that look to challenge but also enable all students to feel comfortable to participate at their own levels within blended learning class time.

Table 4 below gives some ideas for active learning during face-to-face time in math and science classes. As I want to create the best conditions possible for learning, I feel students will naturally take challenges and develop when they are ready. To bolster the strengths of introverted students without having them feeling disadvantaged in the classroom, I offer strategies for helping them adjust to the extroverted activities (Amresh et al., 2013; Gannod, 2008). This chart also includes options for introverted students who have difficulty with the active learning that is focused in the flipped class.

Table 4

Active Learning Ideas for Face-to-Face Time in Math and Science Classes and Options for Introverted Learners

Active learning activities	Options for quiet learners
<p>Class Discussion: I will prepare a list of discussion questions and together with the class, we will discuss a topic based on a video, reading, or problem.</p>	<p>Alternative ways of doing this are to allow quiet learners to work in smaller groups of their own choosing to discuss and answer questions</p>
<p>Error identification: I provide readings, proofs, or other material that contains errors. Students must find and correct the errors. I use this often with math problems. (Refer to Appendix B)</p>	<p>Instead of working with a group, I allow students to work individually if they prefer, this seems to produce the most satisfying results for these students</p>
<p>Role Playing:</p>	<p>Give the introverts strategies for</p>

<p>Students use dramatic techniques to get a better idea of the concepts and theories being discussed (Yale, 2015).</p> <p>They might stage dialogue in a case study, town hall scenario, or present (within a safe context) problematic social responses requiring discussion</p> <p>This is often used when exploring different perspectives in science classes, which gives students a more complete understanding of the topic. (Refer to Appendix C)</p>	<p>interacting with people, such as preparing a script beforehand. Introverts are stressed by having to interact with others verbally in spontaneous situations. Being able to prepare helps them adjust.</p>
<p>Think-pair-share activities Students work individually on an active learning assignment or formative assessment activity (such as one-minute papers or an example problem).</p> <p>Students then compare their responses with a partner and synthesize a joint solution, and then share with the entire class.</p> <p>This allows students to see and reflect on their peers' assessment of their contribution (Yale, 2015)</p>	<p>Give the introverts privacy by letting them keep the results of their work private.</p>
<p>Mock debates: Often times the class is separated into 2 groups so we can debate issues.</p> <p>I often assign the topic and perspective beforehand and students are expected to use class time or watch videos beforehand to prepare</p> <p>I have used this activity with current science issues such as climate change, tailings ponds, and alternative energy sources using face-to-face discussions, class twitter feeds, and classroom blogs.</p>	<p>Participation is often connected with thinking out loud, and that's something at which extroverts excel but with which introverts struggle (Karabulut-Ilgu, 2017)</p> <p>For me, participation is not only those who are comfortable to speak</p> <p>Students can also participate by asking a thoughtful question, take on non-verbal roles, posting in an online forum, or doing revisions of work (Thompson, 2012).</p>
<p>Homework problems: Students are able to work in peer groups of 2 or 3 to complete homework. Peer work can support the process of learning, information sharing, and model preferred</p>	<p>I allow students to work individually. They may prefer to work on homework with me one-on-one.</p>

<p>actions, behaviours (Laine et al., 2015). As I make my way through the class to help with homework, students have opportunity to receive one on one time with me</p>	
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Figure 1

Sample of a Flipped Lesson

Out of class	In Class	Out of class
Read / watch video on lab experiment	Conduct lab experiment	(optional) Reflect on lab experiment; Collate lab data
Review a simulation on a dissection	Conduct the actual dissection	Reflect on lessons learned / applications

VHS Collaborative

Increase student engagement

The second subsection will address the limitations of my second research question, which concerns limitations blended learning has towards increasing student engagement.

Viewing basic concepts through instructional videos has become increasingly available to instructors and students. One of the main hurdles I have, while using this teaching model, is ensuring that students actually view them. This corresponds to the gap presented in my

literature review, which involves students who do not watch the video lectures before attending class. I find that students who are disinclined to watch the video lectures before attending class lessons lack the necessary background knowledge to complete the in-class activities. This defeats the purpose of flipped classroom, which is to eliminate lectures to make time for active learning in the class. In this section, I will present recommendations to a) set the flipped class standard early; (b) provide assessments to ensure completion of online material; (c) use in class extrinsic motivation; and (d) parental involvement. The purpose of these recommendations is to offer teachers suggestions on how to increase student engagement with the learning videos because this has great potential for making learning more accessible for students. As teachers, the goal is to provide opportunity to help students learn anytime and anywhere.

Setting the standard early. The single most essential element of any flipped classroom is whether or not its students actually review the lectures ahead of time and come to class prepared. Being unprepared means possibly not completing the course in the semester. This is an area that my school struggles with. Setting high standards for students must be done right at the beginning of the course. Instructors must take the onus of being “direct with students and define what the flipped classroom is, why this learner-centered teaching approach may be beneficial to students, and how the instructor is going to accomplish this (eg, provide a clear example using a topic)” (Gilboy, 2015, p. 113). It is imperative to obtain approval and consent from students the first day of class on what, why, and how the flipped classroom works. Providing a guide of behavioral learning objectives and outcomes can ensure students know why they are viewing the videos before coming to class (Gilboy 2015). If students follow expectations regarding the use of

time at home and at school for course work, class time can be used more effectively. Students with learning disabilities may need additional help allocating their time and using it effectively. When teachers, students, and parents are on board, flipping has the potential to move more students to proficiency, and take more students beyond proficiency to the desired goal of mastery (Wiesen, 2014).

The following are examples of conversation guidelines to share with students and parents to help them accept the requirements of the flipped classroom instructional method. The table relays initial conversation discussion points as well as issues raised by students throughout the semester and possible discussions points.

Table 5

Examples of Conversation Guidelines

Examples of Critical Conversations Starters for Flipped Learning	Issues raised by students and discussion points to address these issues
<p>What Benefits Should You Share about the flipped classroom:</p> <p>Teachers will have more time to help you since they are not lecturing anymore. Your teacher will know you personally. You will be able to pause and rewind your lecture, which may allow you to learn at your own pace. You will be in a more active classroom. More universities and colleges are moving to this flipped classroom model, and therefore it represents the future of education (Bergmann & Sams, 2012).</p>	<p>Student comment: “Why can’t you just teach the class?”</p> <p><i>Many students are unsettled starting in this environment because they have only known the traditional in class lecture so this is a common question. If the material is complicated, I sometimes may do a mini lesson for the class but they still must view online material at home. Note: not every class or every lesson needs to be flipped. It is at the discretion of the teacher.</i></p> <p>Instructor conversation-starter: <i>Why do we have classes?</i></p> <p>When students raise this concern, it is an opportunity to have a conversation about why classes meet</p> <p>I explain to students that we can either have lecture on basic information in class, and then they would be responsible for the harder parts themselves outside of class; or we can make the</p>

	<p>basic information available for students prior to class, and spend class time working on the harder parts. There is not enough class time for both. Which setup will help students learn better? (Talbert, 2015)</p> <p>This issue is often resolved when students understand that class time will focus on assimilating information, not transmitting it.</p>
<p>Expectations you should share?</p> <p>Note the flipped classroom will expect more of students since they have to come to class even better prepared. The flipped classroom encourages active learning so they must be engaged in their learning during class. Students must ask questions and be self-advocates. Flipped classrooms get better when there is honest feedback. I encourage students to give feedback on in-class activities, technology access, and other aspects which I can continuously improve as I teach the program (Bergmann & Sams, 2012)</p>	<p>Student comment: "I learn better when you lecture."</p> <p>Instructor conversation-starter: <i>How does one learn?</i></p> <p>I respond by asking <i>What are the important things you have ever learned?</i></p> <p>I answer this by using examples, such as feeding oneself or going to the bathroom which was learned with direct instruction, practice, and encouragement. Most students would agree that they did not learn these things only by listening to a lecture (Talbert, 2015).</p> <p>I can compare this to what we are doing in class and most do agree that direct instruction, practice, and encouragement are what will help them learn.</p>
	<p>Student comment: I don't like teaching myself the subject.</p> <p>Instructor Conversation-starter: I begin with <i>why self-directed learning teaches independence?</i></p> <p>In the flipped classroom, students are expected to gain fluency with basic ideas in preparation for class time, rather than during class time. This is so students can synthesize what they have learned with their instructor and peers.</p> <p>This conversation also mentions that the flipped class experience involves acquiring the ability to learn new things, both independently and with instructor and peers. This will help them with post secondary preparation, career preparation, and personal growth (Talbert, 2015).</p> <p>Many students who have started post secondary have made many comments about how helpful this teaching method was for them to succeed at the next level of education.</p> <p>Encourage continual and honest feedback from students and parents. This is how I learn as a</p>

	teacher too and I only want to make this program better.
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Online assignments or quizzes. It is crucial that necessary curricular concepts are viewed before class time. Technology is now making it easier for instructors to tell when and for how long students play a video. However, it is difficult to tell whether students were actually engaged while watching or whether students allowed the videos to play without actually viewing them. To ensure that students are engaged in this process, our school has developed short online homework assignments, for some lessons, to check that students have watched the virtual materials. Some students would state that due to technical issues outside class, they were not able to view videos. I have occasionally allowed these students class time to watch videos, since they could not participate in class activities anyway. However, this does not solve the problem and in fact, has created more disturbances because other students promptly want this exemption from class activities as well. My recommendation is to make an assignment or assessment that ensures students have engaged with the content of the video lectures. This could be done with a few multiple-choice questions in a short online quiz or assignment at the beginning of class (Gilboy, 2015). These assessments could tie the work, activity, or discussion during class time to those specific outcomes. I have found when these assessment results are worth a few points towards the student grade; it can be a very effective motivator.

Table 6.

Suggested Ways to Motivate Students to View Online Videos

Ways to encourage students to watch videos

1) Our school uses a Moodle platform where videos and associated online questions can be prepared and completed by students to assure students have viewed video. A mark can accompany this small video online quiz or video assignment.

2) Quick review at the start of class to check comprehension of video lecture material
This can be done using various review materials such as a game or quiz:

[Endocrine System Jeopardy Round 1](#)
[Endocrine System Jeopardy Round 2](#)
[Endocrine System Anatomy Quiz](#)

The winning team of the game gets a small treat as a prize. This is a great motivator.

3) I will often review the online material at the start of the class by asking a few questions associated to the video. I can often tell who consistently does not watch the videos through this question period.

I will often communicate this information to students and then parents if they continue to ignore the multimedia portion needed to prepare for class.

[Endocrine System Flash Cards](#)

4) To prepare for class, ask students to come to class with a one-page “cheat sheet,” which they will make from the video presentation. They can use this resource to solve a problem presented in class (Yale, 2016).

In class extrinsic motivation. Another approach I have used in class to motivate students to view outside curricular material is the use of external motivation. This may involve class or individual participation to answer a few questions in class about the video lectures for some kind of reward. It is surprising what even a high school student would do for a small candy and a little healthy competition with his peers. I often try to connect to their world by relating the online material to students’ lives. I may end class by presenting the class with a fun fact or trivia about a celebrity or pop culture that relates to our curricular outcome, a strange disease, or an interesting picture. This can be the impetus for students to read or watch a video clip outside of class to find the answer to the trivia presented. Once I have motivated them to open material at home, generally most will look at the rest of the video lesson. Certain extrinsic motivators, like support, praise, and encouragement, can also be an effective way to increase student engagement

with the material. These examples of extrinsic motivation are used sparingly so they do not lose their impact. When used in moderation, extrinsic motivators can be a useful tool to encourage students to complete the required tasks.

Parental Involvement. Another valuable method of getting students on board with the flipped class model is to get parents on board. Because the flipped classroom model is different than traditional classes, parents may be unfamiliar with this teaching style. Teachers should explain that when students watch video lectures at home, there is increased time for their child to get help with difficult concepts in class and more time for application of what they have learned with their peers. By building trusting, respectful relationships with families, even high school parents can be extremely helpful in keeping students on track with the preparation necessary for class. I try to communicate what is happening in class on a daily or weekly basis with students, and I also include parents on these daily or weekly summaries if they would like to be a part of them. There are many simple technological communication platforms that allow teachers to connect with parents easily, such as through Google Classroom or the Remind application. I have found that many students lack the maturity for self-directed learning on their own, so the support and guidance from home can be a tremendous help in engaging high school students in their academics. Parents and teachers both have a common goal in wanting students to thrive in their academic environment, so by working together, parental involvement can provide a great deal of success in the subject for the learner.

Limitations and Suggestions for Future Research

Limitations of the Flipped Classroom Model

Not all scholars are convinced about the success of the flipped model and feel that this may not become the dominant pedagogical model anticipated in education. Some literature has stated that although this approach has become recently favoured, it cannot yet be considered evidence-based since more research must be done using rigorous testing designs (Pawson, 2006). Other scholars report that more credible, peer reviewed studies performed on the flipped approach are needed (Abeysekera & Dawson, 2015).

A significant hurdle towards effective learning in the flipped classroom is monitoring students who do not view essential materials and videos prior to class attendance (Partridge, Ponting, & McCay, 2011). The transition from instructor-centred to learner-centred environments requires assistance in completing the preparatory work, and for students, this is neither easy nor automatic and depends on already existing levels of self-efficacy (McLaughlin et al., 2016; Pintrich, 2003). Flipped learning and acquiring academic achievement depends on self-regulated, highly self-motivated students who have the time management, organizational, and critical thinking skills from the provided pre-class information and the interactive in-class activities (Partridge et al., 2011). This mode of learning presumes maturity and places responsibility for learning on the student. Without this, students were not as successful in gaining knowledge with this pedagogical teaching method.

In addition, the literature reported the flipped learning environment seems to favour the extroverted student who has skills to participate in group discussion and collaborative learning (Wanner & Palmer, 2015). Not all students thrive in these highly interactive situations; therefore teachers may be missing valuable contributions from students who do not openly participate in classroom activities (Faculty Focus, 2014).

Another critique of the method was that the flipped model required increased time demands that may decrease intrinsic motivation for students to complete the required preparatory work. As a result, students may become driven by extrinsic motivators, such as what will be assessed in their learning (Abeysekera & Dawson, 2015). These factors together made it difficult for students to achieve and gain knowledge at the level that was required by the courses being taken.

Suggestions for Future Research

There is much hype and debate about the value of the flipped classroom model for teaching and learning. “The question remains as to whether flipped classrooms will become a dominant paradigm” (McLaughlin et al., 2016, p. 35) in improving student learning over the coming decades. Research has shown that this blended learning has provided opportunities for teachers to rethink their pedagogies and teaching practices, and put the learners more at the center of teaching and learning (Faculty Focus, 2015). Access to new powerful mobile devices continues to be developed, so this has allowed students to access educational resources at times and places that are most convenient for them (Educause, 2012). As a result, studies are showing that greater numbers of courses will likely employ elements of the flipped classroom which has become appealing to students and as instructors, we can use this to our benefit to increase student learning (Roehl, Reddy, & Shannon, 2013).

Another area of study shown by the literature review to have gaps to consider is where and how can the flipped classroom best be employed in our education system? The literature revealed several things. First, because the flipped method does require the

learner to take responsibility for the essential learning outside the classroom, this method seemed to work better in higher-level courses where students had more maturity and intrinsic motivation to complete outside homework to be prepared for in-class activities. Second, it was also found that most research was performed in math and science classes suggesting that perhaps subjects that call for sequential learning and lots of practice do best with this methodology (Bergmann & Sams, 2012). The flipped classroom model bases its success on the in-class activities, which in turn rely on the prior out of class student preparation, but students with more timetable demands may have decreased intrinsic motivation to do the many required preparatory tasks and insufficient time to prepare for in-class activities (Abeysekera & Dawson, 2015). Therefore, school boards may further investigate if it would be logical and more realistic for students to take some blended learning classes, but not all (Wanner & Palmer, 2015).

In addition, another interesting finding was that some studies show significant knowledge and learning gains for intrinsically motivated middle and lower achieving students as they benefited from opportunities to work in small groups and increased one-to-one contact with the teacher who provided extra clarification and assistance that would not be possible in a traditional classroom (Marlowe, 2012). Studies also state that this method allowed instructors opportunity to address individual needs, such as students' moods and learning styles rather than needs of the majority. If the flipped classroom model can help motivate middle and low achieving students to work harder and learn in a more efficient manner, then it is worth further exploration (Marlowe, 2012).

Most current literature reveals that there was no significant difference found in test scores of students who attended traditional class versus the flipped classroom

approach. Perhaps future flipped classroom studies could assess and examine how this model could be evaluated differently using various methods of assessment that will reflect students' enhance Flipped Classroom experience and increased student engagement. This would be a better indication of how students have connected with the subject matter.

Conclusion

This review was constructed to explore students' perception, engagement, and achievement in the flipped model of instruction. The studies revealed that overall student perceptions and student engagement was increased using this model. Student achievement was not shown to increase with blended learning. The analysis of all three factors with both positive development and negative experiences has been discussed. Students of the current age are more engaged with technology than the previous generation. The flipped classroom model requires thoughtful integration of online resources, technology, and face-to-face learning that has transformed the structure and approach to teaching and learning. Many studies were used to evaluate whether this course redesign resulted in improved student performance and greater gains of knowledge with this learning experience. With the increased use of technology in the classroom, the flipped classroom model is growing in popularity. Some studies suggested it may not become the influential standard anticipated in education because it depends too much on students' self-efficacy, and ability and motivation to do the required preparatory work. While there may be the need for more rigorous studies to analyze this approach, the studies that have been currently examined on the flipped classroom model showed

that this mode of instruction is a fundamental redesign that has provided more flexibility for students and has allowed teachers greater insight into student learning as a result of increased student/teacher interaction (Roehl et al., 2013). The literature reveals that students have an overall positive perception of this model of instruction. They feel that flexibility of the technology allowed learning anyplace and anytime which increased their learning potential, the multimedia offered material to be viewed as quickly or slowly as they needed, and the face to face interaction with instructor and peers offered differentiated instruction and active learning opportunities that allowed the learner to reach a higher level of cognitive presence. The self-studying flipped materials, such as video lectures, motivated learning interest and problem-solving in educational contexts and the small in-class peer groups helped students explore knowledge and exchange diverse information, with guidance and clarification from the teacher (Chen & Chang, 2017). This allowed them to be more engaged with the subject matter, the class, and the instructors. Since a few studies were able to show some student increased learning performance and many studies revealed student enjoyment of the flipped teaching model, educators are on the right pathway toward creating a learning environment that can produce more powerful learning outcomes and increased depth of knowledge. This suggests that the flipped classroom does have an optimistic future for education.

In this paper, I have provided several suggestions and exemplars for increased improvement in the flipped classroom. These recommendations, based on my literature review and personal experience, could be used by anyone wanting to implement this model of instruction in the classroom.

In conclusion, the flipped model approach has been shown to inspire and motivate educators to change their teaching practices and incorporate technology to reflect our current digital era. If learning remains the focus, and teachers continue to reflect on improving teaching methodology, there is hope that some of educational reformer John Dewey's philosophy to forward the "progressive education" movement will permeate in our education system (Wiesen, 2014). The flipped classroom has the potential to improve the entire paradigm of teaching. Using this technique, teachers will be given more time and opportunity to observe students, identify their learning needs, and guide them to higher levels of learning.

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Appendix A

Tree Man Disease Video Worksheet



<https://www.youtube.com/watch?v=xmVseKdB6So>

Please answer the following questions while watching the video. Refer to Biology textbook p. 293 for extra help.

1. Dede is a man affected by Tree-man disease.
 - a) Where is Dede from? (1)
 - b) What did Dede do for a living prior to having the disease?(1)
 - c) Why did he have to stop working?(1)
2. What was the cause of the warts on his body? (give specific pathogen)(1)
3. List 3 roots of the problem:(3)
4. What causes the “horns” of the disease?(1)

5. List 3 treatments for this disease. (3)

6. a) Is there a cure for this disease?(1)

b) How can we protect ourselves from this pathogen?(1)

7. The human body can normally defend itself from the attack of pathogens by 3 defences. Use p.293 of the text and describe the line of defence and list 1 or 2 specific barriers the body uses to defend itself.

a) First line of defence description:(1)

Examples:(2)

b) Second line of defence description:(1)

Examples:(1)

c) Third line of defence description:(1)

Examples:(2)

Appendix B

Error Identification in Math problems

Directions: Evaluate the following proofs to identify the student errors. Once you have completed the problems, share your work with your partners to identify if you have correctly identified the mistakes.

Your group work will be shared and discussed in class.

1. Brian tried to determine the non-permissible values for an expression, as shown below.

$\frac{2t - 6t^3}{8t - 14t^2}$	To determine the non-permissible values, I looked for the values that make the denominator equal to zero.
Denominator: $8t - 14t^2 = 0$ $2t(4 - 7t) = 0$	I set the denominator equal to 0 and factored the expression on the left.
$2t = 0$ or $4 - 7t = 0$ $t = 0$ $4 = -7t$ $t = -\frac{4}{7}$	I set both factors equal to zero. I solved each equation separately.
$\frac{2t - 6t^3}{8t - 14t^2}, t \neq 0, t \neq -\frac{4}{7}$	$t = 0$ and $t = -\frac{4}{7}$ are non-permissible values of the variable in the rational expression.

Identify Brian’s error, and correct his solution.

Appendix C

An Environmental Risk–Assessment Role Play Activity: Not In My Backyard

Objective:

The objective this activity is to allow you to use the information you have studied on toxic waste disposal and participate in a role-play that provides a real-world application of risk assessment. After you have listened to different groups speak on the issue from their perspective, you will evaluate this project, and formulate an idea based on who is affected by this proposal.

Project proposal:

A proposal has been made to build a toxic waste disposal facility in a small town in Northern Alberta, due to concerns about unsafe long-term storage of toxic wastes in towns and cities across Alberta. Many Albertans support this proposal, saying that this facility will provide treatment and disposal options for hazardous wastes, where currently these wastes are not being properly treated. Those that oppose the proposal feel having a hazardous waste treatment plant located nearby can cause serious health problems for themselves and the environment and they fear long-term effects.

In this activity, you will:

1. Formulate a perspective, based on an assigned role and information provided (40 minutes)
2. Participate in a town meeting role-play with the "experts" representing different areas of thought and opposing views (45 minutes)
3. Vote for or against the proposed project at the end of the town meeting role play.

You will be assigned one of the following roles:

Townspeople

Special interest group such as those who are experts in hazardous wastes such as Persistent Organic Pollutants (POPs) including PCBs, dioxins/furans, and other more hazardous waste compounds. (Other groups are also acceptable)

Teacher or college professor who teaches toxicology, pharmacology, or biomedical science

Professional outside the community

Professional business person in the community

Environmentalist

First Nation Chief who lives in area

You may use sites listed or any others that can help you with your assigned role.

<http://calgaryherald.com/news/politics/liability-for-swan-hills-hazardous-waste-plant-clean-up-keeps-growing>

<http://edmontonjournal.com/business/alberta-hazardous-waste-treatment-plant-waiting-for-long-term-operating-licence-renewal>

<https://www.townofswanhills.com/lifestyle/tourism/alberta-special-waste-treatment-facility>

<https://townofswanhills.com/lifestyle/tourism/alberta-special-waste-treatment-facility/16-departments/council/bylaws>

<http://calgaryherald.com/news/politics/environmentalists-first-nations-oppose-licence-to-keep-swan-hills-waste-facility-operating>

Taken from :<http://ateec.org/risk-assessment-role-play-not-in-my-back-yard/>