

Flipped Learning and the Motivational Framework of Students

by

Jason Wihnan

B.Sc., University of Victoria, 2000

A Project Submitted in Partial Fulfillment of the
Requirements for the Degree of

MASTER OF EDUCATION

in the Department of Curriculum and Instruction

© Jason Wihnan, 2015

University of Victoria

All rights reserved. This project may not be reproduced in whole or in part, by photocopy or other means, without the permission of the author.

Supervisory Committee

Dr. James Nahachewsky (Department of Curriculum and Instruction)

Supervisor

Dr. Tim Pelton (Department of Curriculum and Instruction)

Department Member**Abstract**

The focus of this project was to develop a ‘flipped’ or blended unit of study for a senior physics course, and to consider how adolescent motivation and engagement might be influenced by a flipped classroom environment. Having students watch online video lessons can be an efficient method of disseminating information while allowing class time to be used for student-centred learning activities.

This project consisted of three major components: developing online content, developing a plan for in-class collaboration, and connecting flipped learning to student motivation. It was found that both the online and in-class aspects of flipped learning may positively influence student motivation and engagement, however, some negative aspects of flipped learning have also been identified.

Table of Contents

Supervisory Committee	ii
Abstract	ii
Table of Contents	iii
List of Figures	v
Chapter 1: Proposal	1
Reflecting On My Practice	2
It All Starts with Motivation.....	4
The Student-Centred Approach and its Challenges.....	5
Overcoming Challenges with Blended Learning	6
Project Focus	7
Chapter 2: Literature Review	8
The Motivational Framework of Adolescents	10
Goals.....	10
Motivation and engagement.....	13
Blended Learning	16
Blended Learning and the Motivational Framework.....	19
Goals and blended learning.....	19
Motivation and blended learning.....	20
Engagement and blended learning.	22
Blended Learning and Achievement.....	22
Blended Learning - Drawbacks and Other Considerations	24
Effective blended learning requires structure.....	25
Different perceptions among males and females.	27
Video lessons can be boring.	28
Conclusion	29

Chapter 3: The “Flipped” Classroom	32
Thinking about Flipping	32
Creating Content.....	35
Creating a teacher website.....	35
Creating video lessons.....	39
Planning for a Student Centred Classroom	42
Planning for in-class collaboration.	42
Clarifying assessment.	44
Considering Student Engagement	46
Engagement with online materials.....	46
Engagement in a student-centred classroom.	47
Conclusion	49
Chapter 4: Reflection	52
Project Summary	52
Recommendations for Others	53
Choose an appropriate class.	54
Start small and do not completely eliminate the lecture.....	54
Developing video lessons.	55
My Graduate Program Experience and How It Might Affect My Practice.....	55
Cultural bias in science.	56
Integration of technology.....	58
Personalized learning.	59
References	61

List of Figures

Figure 1	The Continuum of Goals	12
Figure 2	Ryan and Deci’s Self-Determination Model	14
Figure 3	The Engagement Continuum (Saeed and Zyngier, 2012)	14
Figure 4	The Engagement Continuum (Harris, 2011)	15
Figure 5	Wihnan’s Website	36
Figure 6	Discussion Board	37
Figure 7	Links to Video Lessons	38
Figure 8	Links to Supplementary Material	39
Figure 9	Camtasia Video Editing Screen	40
Figure 10	Annotating a PowerPoint using Camtasia	41
Figure 11	Lesson Plans for a Flipped Unit	44
Figure 12	Collaboration Rubric	45

Chapter 1: Proposal

Like many of my colleagues, I am always looking at ways that I can improve upon my teaching practices. Ideally, all of my students would be interested and enthusiastic about the learning that goes on in my classroom. I understand that this goal is rather lofty, but it does provide me with a focus or direction for my professional growth. I feel strongly that when students are interested in a topic, their academic achievement will naturally improve.

When students find a subject interesting, their motivation to engage in learning is different from those students who are motivated by grades, parent pressure, or future aspirations (Mansfield, 2012; Nieswandt & Shanahan, 2008; Saeed and Zyngier, 2012). Current discourse regarding student motivation suggests that the motivational framework of students exists as a spectrum that subsequently impacts their level of engagement. I have often heard how student-centred teaching methods, such as cooperative learning and project-based learning (PBL), improve the levels of engagement among students, so I intend to explore the connections that exist between these methods and the motivational framework offered in the literature. I have attended several professional development seminars that presented cooperative learning and project-based learning, but found that they were geared towards elementary and middle school levels. I had a difficult time identifying how these strategies could be used in my subject area of high school physics. I was also hard pressed to find any examples of such methods being used in other high school physics classrooms. It became a common question of mine when I met other physics teachers, to ask: “Have you been able to use project-based or cooperative learning in your classroom?” Aside from those who had mistaken PBL for a hands-on activity or lab, most would respond with a statement that can be summed up as “Where do I find the time for that?”

High school physics courses are laden with a vast number of specific learning outcomes. These outcomes can be complex and require an element of critical thinking, as students are having to use theory to solve problems, both qualitatively and quantitatively. Along with many of my colleagues who teach in this area, I have found that the teacher-centred, lecture style approach was the most efficient way to cover the learning outcomes while ensuring concepts are explained correctly and important connections between physics concepts are clarified. This method, however, leaves little time for activities that promote deeper learning. Considering the ever-increasing availability and access to technology, blended learning might be a viable solution to the time constraint felt by teachers in my situation. Blended learning has been defined as the “integration of face-to-face and online learning” (Watson, 2008, p. 5) and has been said to not only allow give students more control over the pace of the instruction (Frederickson, Reed, & Clifford, 2005), it allows for greater opportunities for communication between the teacher and student (Johnson, 2013), and leads to an overall increase in student attitude (Mousel, 2013). Most importantly, having students watch lessons on-line prior to coming to class would ensure that concepts were being presented correctly, while allowing the time for student-centred, cooperative learning activities to take place during class-time.

Reflecting On My Practice

My predominant method of teaching has been teacher-centred and lecture driven, yet as a student I struggled to learn in this very environment. Although I have always been oriented towards the natural sciences, I learned very little within the classroom. As a student in both high school and post-secondary science classes, I would make every effort to keep up with the lecture, but once I was not able to understand something, any subsequent information was also not understood. I would often find myself lost ten minutes into a lecture and feeling frustrated for the

remainder of the class. It was not until I reviewed the material in a text book that I gained a reasonable understanding of it. This way, I was able to read and re-read paragraphs as often as necessary and could spend enough time examining figures and charts to make a real connection with the material. My genuine interest in science provided me with the motivation I needed to put in the extra effort to keep up with course material; however my motivation to attend class on lecture driven days became less and less. There became a point where I felt it was a waste of my time to sit through a lecture in a state of confusion, and found that my time was much better spent learning the material on my own or with a group of my peers.

Knowing that at least some of my students might experience similar frustrations, I feel the need to reflect on the reasons I mainly use a teacher-centred approach. I love to lecture! I enjoy sharing my enthusiasm about science and impressing on my students how amazing it can be. When I see students furrowing their brows, I feel that I have the ability to back up and re-teach the concepts using different analogies and demonstrations. I enjoy bringing students to the edge of their seats when I attempt to hit a toy monkey out of mid-air with a wooden blow-dart to help explain the principles of projectile motion. When I reflect on my lessons however, I realize that my focus is on what I'm doing in front of my students rather what they are doing. I think the "one-size, fits-all" teacher-centred approach appeals to me since it is highly structured and organized with respect to what information was taught and where my students should be in their learning. Although it is an efficient way to cover many learning outcomes, I am not convinced of its effectiveness in terms of engaging learners. I sometimes wonder if my students are even present when they ask me questions about things that I thought I had made very clear in the lecture. Are my students tuning me out during a lecture? Do I sound like Charlie Brown's teacher to them? Perhaps providing opportunities for my students to learn more actively through

inquiry and collaboration rather than requiring them to passively absorb content from a lecture would increase their level of interest and motivation to learn.

It All Starts with Motivation

There are things in my life that I find very interesting and engaging, such as skiing, mountain biking, and of course, science. Practicing or seeking further knowledge in these areas does not require an external force, but rather the impetus is intrinsic and the reward is inherent in the task itself. Some students show up to my physics class already having a fascination with physics. These are the students that have looked out into the cosmos and questioned why the universe is the way it is. They have read books about science and technology and watch documentaries about it on YouTube. These students will surely do well in physics since their genuine level of interest in the subject will provide ample motivation when topics become complicated and extra effort is needed for learning. This is analogous to me not realizing how hard I'm working while mountain biking, as I'm enjoying myself too much to think about the effort.

I also see different types of students showing up at the beginning of a course. These students may be full of energy and ready to learn, but lack a genuine interest in the subject. They might seem indifferent towards science and look at it as a means to an end, such as graduation. They seem to be motivated by extrinsic factors such as personal achievement, future career, or parent pressure. It is my experience that these extrinsic factors are not nearly as powerful as intrinsic ones. If these students begin to struggle with the material, they are less likely to make the extra effort required to shore up their learning. Is there a way for me to improve interest among my students, and thus their intrinsic motivation? Perhaps incorporating a student-centred

environment that doesn't rely on a "one-size, fits-all" lecture will reduce the frustration of sitting confused through a lecture and keep interest levels high for students.

The Student-Centred Approach and its Challenges

Although I would like to think that my lectures "get through" to all my students, when I probe for understanding, I find that only a fraction of my students truly comprehend the material at any given time. Also, since the concepts are cumulative, losing a student's understanding early in a lecture means losing their understanding for the remainder of it, and it is therefore not an effective use of time for that student. Student-centred methods could possibly allow for a more effective use of class-time if students are able to participate more in their learning. Allowing students to interact and learn from each other could potentially increase their motivation, both intrinsically and extrinsically. Having students work in groups where individuals have a well-defined role may provide some extrinsic motivation in not letting down other members of the group, whereas PBL activities could raise interest and thus intrinsic motivation, as the inquiry process more closely emulates the scientific process and it allows group members to focus on their strengths. Cooperative learning could really work well in my subject area, as the problem-based nature of physics lends itself well to collaboration. Whether students are solving problems presented to them in a text book or trying to find the best way to approach a project, team-work seems to be a good fit.

A challenge or obstacle to this approach, however, is the specific nature of the learning outcomes. I can understand that, through a cooperative approach, students could grasp the qualitative aspects of how, for example, a satellite achieves and maintains orbit. The specific quantitative aspects of circular motion, however, would still need to be taught through instruction that is well-structured. Taking the time to supplement each topic with student-centred

lessons would mean cutting out a large proportion of the learning outcomes from the course.

When I consider the reasons why I still use the teacher-centred approach, I feel that the constraint of time along with the quantity and specific nature of learning outcomes are the most significant factors.

Overcoming Challenges with Blended Learning

Incorporating an online component into a course such as physics, has the potential to relieve time constraints and provide the opportunity for students to engage more actively with their learning through peer collaboration.

I can understand how blended learning could have significant pedagogical value. Having students view lessons online, so what was once assigned for homework (also known as ‘flipped’ or ‘inverted’ learning) can be accomplished in class, allows for much better peer and teacher support when it is needed – while applying knowledge. I often tell my students that the real learning in physics comes from working through sets of problems on a topic. With blended learning, specific content can be presented in an organized fashion with an online lesson, but cooperative learning groups in the classroom are where students can refine their collaboration skills and work together on problem sets, experiments, and projects. Having students view lectures online before coming to class allows more time for students to interact with their peers and be active in their learning.

Not only does flipped learning allow for a more personalized experience for students in the classroom, it potentially offers a level of personalization with the video lesson as well. Although a video lesson might not be as engaging as in-person, the student has the ability to view the lecture at their own pace and pause and rewind as they feel necessary. Allowing students to adjust the pace of the lesson is an obvious benefit to this approach.

At first glance, this method might appear like the teacher is being replaced, as students are acquiring much of their knowledge via technology, but freeing the teacher from in-class lecturing allows more time for the teacher to work with groups or individuals that need support. Learning by actively participating and interacting with both peers and teachers seems like a more natural way to learn. Salmon Khan (2012) argues in a 'Ted Talk' that "flipped learning actually humanizes the classroom."

Project Focus

It is a professional goal of mine to incorporate a more student-centred approach to my teaching through cooperative learning. For my M. Ed. Project, I will examine the motivational framework of adolescents and describe how student-centred teaching methods connect with this framework. Faced with the constraint of time and specific learning outcomes in physics curricula, I will explore the existing literature to better understand and present whether blended learning can be used to overcome these challenges and allow for a more student-centred approach to learning. I plan to create a blended unit for a grade 12 physics class, where students will view lessons online, thus allowing for cooperative learning activities to occur during class time. Bringing these ideas together, I can define my central question as: "*Can blended learning allow for more student-centred teaching methods and thus increase student motivation?*"

Chapter 2: Literature Review

The focus of this project is to examine how blended learning might allow for more student-centred teaching methods to be used in the classroom and thus increase student motivation. Through a review of the literature, I intend to establish a current framework of adolescent motivation, while including factors that are inextricably linked to motivation: goals and engagement. I will then discuss how particular aspects of blended learning might connect with a student's motivational framework. Although much research exists that supports blended learning, as it has been found to improve student autonomy and satisfaction; other research identifies how blended learning might not be conducive to certain learning styles.

The professional goals of most teachers likely include finding ways to improve their students' achievement. Most teachers would also agree that students who are engaged perform better academically than those who are not, and that student motivation can be significantly influenced by teaching methodologies. Saeed and Zyngier's (2012) study "confirms that motivated and engaged students learn better and show best possible outcomes in their academic study and by using the appropriate pedagogies teachers can also make classrooms more engaging places for students to learn" (p.262).

The closer one examines the psychological construct of motivation, the more complex it becomes. Motivation is often divided into *extrinsic*, when external rewards are the driving force behind behaviour, or *intrinsic*, when the driving force comes from within an individual. Researchers have divided these categories of motivation even further, describing a continuum of six motivational types based on the level of self-determination or the degree to which an individual's behaviour is self-motivated (Saeed & Zyngier, 2012). Motivational discourse often includes the topic of goals, since an individual's goals are what influence their motivation.

Researchers have shown that there are a multitude of goals that can be either intrinsically or extrinsically oriented (Mansfield, 2012; Nieswandt & Shanahan, 2008). If motivation type is based on goals, then engagement is the product of motivation. As a teacher, I would suggest that a motivated student is one who is engaged. Engagement, however, is also a diffuse construct as Harris (2011) identifies a continuum where, on one side, behavioural engagement, or “engagement in schooling” may result in social outcomes, where cognitive engagement or “engagement in learning” may result in academic outcomes. Saeed and Zyngier (2012), on the other hand, break the concept of engagement into six categories ranging from extrinsically oriented “Rebellion Engagement” to the intrinsically oriented “Authentic Engagement.” When one considers all the factors involved when defining a student’s level of motivation and engagement, it is understandable that the concept of motivation can have various interpretations. Ryan and Deci (2000, as cited in Saeed & Zyngier, 2012) defined motivation in a way that seems to encompass the multi-faceted concept of the term: “To be motivated means to be moved to do something. A person who feels no impetus or inspiration to act is thus characterized as unmotivated, whereas someone who is energized or activated toward an end is considered motivated” (p. 253).

Blended learning, or the integration of online and in-class instruction has the potential to have a positive effect on a student’s experience and motivation. Using online video lessons, teachers can reduce their time spent lecturing and facilitate student-centred, cooperative learning strategies during class-time. Hanze and Berger (2007) identify how blended learning promotes a student’s experience of autonomy, competence, and social relatedness; the three major aspects of a self-determined, intrinsically motivated individual, as defined by Ryan and Deci (2000). Blended learning has also shown to benefit students by improving teacher-student contact time

(Amiri, Ahrari, Saffar, & Akre, 2013; Johnson, 2013) and improving enjoyment and satisfaction for students (George-Palilonis & Filak, 2009; Mousel, 2013).

Some significant trends in the research suggest that, on average, there is very little difference in the academic achievement, or performance, of students participating in blended learning compared to those participating in a traditional lecture-based classroom (George-Palilonis & Filak, 2009; Hanze & Berger, 2007; Marlowe, 2012). It was also noted that males didn't respond to cooperative learning activities as positively as females (Crews & Butterfield, 2014; Hanze & Berger, 2007; Lage, Platt, & Treglia, 2000), and many students found online video lessons to be less than stimulating (George-Palilonis & Filak, 2009; Mousel, 2013).

The intention of this review is to show how adolescent motivation is closely connected to both goals and engagement, and that each of these factors exists as a continuum ranging from extrinsic to intrinsic orientation. I will then examine both the online and in-class components of blended learning and discuss how they fit into a student's motivational framework.

The Motivational Framework of Adolescents

Goals. Since goals influence motivation, and motivation determines levels of engagement, it is important for educators to understand how goals fit into the motivational framework. Mansfield (2012) and Nieswandt and Shanahan (2008) contribute to the literature with their research on goals. Through a qualitative case study, Nieswandt and Shanahan (2008) “examine the motivational structure of a group of male students in a grade 11 General Science class at an independent single-sex school” (p.3); whereas Mansfield (2012), through focus group interviews, showed that along with achievement goals that pervade the literature, students simultaneously pursue other goals, such as future goals, social goals, and personal well-being goals.

Both of these studies (Nieswandt & Shanahan, 2008, Mansfield, 2012) acknowledge the relevance of achievement goal theory in motivational research. Achievement goal theory distinguishes two different types of goals: *performance goals* (associated with extrinsic motivation) and *mastery goals* (associated with intrinsic motivation) (Nieswandt & Shanahan, 2008). Those with performance goals strive to demonstrate their competence and ability, and are likely extrinsically motivated, while students pursuing mastery goals aim to develop their competence and tend to be intrinsically motivated (Nieswandt & Shanahan, 2008). Patrick and Yoon (2004) found that “the pattern of high-mastery and low-performance goals was associated with a sizably greater increase in understanding compared with the high mastery/performance pattern” (p. 327).

The studies done by Mansfield (2012) and Nieswandt and Shanahan (2008) expand on achievement goal theory to include *social goals* and *future goals*. Each of these goals resides on a continuum between extrinsic and intrinsic orientation. Mansfield, however, identifies “personal well-being” as a goal that is only intrinsically oriented. Figure 1 shows how each of these goals can be related to extrinsic or intrinsic orientation.

Social goals are the “internalisation of sociocultural values” (Nieswandt & Shanahan, 2008, p. 5), such as “maintaining supportive relationships with others, adhering to rules, and being well regarded by others” (Mansfield, 2012, p.566). Nieswandt and Shanahan identify how a sociocultural value had negatively influenced student motivation with their findings that students in a General Science class internalised the school’s goal messages that the course was designed for those not pursuing science, but just needing a science credit. The authors found the messages of being a “dead end” course negatively affected the goals and thus motivation of the students: “Our results suggest that the boys internalised the administrative description of the

<u>Extrinsic</u>	Goals ←————→	<u>Intrinsic</u>
<u>Performance</u> <i>ex) To get good grades; to achieve credit</i>	Achievement	<u>Mastery</u> <i>ex) To learn new things</i>
<u>Wealth / Status</u> <i>ex) To get a good job; to make a lot of money</i>	Future	<u>Happiness</u> <i>ex) To be happy in life and successful at something they love</i>
<u>Approval</u> <i>ex) To make parents and family proud</i>	Social	<u>Relationships</u> <i>ex) To make new friends; to get along with the teacher.</i>
An extrinsic component of personal well-being was not identified.	Personal Well-being	<u>Feeling Good</u> <i>ex) To be confident, successful, and happy; to have fun.</i>

Figure 1. Goals are situated somewhere on the continuum between extrinsic and intrinsic orientation (Nieswandt & Shanahan, 2008, Mansfield, 2012).

***Examples given by participants in Mansfield (2012) study.*

course as meeting a diploma requirement, which they expressed in their perception of the course as being for ‘non-science’ people who ‘just need a credit’” (Nieswandt & Shanahan, p.25).

Mansfield’s results showed overwhelming support for the significance of social goals as 96% of the participants indicated that at least one of their goals was social in orientation; either developing relationships (93%) and/or seeking approval from family (45%).

Nieswandt and Shanahan (2008) argue that although achievement goal theory allows for examination of possible goal changes over time, it neglects “the instrumental value of goals for the near or distant future” (p. 5). Nieswandt and Shanahan describe how “being future-oriented or demonstrating a future time perspective means that the present task is seen as instrumental in reaching various anticipated future goals (p. 6). The results of Nieswandt and Shanahan’s study showed that the participants “expressed an increased motivation during topics that seemed particularly interesting or useful in their everyday or future lives (p.19). Mansfield (2012) echoed

these findings and found that 100% of the participants had a future goal that was extrinsically oriented, with responses such as “to get a good job” and “to get into university” (p. 573).

Mansfield’s results also showed that 45% of participants had a future goal that was intrinsically oriented, with responses such as “I want to have a greater understanding of the world” and “to be happy in my life and successful doing something I love” (p. 573). On the other hand, Nieswandt and Shanahan found that the students taking a particular course ‘just for the credit’ “did not see the value of the course in developing their personal or professional life.” (p. 19). The participants were not motivated by the tasks themselves; “they were merely a means to an end” (Nieswandt & Shanahan, 2008, p. 19).

Motivation and engagement. Student engagement can be considered the measurable result of motivation. Hijzen, Boekaerts, & Vedder (2007) refer to engagement as “an indicator of students’ motivation” (p. 674), whereas Ryan (2000) refers to motivation as one’s cognitions underlying involvement in their schoolwork and engagement as their actual involvement in their schoolwork. Saeed and Zyngier (2012) contribute to the understanding of the motivational framework with research that supports existing theories (Ryan & Deci, 2000) on motivation and engagement. Saeed and Zyngier’s (2012) findings support the notion that extrinsic motivation is a continuum ranging from “external regulation (where a task is attempted to satisfy an external demand)” to “integrated regulation (when external regulations are fully assimilated in a person’s self-evaluations and beliefs of their own personal needs)” (p. 254). This research adds to the complexity of motivational theory by expanding on the ideas of extrinsic and intrinsic motivation. Saeed and Zyngier (2012) discuss how “it is very important for educators to understand the different types of extrinsic motivation and how they may work as they cannot always rely on intrinsic motivation to promote learning” (p. 254). Ryan and Deci’s (2000) self-

determination model defines intrinsic and varied extrinsic sources of motivation, with intrinsic motivation being dependent on an individual's experience of autonomy, competence, and social relatedness. Figure 2 summarizes the motivational spectrum according to Ryan and Deci (2000) and supported by Saeed and Zyngier (2012).

Non-self-determined behaviour		←————→			Self-determined behaviour	
Extrinsic Motivation				Intrinsic Motivation		
<u>External Regulation</u>	<u>Introjected regulation</u>	<u>Identified regulation</u>	<u>Integrated regulation</u>	<u>Intrinsic regulation</u>		
<i>External rewards and punishments</i>	<i>Internal rewards and punishments</i>	<i>Personal importance of an activity</i>	<i>Synthesis with the self</i>	<i>Interest, enjoyment, and satisfaction</i>		
Controlled motivation		Autonomous motivation				

Figure 2. Ryan and Deci's Self-Determination Model (2000)

Saeed and Zyngier's (2012) findings also support the notion that there is a five-part continuum of engagements ranging from *rebellion* (associated with those who are not motivated) to *authentic* (associated with those who are intrinsically motivated) (Figure 3).

Engagement				
←————→				
A-motivated	Extrinsically Motivated			Intrinsically Motivated
<u>Rebellion</u>	<u>Retreatism</u>	<u>Passive Compliance</u>	<u>Ritual</u>	<u>Authentic</u>
<i>Refuses to do task and may disrupt others</i>	<i>Disengaged from task, but doesn't disrupt others</i>	<i>Task done to avoid negative consequences</i>	<i>No internal value, but has extrinsic outcomes</i>	<i>Inherent value in the task</i>

Figure 3. The engagement continuum supported by Saeed and Zyngier (2012).

Harris (2011), on the other hand, makes a distinction between “engagement in schooling” and “engagement in learning” (p.377) and how each relates to different outcomes for students (Figure 4). Harris (2011) points out that engagement is a continuum ranging from *behavioural* (student attendance, class participation, and involvement in extracurricular activities), to *academic* (time spent doing schoolwork, academic credits accrued, and homework completed), to *cognitive* (self-regulated and committed to mastery learning). Harris’ (2011) notion of “engagement in schooling” resides on the behavioural end of the continuum, while “engagement in learning” is at the cognitive end. Harris (2011) also argues that researchers tend to focus on and measure behavioural and academic engagement, even though cognitive engagement, albeit more abstract and difficult to quantify, is more closely connected to “goal setting, intrinsic motivation, self-regulation, and commitment to mastery learning” (p.377). Like the concepts of goals and motivation, engagement can be interpreted in various ways.

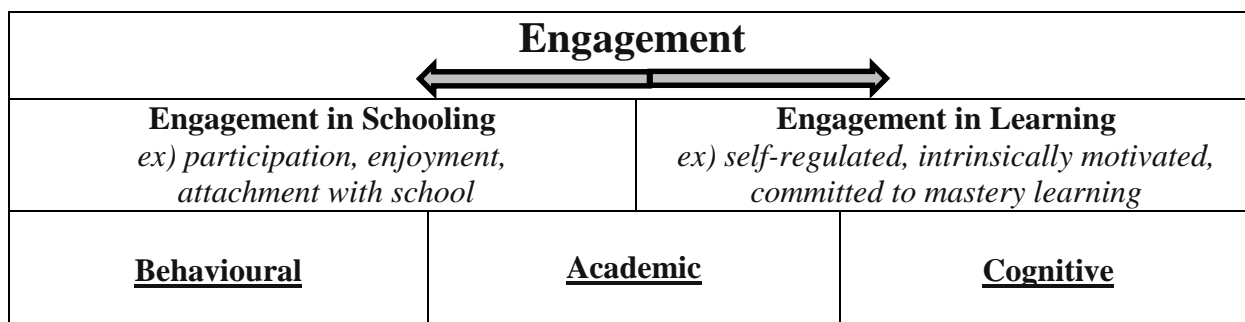


Figure 4. The engagement continuum supported by Harris (2011).

An understanding of the motivational framework of students would be useful for any teacher wanting to incorporate strategies that promote intrinsic motivation and engagement in learning. Certain aspect of the blended learning approach have been shown to have a positive influence on student motivation.

Blended Learning

With the ever-increasing accessibility and connectivity of the Internet, blended learning has become a viable alternative to more traditional face-to-face lecture methods of instruction. Watson (2008) defines blended learning as “the integration of face-to-face and online learning,” (p. 5), but also identifies how this definition can vary depending on the proportions of online and face-face content. Watson (2008) also states that “blended strategies enhance student engagement and learning through online activities to the course curriculum, and improve effectiveness and efficiencies by reducing lecture time” (p. 5). This inquiry into blended learning stems from the desire to shift my practice from a traditional, teacher-centred, lecture-based approach to a student-centred approach that incorporates peer collaboration, active learning and autonomy. Reducing the amount of lecture time by having students view video lessons from home, often referred to as ‘flipping or inverting’ the classroom, would allow for student-centred methods such as cooperative learning to occur during class. Johnson (2013) acknowledges that when the majority of time is spent lecturing, educators are not able to incorporate student-centred educational strategies, but “the Flipped Classroom can make educational improvement possible since it frees up teacher instructional time” (p. 74). Lage et al. (2000) acknowledges that “the inverted classroom allows for an introduction of a large component of group work and active learning into the classroom without increasing contact time or sacrificing course coverage” (p. 39).

In addition to freeing up instructional time for student-centred learning activities, there are other frequently claimed benefits of blended learning such as individualized pacing, improved student-teacher contact, and overall increase in enjoyment. Although it might seem that viewing a video lesson might be less personal than a face-to-face lesson, the learning process can actually

be considered more personalized, as the learner is able to control the pace at which they move through the lesson. Johnson (2013) concluded that instructional videos can be an effective alternative to traditional lecture, as the students in this study reported that they benefitted from being able to watch the video at a time that suited their schedule and appreciated being able to pause, rewind, and fast-forward through videos as they see fit. Mousel (2013) points out that online lessons can reduce feelings of embarrassment for low achieving students and Amiri et al. (2013) found that students benefitted from being able to repeat lessons and could utilize class time more efficiently. Similarly, the students in the Johnson (2013) study, experienced less down time in the flipped classroom. I consider this to be an important benefit of online lessons, as my experience tells me that several students are not able to follow along with the pace of a lecture, and spend significant amounts of time confused and disengaged. Frederickson, Reed, & Clifford (2005) found that there was an increase in achievement for the students of the flipped classroom and attributes this finding to students having greater control over the pace of the instruction.

In a blended learning environment, where class-time is not used for lecture, studies have shown that students appreciate the increased access to the teacher. A participant of the George-Palilonis and Filak's (2009) study mentioned that "the instructor spends class time helping us with real class work instead of standing up there and lecturing at us" (p. 252). Likewise, students of the Johnson (2013) study found that they had "further opportunities to communicate with their classmates and teacher" (p. 71) and the participants of the Amiri et al. (2013) study indicated that they had "better interaction with the teacher" when in a flipped classroom.

Another consistent finding in the literature is that students participating in the blended model have an overall increased level of enjoyment and satisfaction. Mousel (2013) found that there was a positive increase in student attitudes in a blended, student-centred learning

environment, and stated how this finding was supported by other research (Choi & Yang, 2010; George-Palilonis & Filak, 2009) where blended learning instruction was found to reduce students' negative emotions towards the subjects. Similarly, a majority of participants of the Johnson (2013) study indicated that they enjoyed learning in a Flipped Classroom, whereas students of the Lage et al. (2000) "generally preferred the inverted classroom to a traditional lecture" (p. 41). Not all research, however, shines such a positive light on blended learning. For example, Mousel (2013) found that a slight majority of students preferred the traditional classroom, and George-Palilonis and Filak (2009) found that although students enjoyed blended learning, they had to exert more effort, so overall there was no significant difference with respect to student preference. Other aspects of this method that might require further consideration will be addressed later in this review.

By definition, there are two components to blended learning: the online component and the face-to-face component. How these components are implemented can vary widely among educators, so it is important that I establish my interpretation of blended learning, as the remainder of this review and subsequent project will focus on this particular interpretation. For this paper, the focus of the online component of blended learning will include having students view online video lessons and participate in asynchronous discussion with peers. The literature, however, reflects other aspects of online learning that are employed by educators. Frederickson et al. (2005) uses a student inquiry model where students must seek out and integrate knowledge from a variety of online sources. Others promote the use of software that allows students to get instant feedback on their understanding of the material via quizzes and mastery steps (Johnson, 2013).

The face-to-face component of blended learning makes use of afforded class time to utilize student-centred learning methods. Although student-centred learning can take various forms, this review will focus on the use on *cooperative learning techniques*, as a team approach to learning in a problem-based subject area such as physics could be very beneficial. Research suggests that cooperative leaning in the form of project-based learning (Wurdinger, Haar, Hugg, & Bezon, 2007), teams and games (Ho & Boo 2007), and the jigsaw technique (Hanze & Berger, 2007) have a positive effect on student motivation.

Since blended learning is a combination of online and face-to-face learning, I will address each of these components while exploring the discourse around how blended learning effects motivation and achievement, but I will also address some of the drawbacks or considerations of blended learning that exist in the research.

Blended Learning and the Motivational Framework

A common notion found in the literature is that a blended learning environment increases student motivation (Hanze & Berger, 2007; Ho & Boo, 2007; Johnson, 2013). Some researchers, however, explore the causes of this motivation by relating aspects of blended learning to a student's goal structure (Hijzen et al., 2007), to student motivation (Assor, 2012; Chandra & Fisher, 2009; Hanze & Berger, 2007), and student engagement. (Frederickson et al., 2005; Priego & Peralta, 2013).

Goals and blended learning. Hijzen et al. (2007) examined the links between student engagement and cooperative learning for a group of 16 and 17 year old vocational students. The authors suggest that students' motivation for learning can be enhanced if they have an awareness of their goal preferences and how these goals connect with process of cooperative learning. I would think that a well-implemented cooperative learning activity would include a discussion of

goal preferences and the pedagogical value of this particular learning strategy. In other words, a student that spends time helping their peers would likely feel more motivated if they understood how the act of teaching others improves their own learning. Hijzen et al. found that the most prevalent goal preferences for effective cooperative learning teams were “affective goals, social support goals and self-determination goals” (p. 681). These goal preferences seem to align with aspects of intrinsic goal orientation, such as *mastery*, *relationships*, and *feeling good*, presented by other researchers. (Nieswandt & Shanahan, 2008, Mansfield, 2012). Hijzen et al. also found that students with goals related to belongingness were ineffective team members during cooperative learning activities. If one interprets the idea of belongingness as wanting to be accepted by others, they might consider the goal preferences of these particular students to linked to the ‘approval goals’ discussed by both Nieswandt & Shanahan and Mansfield, since these authors consider ‘approval goals’ to be extrinsically oriented and could result in engagement that is less than ‘authentic,’ according to Saeed and Zyngier’s (2012) engagement continuum (Figure 3). The findings presented by Hijzen et al. (2007) suggest that “wanting to feel at home in the group (belongingness) may hinder rather than facilitate socially oriented task engagement” (p.681).

Motivation and blended learning. Researchers have identified how certain aspects of blended learning meet the criteria for intrinsically motivated behaviour according to Ryan and Deci’s (2000) self-determination theory (Figure 2). Ryan and Deci (2000) propose that intrinsic motivation stems from an individual’s experience with autonomy, competence, and social relatedness.

Assor (2012) suggests that an explanation for students who are poorly motivated is that “they do not feel that school-related activities support their need for autonomy. (p. 31). The

flexible nature of blended learning, however, could potentially promote autonomy. Chandra and Fisher (2009) mention how a web-based environment gives students “greater autonomy in achieving their learning objectives” (p. 37). On the other hand, Frederickson et al. (2005) mentioned that although their participants were experiencing more autonomy, they were less sure of themselves and needed more re-assurance that they were on the right track.

Hanze and Berger (2007) state that the jigsaw technique has the potential to improve a student’s experience in all areas of Ryan and Deci’s (2000) self-determination theory. Hanze and Berger argue that, compared to direct instruction, the cooperative learning technique, jigsaw, supports student autonomy, as “students have more leeway in structuring the learning process” (p. 31); competence, as “students act as the expert source for other students” (p. 31) and social relatedness, due to the high degree of peer interaction. According to the Self-Determination Theory (Ryan and Deci, 2000), cooperative learning in the form of ‘jigsaw’ should promote intrinsic motivation among students.

Other forms of cooperative learning have also been shown to improve motivation. Project-based learning was found to increase motivation among low achieving students (Wurdinger et al., 2007), whereas Ho and Boo (2007), found that students were “strongly motivated to perform well for their groups” (p. 19) when using TGT (Teams, Games, Tournaments) and STAD (Student, Teams, Achievement, Divisions) strategies.

Regardless of the method of instruction, there will always be students that do not find enjoyment or inherent value in a particular task, so educators cannot always rely on intrinsic motivation to promote learning. Bell (2010) mentions that, albeit extrinsic, the pressure that exists in a group dynamic was evident. “Accountability to peers often has greater consequences

and provides more motivation for students than if they were only responsible to the teacher” (Bell, 2010. p.40).

Engagement and blended learning. In the discourse around blended learning, it is often mentioned how students are required to be more active in their learning and take more responsibility of it. Without the option of sitting through a lecture and passively absorbing content, students are forced to engage more with the material. Frederickson et al. (2005) mention that students in the blended class seemed motivated to take responsibility for directing and assessing their own learning, while participants in the lecture sessions appeared to vest these roles and responsibilities in the lecturer. Priego and Peralta (2013) suggest that giving students some control over the learning pathway increases their level of engagement. According to the engagement continuum supported by Harris (2011), the self-regulated behaviour that is required of students in a blended class would promote ‘engagement in learning’ and mastery learning (Figure 4).

Blended Learning and Achievement

It is interesting to note that several researchers found that, although student satisfaction and engagement increased with blended learning strategies, there was no significant effect on student academic achievement. Hanze and Berger (2007) had positive results in all areas of intrinsic motivation, as participants had an increase in their experience of autonomy, competence, and social relatedness, however they found the jigsaw classrooms did not show a significant difference in the category of academic performance.

Other researchers found similar results where there was no significant difference in the area of achievement (George-Palilonis & Filak, 2009; Marlowe, 2012). George-Palilonis and Filak (2009) found that the effort variable was rated higher among students in the blended

classroom, but there was no difference between groups with respect to achievement. Marlowe (2012) found that although semester grades improved for students in the blended classroom, their exam grades did not show significant improvement. One explanation for this might be that students learning cooperatively rather might miss important details that would otherwise be emphasized by a teacher during a lecture. Strayer (2012) mentions how students are better able to see “subtleties within the concepts” (p. 191) when learning through direct, teacher-centred instruction.

Some researchers, however have found a positive correlation between blended learning and achievement. Frederickson et al. (2005) declare that an increase in student achievement was due to students having greater control over the pace of the instruction in web-based learning. Choi and Yang (2010) also found a positive correlation, such that learners in student-centred environments had better long-term retention than those in teacher-centred environments. Of particular personal interest, Ho and Boo’s (2007) study explore the effectiveness of cooperative learning in a physics classroom. Ho and Boo confidently state that “the use of cooperative learning does increase students’ academic achievement, helps students achieve a better understanding of physics concepts and increases students’ motivation to learn” (p. 19).

A trend that emerged from the reviewed literature was that low achieving students benefited more from student-centred learning environments than high achieving students (Hanze & Berger, 2007; Marlowe, 2012). Wurdinger et al. (2007) also showed how project-based learning had a positive effect on the motivation of low-achieving students, as this methodology “not only gave them an opportunity to discover unique skills necessary to complete projects, but allowed them to progress at their own pace” (p. 153). Also, Pickens and Eick (2009) suggested that the high achievers in the AP Biology class may have been less motivated by the inquiry-

based approach because “doing inquiry-based lab activities that did not have step-by-step procedures with known outcomes would lead to a lack of performance control by the students, and these students were probably accustomed to meeting performance-achievement goals for obtaining grades” (p. 359). In a ‘jigsaw’ classroom, Hanze and Berger found that since each student has the role of an expert in a particular area, those with a “low academic self-concept in physics felt clearly more competent than in the traditional teaching setting” (p. 38). Similarly, Marlow found that low performing students showed the greatest increase in semester grades. Marlow attributes this to students having “more opportunities for small group work and one-on-one contact with the teacher than would be possible in a traditional classroom” (p. 19). Contrary to this trend, Wu and Huang (2007) witnessed the low-achieving group exhibiting disengaged behaviours during student-centred group work. Wu and Huang acknowledge that “structured instruction might be more helpful for low-achieving students” (p. 747). It is noteworthy that, regardless of the levels of achievement, the research reflects that the majority of students participating in a blended learning environment are more satisfied and have experienced increased levels of autonomy, competency, and social relatedness.

Blended Learning - Drawbacks and Other Considerations

Blended learning is not without its drawbacks, however. There are aspects of cooperative learning that may result in disengagement or, at least, frustration from some students. Hijzen et al. (2007) found that some students felt that they had too much autonomy and thus lacked guidance and direction, reporting that students considered this level of autonomy “correspond to teacher negligence” (p. 683). Similarly, participants from the Acar and Tarhan (2007) study emphasized how their motivation to participate in group work increased only when the teacher visited their group to monitor and guide their work.

Hijzen et al. (2007) also found that some students found climate of cooperative learning to be “chaotic and unstructured” (p. 683) while others mentioned group composition when explaining task-irrelevant engagement. Ho and Boo (2007) also identifies group composition as an issue for some students as they mention how other “group members were not doing their part” (p. 17).

Ho and Boo (2007) also found that a small proportion of students simply “did not like group work” (p. 17). It is understandable how students with introverted personalities might experience anxiety when having to work cooperatively in a group. In a study that examines the effect peer orientation has on motivation during cooperative learning, Hancock (2004) found that “students who had high peer orientation were significantly more motivated to learn when exposed to cooperative-learning strategies than were students who had low peer orientation” (p. 164). In other words, motivation to engage in group activities is largely connected to whether a student prefers to work alone or with others. I agree with Priego and Peralta’s (2013), statement that socialization must be actively promoted to certain student as to prevent discouragement. Lage et al. (2000) acknowledges that it is difficult to appeal to the learning styles of every student, but a blended classroom “implements a strategy of teaching that engages a wide spectrum of learners. (p. 41).

Effective blended learning requires structure. Several researchers note that an effective blended classroom requires sufficient structure. After acknowledging the research supporting high structure in cooperative learning, Hanze and Berger (2007) used the jigsaw method in their study that compares cooperative learning to direct instruction. They chose to use this method as it is a very structured form of cooperative learning that “encourages listening, engagement, and empathy by giving each member of the group an essential part to play in

academic activity” (Hanze & Berger, 2007. p. 30). In a study that examines engagement factors and motivation in blended-learning projects, Priego and Peralta (2013) describe how “an excessive variety of formats in training materials discourages most learners” (p. 459). Strayer (2007) refers to this discouragement as ‘unsettledness’ among participants. “The analysis showed that the variety of learning activities in the flip classroom contributed to an unsettledness among students (a feeling of being ‘lost’) that students in the traditional classroom did not experience” (p. 180). Based on these results, Strayer suggests that “the level of structure should vary inversely with the level of the course, such that introductory courses should be less open ended and more ‘step by step’ in structure” (p. 196).

In another study on how an inverted classroom influences cooperation, Strayer (2012) used student-centred activities to engage his students, but found that many students struggled with the shift in teaching methods. "All of this varied activity influenced the culture of the classroom so that students never really settled into a pattern for ‘how to do class’. At times, students clearly did not know what to expect or where class was going"(Strayer, 2012. p.181).

It appears that the Hanze and Berger (2007) study, which focused exclusively on the jigsaw method was received more positively by the participants, whereas the participants in the Strayer studies (2012, 2007) appeared to be less satisfied with the structure of the class. However, Strayer (2012) discusses how, although many students had negative comments about the inverted model, the looseness of the inverted class almost forced students to rely on each other and establish a more collaborative environment. Perhaps the negative comments towards unstructured classes is a result of people being uncomfortable with unfamiliar learning methods, and not reflective of its effectiveness. This is supported by Mousel’s (2013) study, as it was found that “students might need more time to adjust to the different style of the flipped

classroom” (p. 66). A potential area for further research might be a longitudinal study where participants have had enough time to become accustomed to the blended learning style.

Understanding that students cannot just be grouped together and be expected to collaborate effectively, researchers Acar and Tarhan (2007), and Ho and Boo (2007) clarify how the structure of the cooperative learning activity was crucial to its success. Acar and Tarhan emphasized how organizing group activities based on constructivist approaches was an important factor in improving student achievement. Acar and Tarhan utilized a constructivist approach by recognizing students’ scaffold of knowledge by identifying their misconceptions about a topic before having students acquire new knowledge. Ho and Boo, on the other hand, found two particular strategies, TGT (Teams, Games, Tournaments) and STAD (Student, Teams, Achievement, Divisions) ‘excited’ students, as they were “on task and were strongly motivated to perform well for their groups” (p. 19). Hijzen et al. (2007) mentions how the quality of cooperative learning “strongly depends on the activities that take place” (p. 685) and that students without mastery goals “will easily get distracted by ill-designed group tasks” (p. 685).

Different perceptions among males and females. A noteworthy trend in the literature suggests that males and females differ in how they regard blended learning, and more specifically, the in-class cooperative component of blended learning. Lage et al. (2000) reported that “women students were more active participants in the inverted class than traditional classes, suggesting they were more comfortable in the cooperative classroom environment” (p. 39). Hanze and Berger (2007) noticed a similar trend when girls reported a “greater feeling of competence” (p. 39) in a ‘jigsaw’ classroom than in a traditional setting, whereas boys experienced no difference in their feelings of competence. Crews and Butterfield (2014) stated similar findings, as females reported more positive elements of face-to-face learning than their

male counterparts. Crews and Butterfield suggest that “perhaps females are more tuned to the interactive possibilities of a face-to-face class” (p. 42). Cooperative learning strategies may promote autonomy, competence, and social relatedness for everyone, but the preceding research suggests that cooperative learning is particularly important for female students.

Video lessons can be boring. George-Palilonis and Filak (2009) reported that students found the online video lessons to be “boring” and “not lively enough” (p. 252). Other researchers had similar findings, as Mousel (2013) indicated that “many students did not like watching the videos for homework because they found them redundant and difficult to pay attention to” (p. 65), and the participants in the Johnson (2013) study complained of poor sound quality, too few examples, and a pace that was difficult to keep up with.

The discourse regarding video lessons that are less than stimulating often include strategies to improve the level of engagement in the online component of blended learning. Johnson (2013) suggests keeping video lessons short, and recommends that “a student in the tenth grade should be viewing a lesson video between 10 and 20 minutes” (p. 78). Amiri et al. (2013) recognizes that it is crucial to concisely incorporate the right content into a video lesson and suggests that teachers seek guidance in this process.

Marlowe (2012), in an attempt to improve engagement with the video lessons, had students summarize the video and submit questions about it, which subsequently “helped facilitate class discussion” (p. 22). A different approach was implemented by Frederickson et al. (2005), as students were required to “institute a search for the information they sought, starting from the recommended sites which may not contain the information required (p. 650). These students, however, were discouraged, as they felt it was wasting their time looking through long websites for relevant examples and information.

Students in the Johnson (2013) study suggested that the video lessons be more interactive with “embedded quizzes, a table of contents, and a glossary to create a more engaging experience for the user” (p. 72). Through the use of readily available software, Johnson indicates that, by creating an interactive online environment, a student’s Flipped Classroom experience will be greatly enhanced.

Conclusion

Understanding the motivation of students requires an understanding of the goals that influence their motivation. Nieswandt and Shanahan (2008) and Mansfield (2012) identified several types of goals that may be intrinsically or extrinsically oriented. Both studies suggest that goals can operate in isolation or simultaneously with other goals, and they are not only unique to the individual, but also to the topic of study and teaching methodology (Nieswandt & Shanahan, 2008, Mansfield, 2012). By expanding on Ryan and Deci’s (2000) self-determination theory, Saeed and Zyngier (2012) and Harris (2011) help define the motivational framework by addressing how a particular type of motivation can lead to a particular type of engagement, and thus, achievement. I agree with Marsh’s (2000, as cited in Saeed & Zyngier, 2012) statement that “if teachers have a sound understanding of the different types of student motivation possible in any given context, then they are in better position to provide a more conducive learning environment to students that better promotes their learning” (p. 253).

Blended learning is the integration of both online and in-class learning and allows for a fundamental shift from a teacher-centred, lecture style environment, to a teacher-facilitated, student-centred environment. Having students view lessons online reduces lecture time and allows students to participate in cooperative learning activities. Other frequently claimed benefits of blended learning include individualized pacing, improved student-teacher contact time, and

overall increase in enjoyment. Since enjoyment is an important aspect of intrinsic motivation, it is understandable how blended learning supports the aspects of Ryan and Deci's (2000) self-determination theory that is necessary for intrinsic motivation. Researchers have found that blended learning promotes a student's experience of autonomy, competence, and social relatedness. (Assor, 2012; Chandra & Fisher, 2009, Hanze & Berger, 2007).

With so much research that suggests an increase in student motivation, it was surprising to find that academic achievement levels remained relatively the same. Even with this common finding, most researchers still consider blended learning to be valuable, and would likely support Wu and Huang's (2007) conclusion that although this instructional approach did not lead to significant differences in students' performances on achievement test, they were provided with different opportunities to engage in learning. Perhaps our current model of assessment is not well aligned with cooperative learning. I would think that, based on this trend in the literature, studies could explore how our measures of achievement are aligning with methods of instruction.

The group that did show improvement with respect to academic performance was the low-achieving students. Hanze and Berger (2007), Marlow (2012), and Wurdinger et al. (2007) all found that low achieving students benefited more from student-centred learning environments than high achieving units. Marlowe (2012) suggests that top achievers will be motivated to learn regardless of teaching style, but improving the motivation for low achieving students makes flipped learning worth exploring.

There are some aspects of blended learning that are not received very positively by participants. Students in the Strayer (2007, 2012) studies struggled with the variety of learning activities and the apparent lack of structure. Hanze and Berger (2007), however, found the highly structured cooperative learning strategy, 'jigsaw,' was well received by students. Video lessons

were also commonly referred to as ‘boring’ by participants. Researchers suggest methods to improve student engagement with video lessons by having students write summaries of the videos (Marlowe, 2012), keeping them short, and increasing their interactivity (Johnson, 2013).

Overall, although there was not a clear and decisive winner between traditional and blended learning approaches according to some researchers, (Frederickson et al, 2005; George-Palilonis & Filak, 2009; Mousel, 2013; Strayer, 2007), I feel that there is enough evidence supporting the positive aspects to blended learning to warrant further investigation of this approach, and is the focus of the next section.

Chapter 3: The “Flipped” Classroom

The BC Ministry of Education’s Education Plan has been taking shape over the last few years. The general idea behind this plan is “to make a better link between what kids learn at school and what they experience and learn in their everyday lives” (“BC’s Education Plan,” 2013, p.2). Adopted from the goals of 21st Century Learning, BC’s Education plan states that “there will be more emphasis on key competencies like self-reliance, critical thinking, inquiry, creativity, problem solving, innovation, teamwork and collaboration, cross-cultural understanding, and technological literacy (“BC’s Education Plan,” 2013, p.4).

Thinking about Flipping

A flipped classroom approach may support aspects of the 21st. century learning initiative. Having students view lessons online prior to coming to class would allow for more class time to be used for problem solving activities involving teamwork and collaboration. Also, the BC Education plan identifies “personalized learning for every student” as well as “flexibility and choice” (p.5) as key elements. A flipped learning environment addresses these student-centred ideas by allowing students to not only view a lesson at their own pace, but view it when it’s most convenient for them or more than once to gain a better understanding.

Positive aspects of flipped learning, such as improving student engagement and achievement, has been noted in the literature (Choi & Yang, 2010; Frederickson et al. 2005; Wu and Huang, 2007). Other research suggests that introductory level students tend to have greater concerns over the apparent lack of structure (Strayer, 2007). Since flipped classes provide students with more autonomy but also more personal responsibility, it seems that that motivated and mature students might have more success with this learning situation. For this reason, I chose to begin my exploration into flipping with a senior physics course.

An important part of introducing a new pedagogy in the classroom is to have students understand that it is beneficial to their learning. When presenting the idea and rationale of this approach, I discussed some of the benefits mentioned by Salmon Khan in his 2011 ‘Ted Talk.’

I began by telling students how flipping worked – how they would be viewing my online video lessons before coming to class, so more of our class time could be spent on student-centred learning rather than teacher-centred lecture. I mentioned how students have the ability to pause and review elements of a lesson until they figured it out and to playback lessons at their own pace.

Although I would like to think that my lectures “get through” to all my students, the reality is that only a fraction of my students truly understand the material at any given time. From my experience, I find that some students are not able to follow along with a traditional lecture and spend significant amounts of time in a state of confusion. The ability to control the playback and pace of the lesson makes for a more efficient and effective use of a student’s time.

It was discussed with students how a more collaborative learning model will be used during class, as groups of 4-5 students will discuss the online lessons and help clarify any points for group members. Group members will then work together through a set of physics problems that will help increase their understanding of the topic. To stress the value of this learning method, the importance of team work and collaboration skills in life outside of school was emphasized and it was explained how these skills can be developed just like any other.

It was also emphasized that this new approach to learning would allow students better access to me, the teacher. Without having the time constraints of a lecture, I am able to move from group to group helping keep their discussion focused and moving forward. As Salmon Khan mentions in his ‘Ted Talk’, using this technology actually “humanizes the classroom” as it

increases time for peers to interact with each other as well as the teacher. I agree with Khan that “It’s not just about student to teacher ratios, but rather student to valuable human time with the teacher ratio.”

My experience as a teacher leads me to believe that while the idea of flipping will appeal to most students, it may not be embraced by some who would prefer to work independently (and it might fail some who lack the time or inclination to reliably review the videos before class). This begs the question however, doesn’t everyone need to build their ability to collaborate and share with others (and doesn’t everyone need to learn personal management skills)?

There are three major components to this project. First, a course website was developed along with a set of video lessons and other resources. This website provides a reliable location where students can readily, independently and asynchronously access the online videos, online discussion boards and links to other support materials. The second component of this project is a collection of revised lesson plans that utilize the afforded class time for activities that promote problem solving and collaboration. Since the research tends to show that some participants of the flipped model were discouraged by a lack of structure (Hiljzen et al., 2007; Strayer, 2007, 2012), it is important to ensure that students are clear about how the flipped classroom is structured; from how to view the video lessons, to how to work with others, to how they will be assessed. Finally, given that a pedagogical shift such as this is only worthwhile if it has the potential to positively influence student motivation and engagement, the third component of this project will discuss how motivation and engagement might be affected by both the online and in-class components of flipped learning.

Creating Content

To implement a flipped unit for a senior physics class, it is necessary to not only create a set of instructional videos, but to develop a website where students can easily access these videos and other class resources. While the time required to create video lessons could be avoided by providing students with links to existing online videos, creating my own videos allows me to focus on specific learning outcomes while maintaining a sense of familiarity and credibility among students.

Creating a teacher website. It is important to develop a website that does not require a lot of maintenance and is useful for students, as research suggests that a large proportion of teacher websites become inactive within a few years (Holcomb et al., nd, p.11). It is understandable how a teacher might abandon their website if the cost of maintenance exceeded the benefit afforded to students. Teachers that actively maintain a class website may realize the greatest benefits when the website is in line with a student-centred approach. Besides teacher created videos, teacher websites can provide access to resources such as course syllabi, assignments, links to supplementary resources (documents, videos, etc.), note packages, practice tests, exemplary student artefacts, etc. A class website can also promote organization and communication, as students and parents can view a calendar of important dates and upcoming events, and can support the sharing of ideas through an asynchronous discussion board.

Teachers who are not comfortable with technology may need to seek out guidance and support in creating their first class websites. Researchers (An & Reigeluth, 2011; Jones, 2007) argue that on-site personalized support is necessary to help teachers create effective technology-enhanced, learner-centred classrooms. Some districts support teacher development of websites by providing a secure space on the district server and personnel to support teachers in using the

software. In my district, the file sharing program called SharePoint is set up to support teachers as they create and edit resources and create websites. Although there is a steep learning curve in developing a website with SharePoint, it is fairly user friendly, as it does not require any code writing knowledge. My experience working through the formatting issues was, at times, frustrating and time consuming, however, once my website was operational it required little maintenance. Figure 5 is a screenshot of my website – it is a work in progress, and small changes are made as I learn how students are interacting with it.

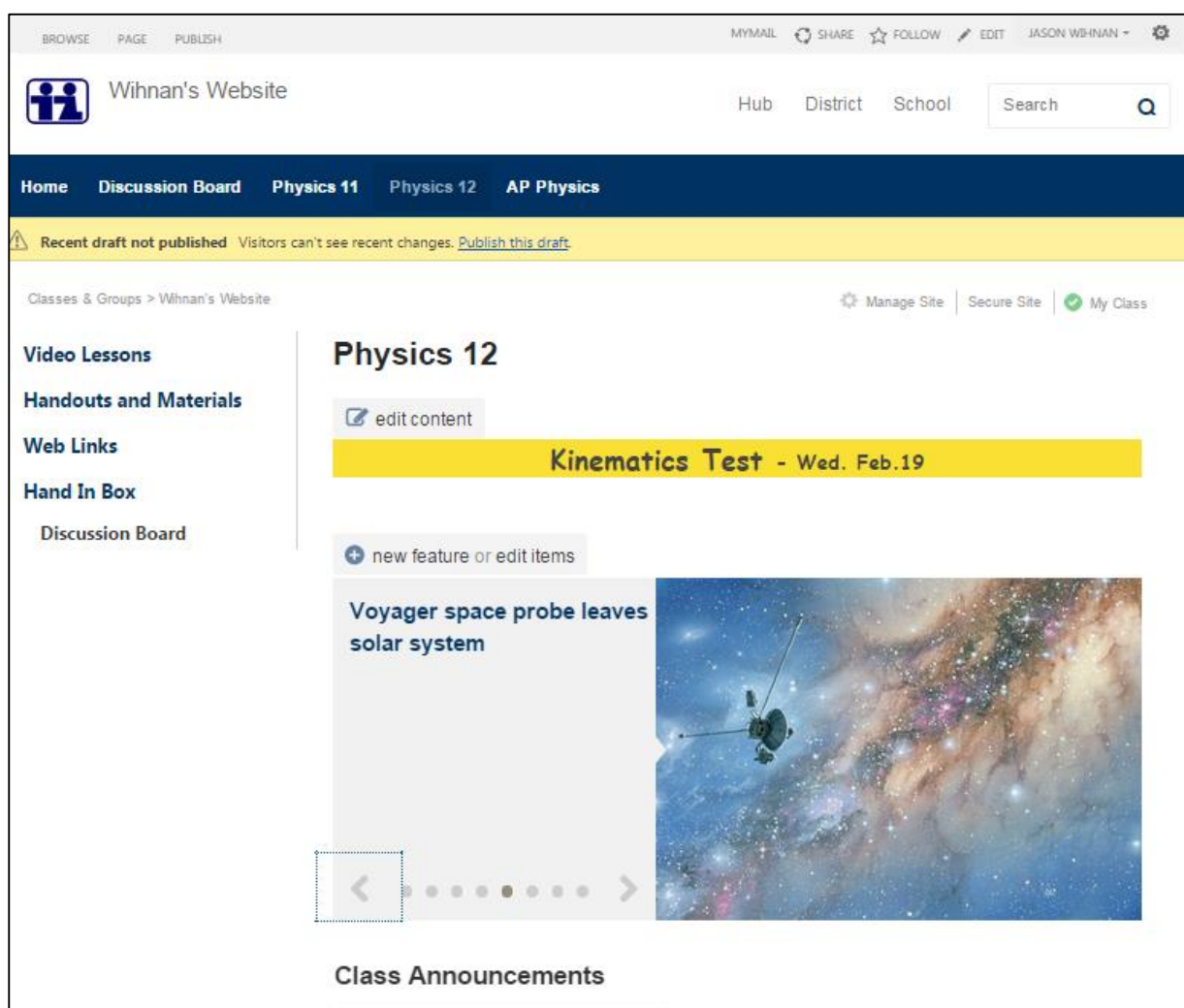


Figure 5. Wihnan's Website

Class websites can also promote collaboration and the sharing of ideas. An asynchronous discussion board, as shown in Figure 6, can be set up to guide out-of-class curriculum based discussions, allowing students to explore topics that interest them (even topics not covered by the curriculum). Providing this type of communication channel with appropriate support encourages them share their newly acquired knowledge. In addition to text, this discussion board can accommodate the posting of pictures and direct links, allowing students to share evidence, contrary results, and other resources to enrich the discussion. Further contributions to the topic can then be made as students comment on each other's posts. The sharing of these ideas simply

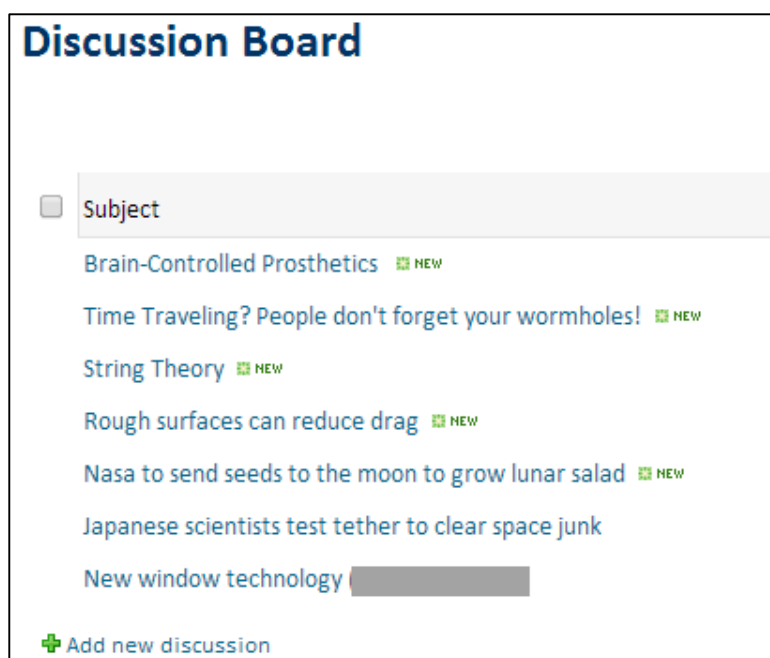


Figure 6. Discussion Board (Wihnan's Website)

could not happen without the online discussion board. The class time required for each student to present their topic would have to come at the expense of time to explore curricular learning outcomes. Since students can read each other's posts and comment on those they find interesting, face-to-face discussions following an asynchronous discussion tend to be

enthusiastic, engaged and interconnected. These discussions support the development of interconnections between students with overlapping interests and allow greater opportunities for the introduction of interesting applications of physics. Although some research has suggested that a portion of students may have negative attitudes towards the use of discussion boards (e.g., George-Palilonis, 2009), the potential benefits (engagement, positive interaction and community building) seem to be greater.

Another significant benefit to maintaining a teacher website is having a location where students can easily find links to supplementary material. Along with links to specific video lessons (Figure 7) it can also be useful to provide links to relevant YouTube clips and documentaries or other instructional websites (Figure 8).

Classes & Groups > Wihnan's Website Manage Site | Secure Site | My Class

Physics 12

Video Lessons

Handouts and Materials

Web Links

Hand In Box

Discussion Board

Recycle Bin

Video Lessons ▶ **6_Electrostatics** ▶ All Links ▼

Type	Edit	URL	Notes
		Lesson 1 - Electric Force	(31:04)
		Lesson 2 - Electric Fields	(22:34)
		Lesson 3 - Electric Potential Energy and Potential Difference	(13:50)
		Lesson 4 - Uniform Electric Fields	(20:10)
		Lesson 5 - Cathode Ray Tubes and Millikan's Experiment	(11:50)

[Add new link](#)

Figure 7. Links to video lessons













Web Links ▸ All Links ▾			
<input type="checkbox"/>	Type	Edit	URL
<input type="checkbox"/>			Electroscope - Charging by Induction and by contact.
<input type="checkbox"/>			Mr. Deagle's Physics Video Lessons
<input type="checkbox"/>			Khan Academy Physics Video Lessons
<input type="checkbox"/>			Quantum Mechanics (documentary)
<input type="checkbox"/>			Mirrors
<input type="checkbox"/>			Standing Waves in Natural Gas

Figure 8. Links to supplementary material.

Creating video lessons. Before preparing their own video lessons, physics teachers may consider using those available through the Khan Academy website (<https://www.khanacademy.org/science/physics>). Although most physics topics are covered in these lessons, they may not align themselves well with a particular curriculum. For example, an out-sourced video lesson on ‘Circular Motion’ might incorporate calculus where some physics courses are algebra based. It is understandable how videos that are not concise and specific to our particular learning outcomes might be regarded as redundant and difficult to pay attention to. Research has identified how previously developed instructional videos from outside sources often reduce engagement among students (Mousel, 2013). For this reason, I have provided links to relevant Khan Academy lessons for my students, but only to supplement the lessons that I have created. Although teacher generated video lessons may not have the highest production value or be the most entertaining, students familiarity with the teacher reassures them that 100% of the content is relevant.

Using an appropriate system (e.g., a PC tablet, PowerPoint, and the video capture and editing software, Camtasia (see Figures 9 and 10)), teachers can capture their lectures, visual representations, notations and symbolic manipulations on video. The threshold and friction associated with mastering these tools is moderate, but with some motivation and effort, along with several YouTube tutorials and a willingness to experiment with the features of the program, teachers can soon become confident enough to create their own video lessons.

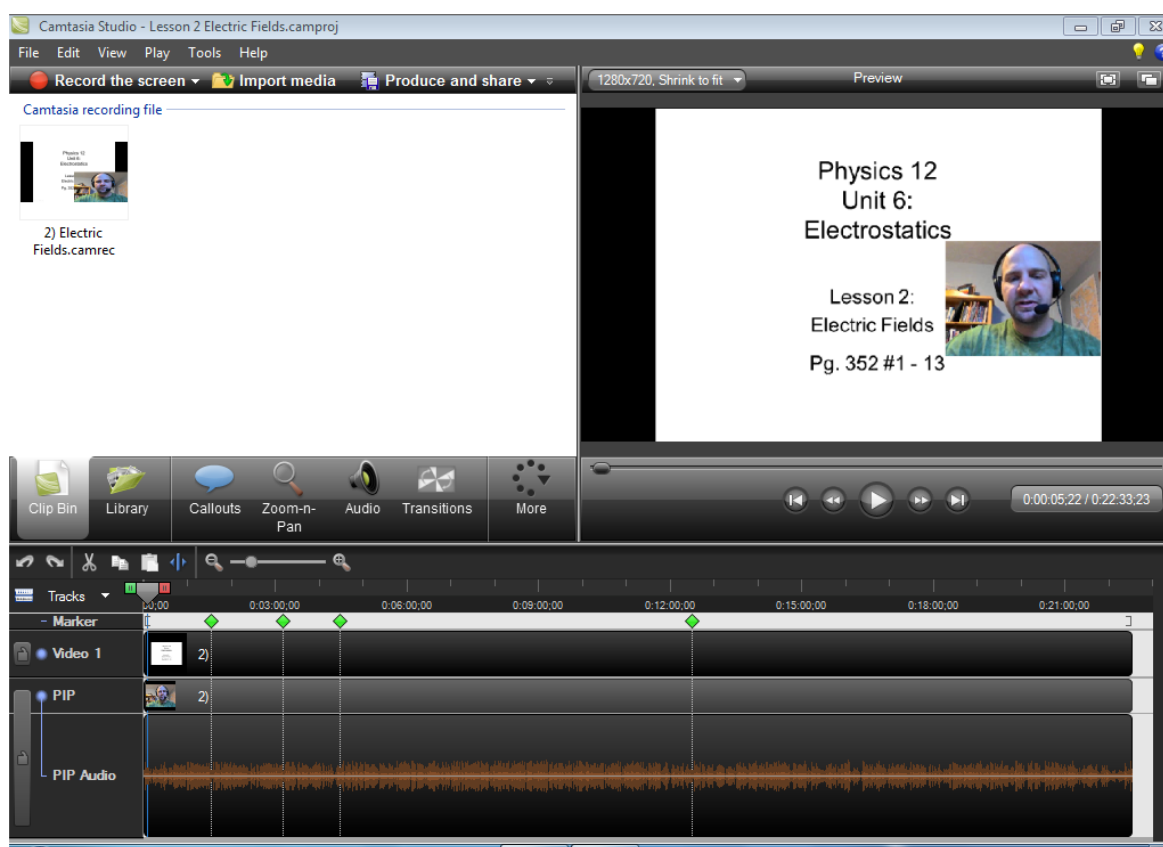


Figure 9. Camtasia video editing screen.

Caution should be exercised though – as the results may not be as satisfactory as might be expected. With this approach (the same as is used by Salmon Kahn in Kahn Academy) the videos are missing the facial cues and hand gestures of the speaker. In addition, teachers may be frustrated as they struggle to present ideas, stress important points, or assess student

comprehension without seeing their audience. In addition, the teacher who captures their presentation on video and subsequently uses that representation of a concept without revisiting, refining or refreshing it, may find that their mastery of the topic atrophies.

Ex. 5)
 What is the magnitude and direction of the electric field at point P due to the two fixed charges?

$$\vec{E} = E_A - E_B$$

$$= \frac{kQ_A}{r_A^2} - \frac{kQ_B}{r_B^2}$$

$$= \frac{9 \times 10^9 (4 \times 10^{-6})}{4.0^2} - \frac{9 \times 10^9 (1 \times 10^{-6})}{1.0^2}$$

$$= 2250 - 9000$$

$$= -6750$$

$E = 6750 \text{ N/C left}$

Figure 10. Annotating a PowerPoint presentation using Camtasia.

Once the video is edited to satisfaction, it can easily be posted to YouTube or Vimeo. For my videos, I usually adjust the privacy settings, so that only people with the actual link may access it. The following are the links to a sample of my video lessons:

- Lesson 1 - Electric Force: <http://youtu.be/eLW28keCoi4>
- Lesson 2 - Electric Fields: http://youtu.be/_hbdYy6fh94
- Lesson 3 - Electric Potential: <http://youtu.be/UD8dDYFdCuE>
- Lesson 4 - Uniform Electric Fields: http://youtu.be/YIL_K8MhfWI
- Lesson 5 - CRTs and Millikan: <http://youtu.be/yYUEjGLXJ4k>

Planning for a Student Centred Classroom

Flipped learning will only be effective when the newly afforded class-time is used for engaging, student-centred activities. In the article “A Review of Flipped Learning,” Hamdan et al. (2013) described flipped learning as “a deliberate shift from a teacher-centered classroom to a student-centered approach, where in-class time is meant for exploring topics in greater depth and creating richer learning opportunities” (p.5).

Although a student-centred classroom can vary in design, this project focuses on the elements of student collaboration and problem solving. A learning environment such as this may appear unstructured and chaotic, as there are several student discussions occurring in the classroom simultaneously – much different than the traditional, lecture-style method of instruction. To minimize the uncertainty felt by some students with this approach, a guideline was developed to help provide some structure. This guideline clarifies how students are to interact with the videos and how they are expected to be prepared for class. Also, it clarifies how groups are expected to work together and the role of each group member. A rubric was also developed to help clarify how a student’s participation in the process would be assessed.

Planning for in-class collaboration. Strayer (2012) suggested that upon shifting to a student-centred classroom, students “never really settled into a pattern for ‘how to do class’” (p. 181). The apparent lack of structure in student-centred classrooms might cause some students to feel unsure about what to expect or what is expected of them. To avoid this feeling of uncertainty, it is important that students are aware of their roles within their groups and how they are expected to contribute. To adequately prepare for class, students are expected to view a particular online lesson while noting some key ideas and those not well understood. The following day, as groups gather during class, each member would share their key ideas and

difficulties with others. This discussion is intended to clarify the lesson to all group members before beginning to work on the set of related problems. With the expectation that students contribute to their groups, it should be noted that either asking for help or helping others is considered a contribution. To promote collaboration, students are expected to stay within a few questions of their group members and offer or ask for help when needed. To help focus group discussion, students would cycle through the role of group facilitator. The role of the facilitator was not to 'know everything,' but rather to keep the discussions focused and moving forward. Figure 11 partially shows an outline of a flipped unit. With this in hand, students know what to expect from day to day, hopefully reducing any feelings of 'unsettledness' among them.

Once students learn how to collaborate effectively, teachers can step away from the more traditional teacher-centred role and play a more supportive role. With a shift like this, teachers would certainly notice some differences. First of all, teachers might find it difficult or uncomfortable to relinquish their control of the class. They might, however, find the room more energetic, as students are engaged in discussion with each other as opposed to listening to a lecture. Also, with class sizes regularly at capacity, traditional lecture-style teachers are often unable to get to all students who ask for help due to time constraints. The group dynamic might help alleviate these pressures, as students have increased access to both the teacher and their peers. Furthermore, to promote collaboration, teachers might need to resist the urge to fully work through solutions, but rather give struggling groups only small cues to get them back on track. This student-centred environment also allows for those students with inclinations towards leadership to take on that role within a group. This opportunity for leadership rarely exists in a teacher-centred classroom and can be added benefit for some students.

Physics 12	<u>Electrostatics has been "flipped"</u>	Nov 28, 2013
<p>We are going to approach this unit a little differently than the others. There will be more of a focus on collaboration between students and much more time for students to work on problems during class. In order to achieve this, we will be "flipping" the lessons for this unit. Students will be required to view the online video lesson before coming to class. The problems that are usually assigned for homework, however, will be done collaboratively in small groups during class. This method not only allows students to follow a lesson at their own pace, but it also allows the teacher to spend more individual time with students during class.</p>		
Nov. 29	<p>Circular Motion / Gravitation Test @home: Watch Lesson 1 - Electric Force (take notes and write any questions you have about the lesson)</p>	
Dec. 2	<ul style="list-style-type: none"> • Form groups (this will be your group for the entire unit) • Discuss lesson 1 and pose any questions you have to the group. • Ensure all group members are comfortable with examples given in the lesson • Collaboratively work through Lesson 1 Assignment: Pg. 342 #1-13 • Contribute to the group by either asking for help or helping others • No group member should be more than 3 questions ahead of the others. <p>@home: Complete Pg. 342#1-13 Watch Lesson 2 - Electric Fields</p>	
Dec. 3	<ul style="list-style-type: none"> • Discuss Lesson 2 • Collaboratively work through Lesson 2 Assignment: Pg. 352 #1-13 <p>@home: Complete Pg. 352 #1-13 Watch Lesson 3 - Electric Potential and Potential Energy</p>	
	<ul style="list-style-type: none"> • Discuss Lesson 3 • Collaboratively work through Lesson 3 Assignment: Pg. 360 1-8 	

Figure 11. Lesson plans for a flipped unit.

Clarifying assessment. Students should always clearly understand how their participation will be assessed. Since collaboration and teamwork are listed as core competencies ("BC's Education Plan," 2013), they can be subject to formative assessment, where students can use the assessment information to make adaptations to their learning process. Assessing collaboration and teamwork is not as clearly defined, however, as assessing a student's understanding of Newton's 2nd Law, for example. For this reason, the author designed a rubric to allow each student to assign a collaboration mark for themselves (Figure 12). This self-

evaluation addresses elements of peer collaboration such as preparedness, and contribution to the group in both discussion of the lesson and working through problem sets. Most importantly, this rubric provides a framework for students to maximize the benefit of peer collaboration by sufficiently engaging in all these aspects.

Unit 6 - Collaboration Rubric				
				Name: _____
				Group: _____
Self-Evaluation		Mark: /14		
	Absent 0	Beginning 1	Developing 2	Accomplished 3
Participation (attendance)	Absent for three or more days	Absent for two days	Absent for one day	Present for every day of the unit
Preparedness	Video not watched and/or notes not taken more than once.	Video not watched and/or notes not taken, just once!	Video watched and notes taken every day	Video watched, notes taken, questions or comments written every day!
Contribution to Group Discussion of Lesson	Does not contribute and comments or questions about the lesson.	Rarely (1-2) contributes comments or questions about a lesson.	Occasionally (3-4) contributes comments or questions about a lesson.	Regularly contributes comments or questions about a lesson, but still allows others to speak
Contribution to Problem Solving	Very rarely (1-2) asks for help or provides help to others	Rarely (3-6) asks for help or provides help to others	Occasionally (7-10) asks for help or provides help to others	Regularly (>10) asks for help or provides help to others
Facilitates	Did not facilitate	Had difficulty keeping discussion and problem solving focussed.	Able to keep discussion and problem solving focussed.	----

Figure 12. Collaboration Rubric

Considering Student Engagement

A major objective of this project was to gain an understanding of the motivational framework of students and how it might relate to aspects of flipped learning. Since motivation is inextricably linked to engagement, it is imperative to consider how aspects of the flipped learning model might influence engagement among students. These aspects include how students might engage with online materials, as well as how they might engage with a student-centred classroom environment.

Engagement with online materials. Studies have found that students in a flipped classrooms were positive about the peer collaboration, but less satisfied with having to watch dull videos (Fredrickson et al., 2005; Mousel, 2013). Teachers might find it difficult to bring the emotion and enthusiasm to a video that they would otherwise bring to a lesson. So, why bother? Why would someone choose to have students watch their lessons online if they are not nearly as engaging and effective as in-class lessons? Looking at the big picture, it can be argued that although the video lesson may not be very engaging, the benefit of having students working on projects and activities requiring collaboration is greater.

There are strategies, however, that one can use to produce more engaging video lessons. As recommended by Johnson (2013), developing succinct video lessons that are less than 20 minutes in length can help maintain interest. This can be quite challenging to a teacher who is used to presenting a topic with a one hour lecture. During this project, a significant time was spent editing each video, trying to reduce the total time by cutting out lengthy pauses and sections that weren't absolutely necessary. Dividing a regular lesson into smaller segments would also help achieve this.

It is understandable how students might attribute poor sound quality to their lack of engagement with the online lessons, as mentioned in the Johnson (2013) study. Teachers might find that a high quality USB microphone is the only option that didn't result in substantial background noise. Another way of improving engagement with videos is to make use of interactive buttons (Johnson, 2013). Embedding quizzes, a table of contents and a glossary allows for instant feedback and more personalized navigation through the material. The most recent version of the video editing software, Camtasia, now includes interactive buttons and quizzes to help engage viewers.

Ryan and Deci's (2000) self-determination theory proposes that intrinsic motivation, which leads to authentic engagement, stems from an individual's experience with autonomy, competence, and social relatedness. The online component of this project could potentially improve a student's sense of these three factors. Autonomy is present as students navigate their way through a lesson at their own pace or being able to choose which topics they would like to pursue with the discussion board. With the ability to progress through a video lesson at their own pace, a student may grasp concepts more completely and achieve a greater sense of competence. A student's sense of social relatedness may also improve with the discussion board assignment, as connecting with other students and having focussed discussions of physics-related topics may improve the sense of community within the group.

Engagement in a student-centred classroom. The underlying reason for flipping a classroom is to help facilitate a more engaging environment for students. All too often, in a teacher-centred, lecture-based classroom, I witness students that appear disengaged with content that is being presented. In large classes, students can easily disengage and let their minds wander, as they are rarely active in discussion are often expected to passively absorb information. The

very nature of small groups promotes engagement, as students can no longer take a passive role and must actively engage with their peers. The type of engagement, however, may be intrinsic or extrinsic, depending on the individual.

As mentioned earlier, some students that would usually come to class unprepared may feel pressure to not let down other members of the group and make more of an effort to be prepared. Saeed and Zyngier (2012) might consider such students to 'passively compliant,' where tasks are done to avoid negative consequences. Although these negative consequences would only be social in nature, they might supersede any negative academic consequence they might have otherwise experienced. Similarly, participants of the Bell (2010) study mentioned not wanting to disappoint members of the group. This type of extrinsic engagement is certainly not as desirable as "authentic" (Saeed & Zyngier, 2012) engagement exhibited by intrinsically motivated students who find inherent value in the task itself. It is, however, better to have this level of engagement than being unmotivated with no engagement at all.

Priego and Peralta (2013) suggest that giving students some control over the learning pathway increases their level of engagement. A collaborative, student-centred classroom may provide students with more control over their learning pathway and satisfy the three requirements for intrinsic motivation as discussed by Ryan and Deci (2000). It seems like this classroom environment would encourage autonomy, competence, and social relatedness. Autonomy is achieved as students have more control over the pace of learning while taking responsibility for directing their own learning. Competence can be experienced by group leaders as they help others, or by students that generally struggle who might gain a better understanding by working with their peers than they ever have. Social relatedness might be the most obvious

benefit of collaborative group work. Having students connect with their peers while learning could easily improve their levels of interest, enjoyment, and satisfaction.

There will always be students that are unmotivated and disengaged, but the collaborative, student-centred environment does appear to encourage engagement. This engagement, however, may vary from extrinsic, where students feel accountable to their peers; or intrinsic, where students experience autonomy, competence, and social relatedness.

Conclusion

An important component of the 21st Century Learning philosophy and the BC Education plan (2013) is the use of student-centred strategies. Having students view online lessons from home, or flipping the classroom, might provide the time during class for students to engage with each other and the teacher in a more personalized way. The focus of this project was to design a unit of study for a senior physics class using the flipped model. With research supporting the notion that there is a benefit to flipping the classroom and employing a student-centred approach (Choi & Yang, 2010; Wu & Huang, 2007; Frederickson et al., 2005), it is a topic worthy of exploration. There were three major components in this project. First of all, content needed to be developed. This involved creating a website as well as a set of online video lessons. Secondly, a plan was required to utilize the afforded class time for activities that promote problem solving and collaboration. Finally, to better understand the potential benefits of the flipped model, it was discussed how the aspects of flipped learning might influence the motivation and engagement of students.

Designing a class website not only allows teachers to provide links to video lessons, it helps support students with access to class resources and supplementary material. An asynchronous discussion board allows students to explore physics topics outside the curriculum

and share these topics with others. These online discussions simply could not occur within the confines of a classroom due to time constraints. The process of designing a website is certainly more manageable when it supported by district that provides a secure space on server as well as personnel that is able to help teachers navigate the software.

To maintain credibility with students while providing them with a sense of familiarity, it was necessary to create my own set of video lessons. Using a tablet and the video editing software 'Camtasia,' I was able to deliver PowerPoint lessons while using a stylus to make annotations. I was then able to upload these videos to YouTube and link these videos to the website. Teachers might discover, however, that delivering a lesson while sitting behind the screen can feel artificial and impersonal. Teachers that use a lot of body language and eye contact during a lesson might feel less effective at explaining concepts through video.

To realize the benefits of flipping my classroom, a unit plan was developed that focused on student collaboration and problem solving. To support students in this shift and to reduce feelings of "unsettledness" (Strayer, 2007), a guideline was developed that clarifies how students were expected to interact with the videos and with each other. Since this collaborative learning style was new to many students, their role in the process, and how they would be assessed needed to be clearly established.

With student engagement being important in understanding the effectiveness of flipped learning, it was considered for both online and in-class components. Developing succinct videos with good sound quality, and incorporating interactive functionality were suggested (Johnson, 2013) as ways to maintain student engagement. Also, the autonomy experienced by students when viewing lessons at their own pace might promote self-determination (Ryan and Deci, 2000) and have a positive influence on student motivation. Engagement during in-class activities may

be influenced extrinsically, as students may feel pressure to not let down other members of the group. Cooperative learning, however, may also improve a student's sense of social relatedness, competence, and autonomy; the components of intrinsic motivation according to Ryan and Deci (2000).

Overall, flipped learning is certainly a teaching method that should be considered by teachers, as it has the potential to improve student engagement and support student-centred learning.

Chapter 4: Reflection

My experience in the MEd program has influenced my thinking as an educator and has begun to influence by practice. Chapter 4 begins with a summary of the most significant learning experience of the program; my project on flipped learning and student motivation. Based on my learning throughout the project, I will then make some recommendations for other educators that might be interested in flipped learning. Finally, I will address how other learning throughout the MEd program has changed my thinking and will subsequently affect my practice.

Project Summary

The impetus for this project was seeded in wanting to shift my practice to a more student-centred model where students are engaged in learning activities during class instead of listening to teacher-centred lectures. With the large amount of specific learning outcomes in subject areas such as physics, teachers often struggle to find time for student-centred learning activities, however, the ever-increasing availability of the Internet may provide a solution. Having students watch online video lessons outside of class can be an efficient method of disseminating information while allowing class time to be used for student-centred learning activities. The focus of this project was to develop a ‘flipped’ or blended unit of study for a senior physics course. To better understand its pedagogical potential, it was also necessary to examine the theoretical framework of adolescent motivation and determine how it may be influenced by a flipped classroom environment.

This project consisted of three major components: developing online content, developing a plan for in-class collaboration, and connecting flipped learning to student motivation. First of all, a website and a set of online video lessons was created. The benefits of designing a class website not only include providing students with links to video lessons and supplementary

material, but allow for asynchronous discussion among students. Without the constraint of time felt within a classroom, these online discussions can achieve greater depth and allow for more student choice in the topics they choose to engage in. It was necessary to create my own set of video lessons to ensure the content was 100% relevant and that lessons were succinct. Teachers might discover, however, that delivering a lesson while sitting behind the screen can feel artificial and impersonal.

Secondly, a plan was required to utilize the afforded class time for activities that promote problem solving and collaboration. To support students in this shift and to reduce feelings of uncertainty, a guideline was developed that clarifies how students were expected to interact with the videos and with each other. Since this collaborative learning style was new to many students, their role in the process, and how they would be assessed needed to be clearly established.

Finally, to better understand the potential benefits of the flipped model, it was discussed how the aspects of flipped learning might influence the motivation and engagement of students. The autonomy experienced by students when viewing lessons at their own pace might promote self-determination and have a positive influence on student motivation. Engagement during in-class activities may be partly extrinsically motivated, as students may feel pressure to not let down other members of the group. Cooperative learning, however, may also improve a student's sense of social relatedness, competence, and autonomy; the components of intrinsic motivation according to Ryan and Deci (2000).

Recommendations for Others

Some recommendations other educators may want to consider before engaging with blended, or flipped, learning include choosing an appropriate class, starting small while

maintaining some lecture time, and improving the effectiveness of video lessons by incorporating some interactivity.

Choose an appropriate class. The benefit of flipped learning comes from using class time that usually consists of teacher-led lecture for student-centred activities. Flipped learning, therefore, is only beneficial for those teachers that spend a majority of class time lecturing and feel they do not have the time for other activities that promote deeper learning. Flipped learning requires a higher degree of responsibility and commitment from students, as the process is only effective when students have watched the appropriate video lessons and come to class prepared. For this reason, I suggest teachers first try flipped learning with a class of motivated and mature students who can handle the increased level of autonomy. Also, students that have some pre-existing knowledge in the subject area may be better equipped to learn new concepts independently and collaboratively with their peers, as they would already possess a scaffold of knowledge to add to. Introductory courses, therefore, may not be appropriate to implement the flipped approach.

Start small and do not completely eliminate the lecture. I suggest that teachers wanting to try flipped learning in their classrooms start with only a single unit, but also maintain a small amount of time where they can address the entire class and emphasize important aspects of the material. Teachers will undoubtedly encounter a learning curve of their own when they first implement flipped learning. I would expect that a teacher would need to work through a flipped unit a few times with their students before they are satisfied with both its online and in-class components. Beginning with a single unit allows teachers more flexibility as they refine their methods. Also, for content rich courses such as physics, I suggest that teachers not eliminate the lecture entirely, but rather spend the first 10-15 minutes of each class with a mini-

lecture that emphasizes key points from the previous video lesson. This would also be a good opportunity to share demonstrations with the class that may help students grasp particular concepts.

Developing video lessons. To minimize negative attitudes towards online video lessons, I suggest that teachers invest in a good quality USB microphone to reduce background noise and to keep the videos under twenty minutes in length. Also, to improve the level of student engagement with video lessons, teachers can incorporate some interactivity into their videos. Interactive games and quizzes can provide instant feedback for students and can be useful for teachers by providing data about where students are in their learning. Improving interactivity with video lessons may also include having a table of contents to help students quickly navigate to particular sections of the lesson.

My Graduate Program Experience and How It Might Affect My Practice

Since beginning the MEd program, my notion of curriculum has changed. Until recently, I simply equated curriculum with the document published by the BC Ministry of Education stating the prescribed learning outcomes. Now, I understand curriculum to be a multifaceted field of study that has been debated since the beginning of public education. Traditionalists may promote a highly efficient, scientific model that can help serve the needs of society, whereas reconceptualists may promote a nurturing, child-centred model. Since the needs and values of society are in constant state of flux, so is our curriculum.

With respect to curriculum and instruction, the MEd program has introduced me to various perspectives, allowing me to develop a more critical lens when considering educational policies and teaching methods, and becoming more focussed on using a best practice approach to my teaching. In particular, three aspects of the M.Ed. program had a profound impact on my

professional thinking and will certainly impact my practice as an educator. First of all, my belief that science was purely objective and that cultural bias did not exist changed as I discovered that cultural barriers do exist for some aboriginal students. Another significant learning experience for me was being exposed to how technology could be used to support student learning. Finally, gaining perspective on the concept of personalized learning has not only reinforced aspects of my current practice, but has helped me plan my professional growth.

Cultural bias in science. I can understand how the reading selections of an English class or the accounts of historical events in a social studies class can have cultural bias, but as a science teacher, I was quite confident that this bias does not exist in my courses. I always considered science to be free of culture and independent of norms, values, and beliefs. To me, the nature of science is objective and quantitative, and is based on the testing and re-testing of hypotheses. Any cultural bias that exists in a scientific finding is usually identified through repetition of the experiment by other researchers. For these reasons, I have always felt that my practice has been free of cultural bias. Others have called this philosophical presupposition “the universality of science” (Stanley and Brickhouse, 1994, as cited in Aikenhead, 1996, p. 9), as it uncovers knowledge or solves problems irrespective of the culture, race, or gender of the individual scientist involved.

A shift in my thinking began when I identified that science is steeped in culture and has its own set of norms, values, and beliefs; in other words, its own culture. First of all, science and the scientific method originated with pioneers like Galileo and Newton, and developed into its modern form with help from other early scientists belonging to a particular 17th century European culture. Because the origins of science are associated with a particular culture, symbols and meanings used in science are inextricably linked to that culture.

The idea that science is steeped in culture is also supported when you consider that curriculum developers decide what learning objectives will comprise a science course. Those making the decision belong to a particular sub-culture of society, and thus it is naïve to think that their set of norms, values, and beliefs do not influence their choices. Critics have pointed out that there are “societal interest groups competing for privilege and power over the science curriculum” (Fensham, 1992, as cited in Aikenhead, 1996, p. 11). For these groups, “school science is a potent cultural force in any society, a force that impinges upon most students daily” (Aikenhead, 1996, p. 12). This social efficiency approach, where learning outcomes are selected based on the current interests of society, is far from being culturally neutral, as the choice of learning objectives are serving the interests of mainstream culture.

When the view of Western science conflicts with the worldview of a student, another cultural barrier becomes evident. For example, an aboriginal student may have grown up with the legend that the “Thunderbird, a giant supernatural bird, causes thunder and lightning and that his weapons are lightning snakes he throws towards the earth” (BC Aboriginal Legends & Symbolology, para. 3). When this student enters a typical science class, they hear that lightning is simply the discharge of electrons and the thunder is the sound wave produced by these moving electrons. Aikenhead (2001) suggests bringing some of the humanities into the science class by having students discuss their interpretations of natural phenomena and have it validated as a cultural perspective. The Western science perspective can then be introduced as just that, a perspective, albeit one that is based on scientific method and fact. This way, students are not required to abandon their beliefs and can view the perspectives as being separate.

My prevailing notion of the “universality of science” has certainly been challenged. Having an awareness of how aboriginal students might face cultural challenges in my science

classes is an important first step in providing a more culturally inclusive learning environment. Even without systemic changes to curriculum development, I can make small changes in my practice that may reduce some cultural barriers such as acknowledging various interpretations of natural phenomena to help students cross the cultural border without feeling like they are abandoning their traditional ways of knowing.

Integration of technology. Until recently, I would consider myself to be a low-level user of technology. Aside from the equipment used to perform science experiments, my use of technology was limited to PowerPoint lessons and e-mail communication (mostly with parents). After reading the article by Ertmer & Ottenbreit-Leftwich (2010), I felt discouraged by statements such as, “To put it simply, effective teaching requires effective technology use” (p. 256) and “using technology simply to support lecture-based instruction falls far short of recommended best practice” (p. 257). Although I find these statements to be a bit brash, I have always felt that I could improve the relevance of my courses for my students by better integrating technology.

The 21st century learning initiative refers to learner-centered, technology based teaching as being necessary in today’s world. “We must make better use of technology in education so our young people will be equipped to use it effectively and ethically” (*BC’s Education Plan*, 2013, p.3). The MEd program allowed me to experience various ways of incorporating technology into the classroom and understand its pedagogical value. This new level of understanding has immediately translated to a change in my teaching practice. For example, experiencing how the clicker system can engage an audience inspired me to integrate its use in my own classroom. Also, using the online animation software ‘Scratch’ inspired me to look at other online tools specific to my subject area. Since then, I have begun using ‘Phet,’ a website that allows my

students to engage with interactive physics simulations. Another significant change to my practice has been the development of a teacher website and online video lessons. With regards to technology, I no longer consider myself to be a low-level user, but one who is progressing in its use.

Personalized learning. Personalized learning involves a student-centred approach. Along with developing real-life skills, such as collaboration, critical thinking, and problem-solving; the learner-centered model also addresses the personal domain, where students feel a sense of autonomy, competence, and social relatedness. I used to think that personalized learning was unattainable for large classes with numerous specific learning outcomes as time constraints just wouldn't allow for it.

Through my project, I was able to address the time constraint issue by flipping the classroom and using the afforded class time for student-centred, cooperative learning activities. With the flipped learning approach, there is an opportunity to take student-centred, personalized learning to the next level by integrating some personalized project-based-learning activities.

Until recently, I considered hands-on activities and lab experiments to be a form of project based learning. From exploring this topic further in the MEd program, I have come to realize that PBL is student directed and organized around an open-ended driving question requiring in-depth inquiry for a group of students. Critical thinking skills are important when sifting through the given information in a project, determining what's important, and what they need to find out. In my subject area, discovering what they need to know will usually require students to devise their own methods of experimentation and understand how to interpret their results, consequently gaining a much deeper understanding of the concept. The degree of student

choice, working as a team, and acquiring and applying knowledge to real situations increases motivation and, in my opinion, enriches the learning experience.

References

- Acar, B., & Tarhan, L. (2007). Effect of cooperative learning strategies on students' understanding of concepts in electrochemistry. *International Journal of Science and Mathematics Education*, 5(2), 349-373. doi: 10.1007/s10763-006-9046-7
- Aikenhead G.S. (1996) Science education: Border crossing into the subculture of science. *Studies in Science Education*, 27, pp. 1-52
- Aikenhead G.S. (2001) Integrating western and aboriginal sciences: Cross-cultural science teaching. *Research in Science Education*, 31(3), 337-355
- Amiri, A., Ahrari, H., Saffar, Z., & Akre, V. (2013). The effects of classroom flip on the student learning experience: An investigative study in UAE classrooms. *Current Trends in Information Technology*, 11(12) 71-76. doi: 10.1109/CTIT.2013.6749480
- Assor, A. (2012). Allowing choice and nurturing an inner compass: Educational practices supporting students' need for autonomy. In *Handbook of research on student engagement*, 421-439.
- Atteberry, E. (2013, December 5). Flipped classrooms may not have any impact on learning. *USA Today*. Retrieved from <http://www.usatoday.com/story/news/nation/2013/10/22/flipped-classrooms-effectiveness/3148447>
- Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. *The Clearing House*, 83, 39-43.
- BC Aboriginal Legends & Symbolology. (n.d) Squamish Lilwat Cultural Centre, Retrieved July 28, 2013 from <http://shop.slcc.ca/legends-symbology?page=2>).

- BC's Education Plan. (2013) BC Ministry of Education. Retrieved July 14, 2013 from http://www.bcedplan.ca/assets/pdf/bc_edu_plan.pdf
- Chandra, V., & Fisher, D. L. (2009). Students' perceptions of a blended web-based learning environment. *Learning Environments Research*, 12(1), 31-44. doi: 10.1007/s10984-008-9051-6
- Choi, H. J., & Yang, M. (2010). The effect of problem-based video instruction on student satisfaction, empathy, and learning achievement in the Korean teacher education context. *Higher Education*, 62(5), 551-56
- Crews, T., & Butterfield, J. (2014). Data for flipped classroom design: Using student feedback to identify the best components from online and face-to-face classes. *Higher Education Studies*, 4(3), 38. doi:10.5539/hes.v4n3p3
- Ertmer, P. Ottenbreit-Leftwich, A. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, 42(3), 255-284
- Frederickson, N., Reed, P., & Clifford, V. (2005). Evaluating web-supported learning versus lecture-based teaching: Quantitative and qualitative perspectives. *Higher Education*, 50(4), 645-664.
- George-Palilonis, J., & Filak, V. (2009). Blended Learning in the Visual Communications Classroom: Student Reflections on a Multimedia Course. *Electronic journal of E-Learning*, 7(3), 247-256.

- Hamdan, N., McKnight, P., McKnight, K., & Arfstrom, K. (2013). A review of flipped learning. *Flipped Learning Network*: www.flippedlearning.org/cms/lib07/VA01923112/Centricity/Domain/41/LitReview_FlippedLearning.pdf
- Hancock, D. (2004). Cooperative learning and peer orientation effects on motivation and achievement. *The Journal of Educational Research*, 97(3), 159-166.
doi:10.3200/JOER.97.3.159-168
- Hänze, M., & Berger, R. (2007). Cooperative learning, motivational effects, and student characteristics: An experimental study comparing cooperative learning and direct instruction in 12th grade physics classes. *Learning and Instruction*, 17(1), 29-41.
doi:10.1016/j.learninstruc.2006.11.004
- Harris, L. (2011). Secondary teachers' conceptions of student engagement: Engagement in learning or in schooling? *Teaching and Teacher Education*, 27(2), 376-386.
- Hijzen, D., Boekaerts, M., & Vedder, P. (2007). Exploring the links between students' engagement in cooperative learning, their goal preferences and appraisals of instructional conditions in the classroom. *Learning and Instruction*, 17(6), 673-687.
- Ho, F. F., & Boo, H. K. (2007). Cooperative learning: Exploring its effectiveness in the Physics classroom. In *Asia-Pacific Forum on Science Learning and Teaching*, 8(2), 1-21.
- Holcomb, L. B., Johnson, P. R., Castek, J. M., Henry, L. A., & Leu, D. J. Unlocking the potentials of K-12 classroom websites to enhance learning: An examination of website features and longevity. Unpublished technical report. University of Connecticut.
- Johnson, G. B. (2013). *Student perceptions of the flipped classroom*. (Master's thesis). Retrieved from <https://circle.ubc.ca/handle/2429/44070>

- Khan, S. (2011). TED talk: Let's use video to reinvent education.
- Lage, M., Platt, G., & Treglia, M. (2000). Inverting the classroom: A gateway to creating an inclusive learning environment. *The Journal of Economic Education*, 31(1), 30-43.
- Mansfield, C. (2012). Rethinking motivation goals for adolescents: Beyond achievement goals. *Applied Psychology*, 61(4), 564-584.
- Mousel, A. (2013). Flipping the High School Mathematics Classroom. *Studies in Teaching 2013 Research Digest*, 61-66
- Nieswandt, M., & Shanahan, M. C. (2008). "I Just Want The Credit!"—Perceived instrumentality as the main characteristic of boys' motivation in a grade 11 science course. *Research in Science Education*, 38(1), 3-29.
- Patrick, H., & Yoon, C. (2004). Early adolescents' motivation during science investigation. *The Journal of Educational Research*, 97(6), 319-328.
- Pickens, M., & Eick, C. J. (2009). Studying motivational strategies used by two teachers in differently tracked science courses. *The Journal of Educational Research*, 102(5), 349-362.
- Priego, R., & Peralta, A. (2013). Engagement factors and motivation in e-learning and blended-learning projects. Paper presented at the *First International Conference on Technological Ecosystems for Enhancing Multiculturality*, 453-460. doi:10.1145/2536536.2536606
- Ryan, A. M. (2000). Peer groups as a context for the socialization of adolescents' motivation, engagement, and achievement in school. *Educational Psychologist*, 35(2), 101-111.
- http://dx.doi.org/10.1207/S15326985EP3502_4

- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*, 54-67.
<http://dx.doi.org/10.1006/ceps.1999.1020>
- Saeed, S., & Zyngier, D. (2012). How motivation influences student engagement: A qualitative case study. *Journal of Education and Learning, 1*(2), p252.
- Strayer, J. (2007). *The effects of the classroom flip on the learning environment: A comparison of learning activity in a traditional classroom and a flip classroom that used an intelligent tutoring system*. (Doctoral dissertation). Ohio State University. Retrieved from <http://faculty.washington.edu/rvanderp/DLData/FlippingClassDis.pdf>
- Strayer, J. F. (2012). How learning in an inverted classroom influences cooperation, innovation and task orientation. *Learning Environments Research, 15*(2), 171-193.
- Watson, J. (2008). Blended learning: The convergence of online and face-to-face education. *Promising Practices in Online Learning*. North American Council for Online Learning.
- Wu, H., & Huang, Y.-L. (2007). Ninth-grade student engagement in teacher-centered and technology-enhanced learning environments. *Science Education, 91*(5), 727-749.
- Wurdinger, S., Haar, J., Hugg, R., & Bezon, J. (2007). A qualitative study using project-based learning in a mainstream middle school. *Improving Schools, 10*(2), 150-161