

Student-Centered Approaches in K-12 and Higher Education

Stacie L. Mason

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Stacie L. Mason

Brigham Young University

Stacie Mason has taught writing at Brigham Young University since 2005 and has graduate degrees in English (MA) and Instructional Psychology and Technology (MS, PhD). She has researched outcomes from following student-centered practices, using open textbooks, attending online school, and learning coding and computational thinking.



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About this Book

This book is an evolving, collaborative project. Chapters have been written and peer-reviewed by graduate students studying instructional design. If you would like to submit a new chapter or revise an existing chapter, please email stacie_mason@byu.edu.



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Introduction

Stacie L. Mason

As an educator, I have never wanted to waste my students' time, but I am more mindful of students' time than I was before COVID. Now that students have experienced alternatives to classroom instruction, if I don't use class time well, they might be inclined to think, "We could have done this online. I could have stayed home in bed. This wasn't worth the trip."

Some students will be generous—they are so glad to be back in the classroom among their peers that they will tolerate a little boredom.

For other students, the school day has always felt long. Traditional schooling was never working for them—not pre-COVID, not during COVID, and not post-COVID. Some of these students went home in March 2020 and have not returned to brick-and-mortar school.

For all students, educators, and parents who took on the role of educators, COVID has provided new challenges, opportunities, and experiences—new approaches to teaching and learning. Now is a good time to reflect on what is and isn't working in our schools, and to apply what we have learned to designing better schools that meet the needs of all students.

To meet the needs of all students, our schools need to be more student-centered.

Traditional classrooms tend to be teacher-centered. The teacher plans the schedule and teaches the lessons. Students are expected to learn what the teacher teaches.

In student-centered classrooms, students have considerable autonomy and responsibility for their own learning. Students may learn independently or collaboratively, but the students help determine what they will learn and how. The teacher's role tends to be that of instructional designer, guide, and more-knowledgeable-other.

You may be thinking, "Well, that won't work. If I put my child in charge of their learning, they would play video games all day, every day." It's true that when given the choice, some people choose not to learn much. At its best, autonomy entails creative production: building things, writing books, programming robots, and composing symphonies; at its worst, autonomy entails endless hours of passive (and sometimes harmful) media consumption. The idealist might imagine children adventuring in the woods, magnifying glasses in hand, studying the flora and fauna—but we live in the real world.

The versions of student-centered learning described in this book do not give students absolute autonomy. Each of these approaches allows for "freedom within limits," to borrow a phrase from Montessori. Students and teachers share responsibility for learning. Educators have an important role designing learning experiences, providing structure, support, and timely instruction. But the students have a say too.

When I started my graduate program in instructional psychology and technology, I was looking for best practices: I wanted to know what works in education and why. Pretty quickly I learned that there's not a definitive list of practices that work equally well for all students in all settings at all times.

That said, we have extensive data demonstrating that certain practices tend to work for most students. For example, we know that teaching young students decoding skills helps them learn to read (Foorman et al., 2016). Effective writing instruction often includes modelling, practice, and reflection (Graham et al., 2016). And using number lines can help students learn math (Fuchs et al., 2021).

While some practices tend to be more effective than others, realized outcomes often vary according to student characteristics. Research suggests that students who are behind gain more from teacher-led instruction than they do from student-led instruction, while students who are starting out ahead may learn more from student-led instruction than from teacher-led instruction (Hulan, 2010; Kirschner et al., 2006). In student-centered education, the teacher must “follow the child” (another Montessori phrase), or adjust instruction to meet individual students' needs.

Just as there is not a concise list of best practices that always work, there is not just one approach to student-centered instruction. Any teacher in almost any school can adopt student-centered practices. In this book we discuss several approaches that we consider student-centered. What all of these approaches have in common is that they allow and require students to engage in and take some responsibility for their learning.

Each of these approaches is also an evidence-based practice (i.e., teaching approaches for which we have evidence showing that the practice is effective). In this book, we have summarized evidence regarding what outcomes have been correlated with each educational approach. Some outcomes are academic, other outcomes are affective; i.e., having to do with attitudes, values, or motivation. For most or all of these approaches, more research may be needed to fully demonstrate outcomes.

Our purpose in writing this book was to provide concise overviews of student-centered approaches to instruction, describe how each approach is student-centered, and summarize observed student outcomes. Our hope is that educators who read the text will be persuaded to adopt effective student-centered approaches to instruction and learning, students will become more engaged as a result, and researchers will continue to expand our understanding of effective practice.

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Math Manipulatives

Kenzie Dinsmoor

Metacognition

Learning

Engagement

manipulatives

problem-solving

In a traditional grade-level mathematics classroom, the use of manipulatives has become essential in providing students with the knowledge to conceptualize basic math operation skills. This approach to instruction involves using physical tools to enhance student understanding of the mathematical content. Teachers are finding the need for using manipulatives to create effective, active, and engaging math lessons. Using manipulatives, or “tangible objects,” can provide for a variety of learning styles and abilities within classrooms (Horan & Carr, 2018).

What are Manipulatives?

Horan and Carr (2018) define manipulatives as concrete objects that allow students hands-on experience while being actively engaged in the learning. There are multiple ways to use manipulatives. In the classroom, teachers are using manipulatives in a lesson as they introduce, practice or remediate a mathematical concept (Hidayah et al., 2021). These physical tools may include a variety of concrete objects that might be used at the elementary level such as counters, fraction strips, pattern blocks, cubes, geoboards, etc., for all kinds of math instruction.

Using manipulatives as an approach provides a foundation which will encourage critical thinking and students' ownership of their work. Teachers are able to have a vivid picture of student understanding in which they can determine the next appropriate steps (McDonough, 2016).

Origin of Manipulatives

Using math manipulatives dates back to earlier civilizations that used clay beads and wooden trays to help grasp mathematical concepts (Boggan et al., 2010). Throughout history, different types of manipulatives have been used to aid in comprehension of mathematical concepts.

We first hear about manipulatives being seen as educational tools for teaching in the late 1800s. Teachers were starting to use manipulatives to enhance their lessons and saw positive outcomes in their students' mathematical skills. In the 1900s, Italian physician and educator Maria Montessori developed the use of manipulatives with the goal in mind to enable children to learn through personal investigation and exploration (Hurst & Linsell, 2020). Today, using manipulatives stresses the importance of concrete operations in the primary stages of knowledge formation in young children. In a traditional mathematics class today, using manipulatives is well-established in the classroom.

Why are manipulatives important?

Based on psychologist Jean Piaget's research, children learn concepts through three levels of knowledge: concrete, pictorial, and abstract (Hurst & Linsell, 2020). As students manipulate objects, they take the necessary first steps toward building understanding and internalizing math processes and procedures. Manipulating objects allows students to explore concepts at the first, or concrete level of understanding. Strategies and algorithms will be developed over time (Ojose, 2008).

Students need to understand the concept at the two levels of concrete and pictorial first before they can handle an abstract or symbolic level (Hurst & Linsell, 2020). To create mental images and models, it is necessary to use concrete manipulatives. Students who show an understanding of the concept at this physical or concrete level are well-positioned to move to the next level where they will be able to use representations of the objects in place of the real objects (Tirosh et al., 2018).

The use of concrete models can facilitate the development of number sense as well as develop the meaning of written symbols and help students develop a sense of place value (Hurst & Linsell, 2020). By using this method, teachers can get a better understanding of what students know, as well as identify misconceptions, so they can design interventions accordingly.

Understanding the interconnections of mathematical ideas can be improved by utilizing manipulatives. Using manipulatives to solve a problem can assist students in keeping track of what they did and explaining their ideas (Hurst & Linsell, 2020).

Student-Centered Approach

Student-centered learning has a variety of meanings in education. Students are encouraged to engage with their own ideas, experiment with new materials, and explore. A common description of student-centered learning is that students are at the center of their learning where the teacher is there to support and guide students' progress and learning (Keiler, 2018). So what makes math manipulatives student-centered?

Using math manipulatives fosters student engagement in a way that allows for students to explore different math concepts with hands-on learning materials (Hidayah et al., 2021). In an encyclopedia article, Stephan (2014) stated the following:

Using math manipulatives is a learner-centered teaching approach to mathematics instruction that places heavy emphasis on the students taking responsibility for problem solving and inquiry. The teacher is viewed as a facilitator by posing problems and guiding students as they work with partners toward creating a solution. (p. 331)

Therefore, manipulatives are student-centered because students are able to play with tangible objects which are designed to give students a deeper understanding of mathematical concepts.

Outcomes of using Math Manipulatives

The use of manipulatives in the classroom greatly aids the development of strong mathematical foundations in young students. Research shows that there are benefits to using manipulatives to help teach a mathematical concept.

Academic

According to D'angelo and Iliev (2012), using manipulatives aids in furthering student comprehension of mathematical knowledge. As students are given the chance to explore on their own with the chosen manipulatives they are able to critically think and make connections in understanding the math concept. Data have shown that concrete objects can

help children gain access to concepts and processes that might otherwise be inaccessible (Uttal, 1997). Looking at a specific group of students, English language learners' (ELLs) comprehension increases immensely. Data have shown that ELLs, "improve in vocabulary development, oral proficiency, comprehension, and display enthusiasm to continue using the manipulatives" (Stapleton, 2014, p. 161). ELL students' comprehension increased because they had to interpret a directive with an action in solving the problem. Therefore, the use of hands-on, multi-sensory manipulatives to help students increase comprehension is encouraged.

Another connection is how the role of manipulatives and metacognition go hand in hand with young children's cognitive development. Metacognition is when one observes, tries, and reasons with various mathematical concepts. It is thinking about thinking; a way for student learning to be enhanced and for them to understand their own learning processes. Belenky et al. (2009) state, "metacognitive prompts are questions that ask students to reflect on various aspects of the learning materials and problem-solving process and have been hypothesized to facilitate abstraction and learning" (p. 103). Students given concrete manipulatives with metacognitive prompts have shown a better transfer of procedural skills than students given abstract manipulatives with problem focused prompts. As a result, the manipulatives utilized in mastering sophisticated cognitive skills taught in mathematics are critical to increasing comprehension.

The use of multi-sensory manipulatives as tools has been said to increase involvement and interaction in teaching ESL students. In a journal article, Stapleton (2014) stated the following:

Students enjoy working with hands-on manipulatives which increase the opportunity for student involvement and interaction. Students who use the materials do not sit passively while the instructor attempts to verbally explain a concept. Students are encouraged to participate with other students, make connections with new concepts, and draw conclusions based on their understanding. (p. 162)

This brings us to the next point: visualization. Where some students learn best with visuals, math manipulatives also aid with being able to conceptualize a math problem (Carbonneau, 2013). While students can recall material from books and lectures for short periods of time, deep understanding and the ability to apply what they've learned to new contexts necessitate conceptual understanding anchored in actual interactions with concrete objects (D'angelo & Iliev, 2012).

Research shows that when manipulatives in mathematics are used effectively, student understanding and engagement increases because manipulatives aid in the understanding of visual concepts through the use of visuals, scaffolding learning, and engaging students in learning (Cockett, 2015). Students are able to link representations based on manipulatives with written, symbolic representations.

Affective

Authors Cockett and Kilgour (2015) did a quantitative study on the impact of using manipulatives in mathematics on student understanding, efficiency, engagement and enjoyment. During this study, several types of manipulatives were used with students participating in various mathematical activities. Observations were also part of collecting qualitative data. The results concluded that students were more engaged when using manipulatives, and that their perception of their learning environment improved in each of the three areas: enjoyment, understanding, and efficiency.

In addition to enjoyment, concrete things that imitate daily objects help youngsters learn concepts by allowing them to draw on their practical expertise. Students are building up their problem solving skills and making connections. Planning instructional engagement activities is a huge part of students' motivation. Manipulatives give that extra boost in creativity and an increase in skills in students. A Yale University study (Hurst & Linsell, 2020) found that simple objects kept elementary students involved and entertained with very high levels of attention and concentration. Manipulatives also allowed students to design and experiment to find a solution, which encourages social interaction (Berk, 1999).

Therefore, manipulatives are effective for the following reasons: they are multisensory, they represent ideas in more than one way, they promote communication among students, and they increase confidence, leading to less confusion

and a deeper understanding.

Challenges with Manipulatives

Challenges are a natural part of mathematics. Research has confirmed that using math manipulatives produces positive outcomes in students' cognitive development and skills; however, there are some challenges with using them. When students learn with manipulatives, they may become too reliant on the item and context (Boggan et al., 2010). If students are constantly using manipulatives, they might become a crutch, preventing students from learning more advanced problem-solving skills (Boggan et al., 2010). Students will have difficulty transferring new knowledge to new contexts (Boggan et al., 2010).

Effectiveness of Learning

Hidayah et al., (2021) stated, "the use of manipulatives is still limited to the use of classical and group learning. The students, therefore, could not repeat the math manipulatives instruction by themselves after class" (p. 539). The manipulatives' nature allows students to manipulate them in order to learn certain ideas. It is necessary to have manipulatives, but it is also important to know how to utilize them appropriately in a well-designed learning experience.

Manipulatives, like any other educational instrument, may aid or impede learning.

Conclusion

Using manipulatives is of value in the mathematics classroom, especially when students are making their own connections to problem-solving in relation to mathematical concepts.

When teaching mathematics, educators who are aware of their students' competency levels can effectively scaffold content. To do so, teachers must first comprehend how their students think and why they think that way. Mathematical knowledge acquisition in early learners is dependent on student-centered mathematics education; consequently, educators should endeavor to provide a mathematically rich atmosphere in which children critically explore concepts, solve problems, and openly discuss their thoughts. Teachers who use tangible manipulatives effectively in their classrooms can have a favorable impact on their students' arithmetic skills. When it comes to employing manipulatives in the classroom, the advantages are infinite. The use of these tools enhances students' learning experiences, bridges the gap between the physical and abstract, and, ultimately, fosters life-long learning in curious young learners.

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Kenzie Dinsmoor

Brigham Young University

Kenzie Dinsmoor is a graduate student in Brigham Young University's Instructional Psychology and Technology program. She previously earned a Bachelor's degree in Elementary Education with minors in Art History and TESOL K-12 (Teaching English to Speakers of Other Languages) from BYU. She is currently teaching a programming course at BYU for Elementary Education majors. Her interests include teaching coding at the elementary level, military instruction and design curriculum.



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Study Abroad

Tanner Kohler, Parker Whitelock, & Joseph Diaz

student experience

Transformative Learning

Study Abroad

Language Proficiency

cultural awareness

Experiential Learning

Language

A study abroad is when a university student lives in another culture for a predetermined amount of time for the purpose of studying academically. When study abroads were first introduced, they were primarily for language acquisition, and for students studying the arts to gain first-hand experience with artifacts (Twombly, 2012). Over the years the term “study abroad” has developed to apply to experiential learning that is centered on furthering studies towards an academic degree (Twombly, 2012). In research surrounding study abroads, University of Kansas professor, Susan Twombly (2012) pointed out that study abroads include students who are currently enrolled in the US college system, but temporarily enroll in foreign school systems for their own benefit, missionary and other service, research, and internships. In this chapter, we discuss study abroad programs and their benefits. We will focus primarily on university students who are pursuing an academic, university-level degree.

Student-Centered Travel

Studying abroad tends to be a very “student-centered” experience. Learning shifts from teacher-centered to student-centered often depending on the influence of five principles: the balance of power, the function of course content, the role of the teacher vs. the role of the student, the responsibility for learning, and the purpose and process for evaluation (Wright, 2011). Studying abroad provides a unique student-centered experience because of the agency it provides. “Students are the center of the educational enterprise, and their cognitive and affective learning experiences should guide all decisions as to what is done and how” (Wright, 2011, p.93).

Brief history

In 1923, the University of Delaware sent a cohort of students to France as part of the first official study abroad facilitated by a university in the United States (University of Delaware, n.d.). At the time, this was an enormously daunting and extremely costly endeavor. The project was driven by the potential language acquisition and cultural awareness benefits for students in the wake of WWI. Following this pioneering achievement, the number of study abroads conducted by universities across the country has only increased in both quantity and diversity (U.S. Department of State, 2019).

In each year since the 1960’s, roughly two-thirds of all American study-abroad students have consistently been women. The majority of those who have studied abroad reported spending between three and six months away, with more than a quarter of these studies abroad falling in the four-month range (Paige et al., 2009). The tendency to spend roughly four months abroad suggests that many students participate in a study abroad for the length of a typical college

semester. Similar to the original study abroad cohort visiting Europe, the top ten destinations for study abroads since 1960 have been the UK, France, Spain, Italy, Germany, China, Australia, Japan, Mexico and Greece (Paige et al., 2009).

Perhaps one explanation for the increasing popularity of studying abroad is the finding that alumni who studied abroad at some point during their college careers reported it as the experience creating the strongest impact during their college experience (Paige et al., 2009). Interestingly, more than half of the same respondents reported going on to pursue advanced degrees following the study abroad experience, and of those, 35% of the degrees were internationally oriented (Paige et al., 2009). Clearly, studying abroad has greatly influenced many college students for decades, and will likely continue to do so with increasing frequency as there has been a steady increase in the number of students studying abroad for the last 25 years (Open Doors, 2020).

Outcomes

To better understand students' motivations for studying abroad and the resulting outcomes, Luo and Jamieson-Drake (2015) analyzed data collected from 19 different colleges and universities. The researchers found that female students often participated in study abroad due to influence from prominent figures in education. Male students, in contrast, more frequently tended to study abroad because of a desire to explore personal values or follow the influence of peers (Luo & Jamieson-Drake 2015). At the conclusion of this study, researchers determined that some of the most influential motivations for students of both genders to study abroad were greater understanding of culture and positive social interactions with peers (Luo & Jamieson-Drake 2015).

Language Acquisition

Research has continually proven that study abroad programs provide a productive environment and "statistically significant gains" for language learning (Kinging, 2008, p. 107). Factors that affect language acquisition while studying abroad include the student's living arrangement, social experience, and disposition toward language learning. Students who live in a homestay environment with native speakers—rather than shared student housing—have a significantly greater language capability by the end of their stay (Kinging, 2008). A similar increase in language capabilities tends to be seen in those who are encouraged to develop social circles outside of their living arrangement. Most importantly, a student must have a positive disposition towards acquiring a language. A student who shows strong desire and motivation to learn the native language will have significantly more success (Kinging, 2008).

Dan E. Davidson (2007) noted that linguistic learning on a study abroad is a more effective way of learning a language. As more formal time is spent learning a language, learners often lose the appeal and motivation to study and practice (Davidson, 2007). Real-world contexts such as a study abroad lend themselves to more practice and improved attitudes toward language acquisition. These improved attitudes later benefit classroom study and student morale regarding language acquisition. Students who study abroad were also more likely to obtain graduate education "than the general US college undergraduate population" (Paige et al., 2009, p. S41).

Affective Outcomes

Studying abroad seems to have lifelong impacts on individuals. Studies have confirmed that those who have returned from studying abroad reported an increase in self-confidence and maturity, greater tolerance for ambiguity, change or refinement in political beliefs and a general change in world view (Dwyer, 2004). Research also indicated that these impacts can be sustained for as long as 50 years. Individuals associated an increase in their sense of personal responsibility and a significant development in their intercultural awareness (Ingraham & Peterson, 2004). Students also are significantly more likely to seek opportunities for global engagement throughout their lives in career paths and general development. This engagement seems to cause students to evaluate and debunk stereotypes "while at the same time obtaining a deeper understanding of social contexts and behaviors" (Freestone & Geldens, 2008, pg. 52).

Theoretical foundations

While it is valuable to recognize that studying abroad has strong impacts on participating students, it is also relevant for organizers of such programs to understand *why* this is the case. Two theoretical frameworks are frequently cited in the literature to explain the effects studying abroad has on students: Experiential Learning Theory (ELT) and Transformative Learning Theory (TLT).

Experiential Learning

As originally articulated by Dewey (1938), experience is both the means and the goal of education. ETL proposes that as people are exposed to various stimuli, they have unique, personal experiences that teach them. This view is unique in that it describes how each individual person receives a personalized education through the particular combinations of experiences they undergo throughout life. Because studying abroad often exposes students to situations (or stimuli) which are new and interesting, students have a greater variety of experiences through which they gain knowledge and experience otherwise unavailable to them (Stone & Petrick, 2013). They would not have learned such impactful lessons had they simply stayed at home where they would not have been exposed to such a diversity of new stimuli. Students in a new environment must reflect on their experiences and draw new conclusions.

Transformative Learning

Similar to the basic tenets of ELT, TLT describes the process where learners must make sense of new stimuli to which they are exposed. More specifically, however, TLT explains how learners must reevaluate previously held beliefs and assumptions in light of new experiences which tends to transform their existing worldviews (Mezirow, 1991). The connection is clear between TLT and the types of learning that occurs on a study abroad—students are exposed to new cultures, customs, people, and perspectives which force them to assess their beliefs, and often alter them to accommodate new realizations. Morgan (2010) described how a student leaves as a normal resident, and returns from travels a “transformed home comer” (p. 252). The deeper the experience, the more opportunity it has to transform previously held beliefs. Often, this can mean that those who are willing to go off the path beaten by the official study abroad program have a greater chance of finding unique experiences that can powerfully change them.

Best Practices

Because study abroads have so many elements and facets, the design of the experience has large implications for the expected outcomes. When planning to facilitate a study abroad experience for others, or when considering programs one might take part in as a student, the following factors should be considered:

Length

Although the majority of study abroad experiences last between three and six months, which is equivalent in length to a typical college semester (Paige et al., 2009), longer programs tend to have greater outcomes. According to Dwyer (2004), an average study abroad program tends to have a more enduring impact when they last for at least one full year. Research by Kevin Kehl (2006) of Baylor University showed that students who studied abroad for at least a semester were assessed as being more globally minded when compared to students who studied abroad for eight weeks or less. The longer an individual studies abroad, the more growth they are likely to see in language acquisition, academic success, intercultural development, and personal growth. In a survey by Freestone and Geldens (2008), students reported that staying for longer periods enabled them to spend more time in environments that highlight the uniqueness of their host destination—experiences that mass-tourism could never equal. However, summer programs that last only six weeks have achieved sustainable benefits for students when careful educational planning, expert implementation, and significant resources are used (Sachau, 2010). These shorter programs cannot, however, replace the potent results of a one to two semester program (assuming college semester lasting roughly 15 weeks).

Homestay Environments

Students who stay with local families have significant success in their academic and affective outcomes (Kinging, 2008). Linguistic acquisition is greatly improved when individuals live with native speakers who help and encourage authentic speaking experiences. It also helps students to develop a social circle outside of fellow program participants. This promotes opportunities for global engagement which helps to debunk stereotypes and expand worldviews. When possible, students should seek study abroad opportunities that allow for the homestay experience.

"The quest for authenticity" is a term coined in Cohen's (1988, p. 373) *Phenomenology of Tourist Experiences* which explains that students seek study abroad and exchange programs because they provide a unique, authentic experience that general traveling and tourism never could. The length of a program and the homestay environment are two major factors that promote authentic experiences. Students and schools should strive to create culturally rich and authentic experiences.

Inequities

Regardless of the tremendous value in spending time abroad, there has not historically been equal participation in study abroad programs. One such inequity is the finding that over the past decade, only 34.7% of students studying abroad are men. Research has shown that this is due, in part, to men being significantly less culturally sensitive than women (Tompkins et al., 2017). Women were also shown to be more motivated to understand and appreciate differences among cultures. One potential remedy for this imbalance could be intercultural opportunities on campus which may improve men's interest in studying abroad. Age can also play a limiting role, although research shows that while older students quickly adapt and see academic and affective benefits while studying abroad, younger students tend to be more successful in the long term (Llanes & Munoz, 2013). Nationality is a third characteristic which may play a role in motivating or demotivating students to study abroad. China sends the most students abroad by a large margin, followed by India, Korea, Germany, Saudi Arabia, France, and the United States (Sheth, 2017). This is at least partially due to the differences in educational options available in their home countries (Sanchez & Fornerino, 2006).

Conclusion

To conclude, it is important to emphasize the tremendous value study abroads can hold for university students. Out of roughly 6,000 alumni who participated in at least one study abroad during college, the study abroad was ranked, on average, as the most important experience out of all provided options (Paige et al., 2009). Study abroad programs have a significant, life-long impact on the lives of participating students (Dwyer, 2004).

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Flipped Classrooms

Evie Howell & Pamela Smalley

Student Centered

Transformative Learning

Engagement

With limited in-class time and different speeds of learning among students, the flipped classroom approach offers teachers and students an alternative that is student-centered (Corwin, 2020). In flipped classrooms, students take on an active responsibility of learning the course material before coming to class, instead of passively learning through in-class lectures (Yin, 2020). With the responsibility of learning placed mainly on students, this teaching method shifts from what was previously teacher-led to learning that is student-led. Flipped classrooms provide opportunities for students to be more engaged in directing the depth of mastery and speed of learning that is individualized to them (Yin, 2020). Although flipped classrooms are a relatively recent learning adaptation, this approach has been shown to yield certain improvements and limitations when compared to more traditional learning classrooms (Eppard & Rochdi, 2017). This chapter will explore the definition of flipped classrooms, their origins, outcomes, and limitations.

What is a Flipped Learning Classroom?

Flipped learning is a recent strategy used to help students become more active and engaged learners. It is the “flipped” concept of traditional learning classrooms. Flipped learning classrooms consist of two parts: 1) learning at-home material that can be delivered through various technological formats, and 2) doing exploratory and peer-collaborative activities in class (Yin, 2020). Instead of passively learning course materials, students watch assigned videos or complete readings before class (Yin, 2020). This student-centered approach encourages students to take control of their learning, as students are able to control their learning pace, review segments that are more complicated or skim through those that come more easily, thereby gaining mastery of the topic (Yin, 2020). The idea is that students will have a better foundation of course materials, and as a result, teachers are able to use limited class time for problem-solving or collaborative activities pertaining to the studied topic; thus students can enhance their learning through concept application, and peer collaboration (Sergis et al., 2018). Flipped learning classrooms often differ from traditional learning classrooms in the sense that students begin to take a more active role in their learning, and teachers take on the role of mentor and co-collaborator instead of lecturer (Eppard & Rochdi, 2017; Yin, 2020).

Origins of Flipped Classrooms

The history of flipped classrooms began with studies in the United States. Even though the concepts of homework and studying at home are quite traditional, the origins of flipped classrooms (or inverted learning) can be traced back to the year 2000 when Lage, Platt, and Treglia used the “inverted classroom” learning strategy in two of their college-level economics classes and published their study in a journal article (Eppard & Rochdi, 2017). The main concept was to “have events that traditionally take place in the classroom now take place outside the classroom and vice-versa” (Lage et al., 2000, p. 32). Lage and her colleagues inverted their classrooms by assigning students to watch video-recorded

lectures before class and then used class time for answering questions and doing lab work (Lage et al., 2000). This student-centered method allowed students to learn the material at home and then come to class and lead the discussion through their questions. If there were no questions, the instructor assumed that the students had mastery of the topic (Lage et al., 2000) and would move on to the hands-on application. Their results showed positive perceptions from both students and instructors (Lage et al., 2000). In the same year that Lage et al. published their study on inverted classrooms, J. Wesley Baker presented his research on a similar “new” learning approach called flipped classrooms in Florida, at the 11th International Conference on College Teaching and Learning (2000).

Even though the concept of “flipped classrooms” was introduced in academia in 2000, it took a little longer for it to make its way into everyday classrooms and educational practices. Eight years after Lage et al. and Baker introduced flipped classroom learning, Jonathan Bergmann and Aaron Sams, two chemistry high school teachers from Colorado, started implementing this learning approach. It was in 2008 that flipped classrooms became generally popularized (Butt, 2014). Bergmann and Sams decided that they wanted to spend in-class time doing experiments and other hands-on activities, so they recorded their chemistry lectures onto different technology formats (i.e., videos, audios) for students to access from home. This form of student-centered learning allowed students to leverage learning from home at their own pace and level of comprehension, and engage in collaboration with peers at school. With the combining powers of the Internet and YouTube, educational content became easily accessible to everyone, inside and outside of the classroom. Education was no longer limited to what teachers could teach through traditional means, but rather, it became a matter of individuals choosing what they wanted to learn and in which format. Today, teachers, instructional designers, and companies like Khan Academy are collaborating in the development of content for flipped classroom learning (Butt, 2014).

Outcomes of Flipped Classrooms

Studies of flipped classrooms have shown an increase in both students’ positive attitudes toward learning and overall academic performances. These outcomes are important indicators that flipped classrooms are effective in educational pedagogy.

Affective

Student attitudes and perceptions play an important part in learning. In a study performed by Sergis, Sampson, and Pelliccione (2018), secondary education students from three different courses were assessed and surveyed to gauge the effects of flipped classrooms and traditional classrooms on “students’ cognitive learning outcomes, and also the internal impact on students’ satisfaction as well as their self-determination for their learning” (Sergis et al., 2018, p. 372). With six classes total (two from each of the three different courses), half were taught the same materials through the flipped classroom approach (experimental groups), while the other half were taught in person (control groups). In each of the sample sets, students in flipped classrooms scored higher on assessment tests and claimed to have greater levels of satisfaction, confidence, and relatedness than the students who were taught traditionally in person (Sergis et al., 2018). Furthermore, the analysis from this study showed that students who were low performers (from based line tests) had a higher increase in satisfaction, confidence, competence, and relatedness than their peers who were medium- to high-performing students (Sergis et al., 2018). The researchers from this study believed that these positive outcomes derived from the increased time of active engagement and interactions with teachers and peers in the classroom (Sergis et al., 2018). In other qualitative studies of flipped classrooms, similar results have emerged of positive attitudes, feedback, and perceptions from both students and teachers (Akçayır & Akçayır, 2018).

Academic Outcomes

In addition to qualitative studies, researchers have shown through quantitative studies “using grade point averages, standardized test scores, and course grades” (Akçayır & Akçayır, 2018, p. 338) that flipped classrooms are more effective in improving learning performance than traditional classrooms. In a meta-analysis conducted by Akçayır and Akçayır (2018), they concluded that 52% of flipped classrooms showed higher learning improvements than traditional

classrooms. In the remaining 48% of studies, students in flipped classrooms performed as well as or worse than students in traditional classrooms when “measured by GPAs, standardized test scores, and course grades” (Akçayır & Akçayır, 2018, p. 338). Moreover, the effectiveness of learning in a flipped classroom extends to better in-class time management and increased flexibility accounting for different learning speeds and levels (Akçayır & Akçayır, 2018).

Greater student participation in the teaching process and collaborations have been shown to improve overall learning. In a 2020 study, Yin examined whether having students help teach courses during class time, independently or in collaboration with teachers, would further improve student learning (Yin, 2020). This strategy allowed students to learn the course materials outside of class and then take what they learned to teach other students in class. With this responsibility of teaching, students took learning outside of class more seriously. In addition to average test scores improving by 6.63%, this research showed that flipped classrooms also contributed to an increase in student attendance and positive collaboration among peers (Yin, 2020). Collaborative opportunities allow students to interact and learn from one another, while “effective collaboration among group members facilitates cognitive growth and knowledge acquisition, and consequently leads to better performance” (Yin, 2020, p. 76). It is in the active process of engagement, students become better learners.

Limitations and Criticisms for Flipped Learning Classrooms

While there are positive outcomes for flipped learning classrooms, they are not without faults. Discussed below are several ways in which flipped learning classrooms may not be as developed or successful as traditional learning classrooms.

Time

As any seasoned student knows, classwork takes time. In the case of flipped classroom learning, time dedicated to the work involved for flipped classroom learning increases for both teacher and student. In comparison to traditional classroom planning, it generally takes more time to prepare for and carry out flipped learning classroom techniques (Akçayır & Akçayır, 2018). In a 2014 study, Butt surveyed two groups of university students: one group experienced a more traditional classroom setting while the other experienced a flipped classroom setting. When categorizing survey responses, the researcher found that one of the most common negative responses from students in the flipped classroom was regarding the amount of time it took to prepare for classes in comparison to traditional learning classrooms (Butt, 2014).

Adaptability

There are many styles of implementing flipped classrooms that may not have a high level of adaptability for each group of students. In many cases, teachers create educational materials that are specific to only their group of students with little room for adaptability in different classrooms, grades, or cultures (Herreid & Schiller, 2013). In a research study by Herreid and Schiller (2013), researchers surveyed members of the National Center for Case Study Teaching. Of approximately 15,000 respondents who self-identified as teachers, approximately 200 of them said that they used flipped classroom learning in their educational institutions. The teachers in this survey reported creating specificity and detail in their programs, making their resources only applicable to their specific classrooms (Herreid & Schiller, 2013). This approach creates less adaptability for other educators in the future wanting to use their materials. In contrast, classes that have high adaptability contain their own unique drawbacks. In a recent study, researchers Eppard and Rochdi (2017) found that classrooms that demonstrate a high adaptability rate are very difficult to study. This may be because flipped classrooms that are high in adaptability often contain varied content and learning approaches, making it difficult to pin down exactly what factors contribute to making flipped learning classrooms either effective or ineffective (Eppard & Rochdi, 2017).

Autonomy

While at times considered a strength, a possible weakness of flipped learning classrooms is the autonomy given to students to control aspects of their learning. An important element of flipped learning classrooms is the pace at which students do work outside the classroom (Butt, 2014; Herreid & Schiller, 2013; Milman, 2012). Students' personal decision-making contributes to the pace of the class, which can occur at different rates; if students fall behind on their own time, teachers must take time filling in important details and supporting each student in what they missed from take-home video lectures (Milman, 2012). Additionally, by not being able to exactly control the environment in which outside learning is done, teachers may face a variability of knowledge among students (Milman, 2012). For example, when viewing videos created by teachers outside of class, students may multitask by watching other videos at the same time or may not have the technology available to watch or listen to what is being taught, which increases the likelihood that important concepts may be missed and need to be recapped in supportive class time (Milman, 2012).

Accessibility

A final important limitation to note is that ESL students and those with disabilities may have a harder time with flipped learning environments and their needs must be taken into account (Milman, 2012). Accessibility in classroom learning has been inconsistent at times and will continue to be so as a new way of student-led learning is introduced into a mainstream setting. One important factor in flipped learning classrooms is the incorporation of technology as a learning staple, which can affect the accessibility of a flipped classroom for those in K-12 schools and beyond (Milman, 2012). When viewing or listening to learning materials at home, ELLs or students with learning challenges do not have a way to ask questions in real time or participate in scaffolding activities with other classmates, which may affect the success of flipped classroom learning (Milman, 2012). To improve accessibility in flipped classroom learning, digital materials are needed that meet accessibility standards and can be used by all students.

Conclusion

Although flipped learning classroom approaches are not ideal in every teaching scenario, they can be beneficial in student-centered learning programs. They have been shown to positively affect student learning and increase engagement and mastery of topics by helping students make the connection between pre-class materials and real-life applications (Lo & Hew, 2017). Flipped learning classrooms have many positive learning outcomes, but most of these outcomes are achieved when teaching and technology are applied thoughtfully and carefully (Butt, 2014). Flipped learning classrooms are an important tool to be considered when building educational programs and should continue to be studied, implemented, and evolved in the future.

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