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Understanding the Flipped Classroom: Types, Uses and Reactions to a Modern and Evolving Pedagogy

Becki A. Brown
St. Cloud State University, banelson@stcloudstate.edu

**Understanding the Flipped Classroom: Types, Uses, and Reactions
to a Modern and Evolving Pedagogy**

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Becki Brown

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Starred Paper Committee:
Stephen Hornstein
Hsueh-I Lo
Mary Beth Noll

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Chapter 1: Introduction

Purpose of Study

Teachers and administrators, and even some parents and students, are often searching for new methods for improving scores, increasing understanding, and allowing students to connect with the lessons being taught. In my classroom, I strive to create meaningful activities for the students in an attempt for them to connect to and gather meaning from the topic. This study of the flipped classroom showcases a method of instruction and classroom activities. The pedagogy allows students to introduce a topic and gather their own meanings outside of the classroom, then explore the topic and create their meanings or exclude their misconceptions during in-class, critical thinking, inquiry-based activities. The purpose of this study was to identify and examine the types of flipped classrooms and their impact on student performance.

Technology is heavily emphasized by professionals in many school districts. Examining a teaching approach that uses technology to change the way class time is used to, potentially, increase student engagement and performance and use precious class time to achieve higher level understanding and learning activities may prove to be time better spent. The 2014 NMC Horizon Report, which looks at potential new technologies and studies them for their possible impact on teaching, identified that a flipped classroom is a model that will have a considerable impact in education in a year or less because "the learning environment transforms into a dynamic and more social space where students can participate in critiques or work through problems in teams" (Johnson, Adams Becker, Estrada, & Freeman, 2014, p. 37). The 2015 NMC Horizon Report identified that the flipped classroom model is most widespread in the United States (Johnson, Adams Becker, Estrada, & Freeman, 2015). The results and conclusion of the Speak Up 2013

National Research Project Findings stated that, not only are teachers and administrators interested in using technology to mold student learning experiences, they are interested in the flipped classroom model because of the potential of improving student performance and teacher effectiveness (Project Tomorrow, Flipped Learning Network, 2014).

Research Question

What is the flipped classroom and how can it be strategically implemented to facilitate meaningful classroom activity that could result in student growth?

Definitions of Terms

Flipped classroom: a model of delivering instruction that shifts lectures from a class time activity to an at home activity and shifts "homework" from an at home activity to an in-class, critical thinking set of activities.

Flipped learning: "pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter" (Yarbro, Arfstrom, McKnight, McKnight, 2014, p. 5).

Traditional teaching: the practice of a teacher led, in-class lecture as the primary learning activity in the classroom and comprehension activities assigned as homework.

Alternative teaching: for the purposes in this paper, any teaching style that deviates from the traditional style of teaching. Usually using technology and collaborative learning to help students make meaningful connections with the topics being taught.

Critical thinking: thinking which stimulates higher levels of questioning, learning, and understanding of any given subject

Student growth: student improvement individually or collectively in areas such as course grades, standardized test scores, homework completion

Project-based activities: students gain understanding by working individually or collaboratively on critical thinking activities that extend beyond one-answer questions. These activities provoke higher-level thinking.

Chapter 2: Review of the Literature

Definition of Flipped Classroom

There are many different models of a flipped classroom. Not all methods of delivering instructional content in a flipped learning environment look the same, but there are a few common, necessary, and core components to effectively put this practice into place. Jonathan Bergmann and Aaron Sams are thought to be the pioneers of the flipped classroom. Bergmann and Sams (2012) are quick to recognize that "...there is no single way to flip your classroom-there is no such thing as *the* flipped classroom" (p. 37). The idea of a flipped classroom is a mindset, a methodology, not a mold that classrooms can be placed into. To better facilitate educators in properly implementing an effective model of the flipped classroom, the Flipped Learning Network established four pillars of flipped learning that represent key practices in this model of teaching. They use the acronym "FLIP" to give an overview of these elements:

F: Flexible Environment

L: Learning Culture Shift

I: Intentional Content

P: Professional Educators

(Hamdan, McKnight, McKnight, & Arfstrom, 2014).

A flexible learning environment means adaptability to learning styles as well as teacher accommodations in the classroom. The classroom is manipulated to best suit the learning activities that are taking place during any given lesson. Students may be given the flexibility to choose the order and importance of their learning activities. This flexibility can also apply to the assessment and evaluation tools that the teacher uses to assess student learning. Summative

assessment has the ability to move away from a traditional, multiple-choice or essay response test. Students can be allotted the freedom to write, create, or converse in the classroom setting to show their mastery of a given concept.

The learning culture shift refers to the idea of the teacher's role shifting from the main source from which students receive information, to a guide. The teacher, as a guide, creates meaningful exercises and allows students to construct their own understandings during supervised, critical thinking, in class activities.

Intentional content speaks directly to teachers understanding, evaluating, and focusing on the key learning content that needs to be provided and available to the students. Once the essential material is identified, teachers decide what material can be delivered via recorded introductory lectures, and which material is best suited and can be best supported during in class activities.

Lastly, the Flipped Learning Network (2014) addressed the need for professional educators. Not only are teachers who use a flipped classroom model responsible for delivering the traditional lecture, as any other teacher is, but they are challenged and required to create meaningful, critical thinking activities to deepen students' understanding. They are shifting their classroom to a student-centered model that allows valuable face-to-face interactions to be spent creating new knowledge and understanding, not introducing new concepts and asking students to explore them on their own time.

Technology Accessibility

Some educators, administrators, and parents have voiced some concerns over the use of a model of teaching that requires students to be introduced to new knowledge at home via online

videos. Nationally, many areas, especially rural areas, do not have readily available and affordable Internet access. According to Roehl, Reddy, and Shannon (2013), "The success of [a flipped classroom] relies on the availability of computers and access to the Internet outside of the classroom" (p. 48). How can a student be expected to participate in the introduction of new knowledge if they do not have the resources necessary to access it? In my research, this is one of the most asked, and possibly easily solved questions. Although the recorded lecture material is created electronically and with Internet access, it does not necessarily need to be viewed that way. Some schools have opened their doors to students beyond regular school hours so that students have access to the material before or after school. Teachers have made the content compatible with students' personal devices and have even burned DVDs of the lectures for students to watch at home on their own DVD player (Finkel, 2012). Even though a video lecture has come to be identified as the main vehicle for content delivery in a flipped classroom setting, it is not the only available format. It can just as readily be made available in a podcast or other audio format (7 things you should know about flipped classrooms, 2012).

Video Lectures

Other teachers who have used a flipped classroom model have concerns that the primary mode of delivering content and information to the students is still a lecture. Since this is still the main vehicle to deliver information, there are concerns that the struggling learners are not being reached and that a flipped classroom design is "... a better version of a bad thing" (Ash, 2012 p. S6). In a traditional classroom setting, a lecture is paced and controlled by the teacher. One of the main advantages of putting the lecture in the hands of the students is giving them the ability to control the pace. For students who are struggling and have a hard time keeping up with

the pace of a traditional lecture, a recorded video lecture can help alleviate some of the anxiety and confusion of a teacher paced lecture (Siegle, 2014).

A number of educators have expressed concern about their ability to make or find high quality videos that address their desired learning objectives. Many of these educators are asking for proper training in these areas (Project Tomorrow, Flipped Learning Network, 2014). Even for those teachers without extensive training and who are not comfortable with or lack the knowledge of how to create the videos, there are many online resources available. YouTube, TeacherTube, and Educannon are just a few of the resources teachers commonly turn to for prerecorded lessons. Another option that Finkel (2012) became aware of is collaborating with other teachers. When working collaboratively, one teacher does not need to devote all the time necessary to make videos that are tailored to the learning objectives that need to be covered. Collaborative teachers can share the responsibility of creating the learning content. Teachers can choose to divide the work by lessons, by units, or even by which content they are most comfortable with. Not only can the workload be shared, but so can the expertise and wisdom of colleagues.

Attitudes and Inferences

Still, other professionals are concerned that a flipped classroom is a way to replace teachers with video lectures (Hamdan et. al, 2013). Some say that the idea of video instruction gives the impression that a teacher is replaceable and that learning can go on with or without these professionals.

Attitudes of students can be hard to gauge. In any educational setting there are students who are seemingly unmotivated or unwilling to learn new content. This type of student creates

another concern of a flipped learning model. This approach calls upon students … "to assume more responsibility for their individual learning experience" (Roehl et al., 2013, p. 48). As in a traditional classroom, students who are unmotivated may fail to complete their assigned tasks, therefore falling behind their peers who have been exposed to the necessary background knowledge (Siegle, 2014).

The Teacher's Role in the Classroom

To fully understand how vital the role of the skilled, professional, classroom teacher is in a flipped model, one must understand the differences in the role the teacher plays in each type of classroom set up: the traditional classroom and the flipped classroom. The teacher is present in both situations to teach and guide the students, but the focus shifts from the teacher being the main vehicle of information to the teacher being a guide to help students develop an understanding of content.

The teacher's role in the traditional classroom. In this setting, the teacher acts as the main source of information for the students. The teacher is responsible to delivering instructional material to a classroom full of students with differing learning abilities and styles. The teacher delivers one classroom learning activity during the allotted class time, answering questions, and giving examples in order for students to develop an understanding of the material. If applicable to the lesson, students are assigned homework on the presented topic, "...which many students perform in a private hell of frustration and confusion" (Goodwin & Miller, 2013, p. 78). When completed, students turn in the homework and move on the next day's lesson, the next day's lecture. Unless purposefully planned for, immediate feedback and correction of

misunderstandings does not happen until the assigned homework is corrected. The teacher and the assigned homework guide students to the desired understanding of the content.

The teacher's role in the flipped classroom. In this setting, the teacher prepares a lecture that is recorded either by him or herself or is obtained from another professional source. The time that the teacher spends creating or acquiring this instructional content is, "...the most visible but least critical step in the planning process" (Hirsch, 2014. p. 2). This precise, 10-20 minute video is viewed by the students at home. Many teachers choose to load all their classroom content into a learning management system. As long as students have access to the Internet, they then have access to the learning content.

Before fully implementing this model, the teacher teaches the students how to watch the videos, encouraging them to pause and replay the video as needed, take notes, and write down questions they have. Sometimes, to ensure that students are taking part in their out of class learning experience, teachers require that a concise but comprehensive task be completed before coming to class the next day. These tasks could include online quizzes, worksheets, writing assignments, or another chosen activity that is worth points in the student's overall course grade (Brame, 2012).

When the students return to class the next day, the teacher goes over the questions, misconceptions, and other issues the students raise from their notes on the video, then introduces the class to the learning activities that s/he created for the day. Students are given any needed instructions, then they begin working on the assigned tasks. Because the "homework" has been shifted into the classroom environment, Goodwin and Miller (2013) stated that, "...increased student-teacher interactions give teachers more opportunities to provide feedback to the

students" (p. 79). As the teacher provides feedback and guides students through their critical thinking activities, s/he is available to help students who struggled with the concept at home. In a flipped classroom model, the role of the teacher "...becomes even more important—just less visible" (Hirsch, 2014. p. 2). Hirsch went on to note that teachers are more available to lead critical thinking discussions, provide one-on-one support to struggling students, or facilitating an extension activity with high-performing students. The teachers also uses assigned activities to facilitate students in their development of learning, challenging them to create new meanings and think on a higher level.

Ways to Flip the Classroom

As stated earlier, there is no cookie cutter mold that a flipped classroom has to fit. Even though there are ineffective models of a flipped classrooms that do not allow for the pedagogy to be used to the fullest potential, there are more than one effective models that has the components necessary to be successful.

Traditional flip. Students are assigned video lectures as homework. The purpose of this homework is to introduce or preview the information that the students will need the next day. The students watch the videos and complete any corresponding work that goes with it. The next day in class, the teacher reviews any questions the students may have and introduces the learning activity for the day. Students complete during class the work that would have been traditionally assigned as homework. In all flipped classroom models, the teacher is available to facilitate discussion, guide learning, and help students problem-solve as they work through a concept. Students are responsible for completing the learning activities by a particular due date. Students are also responsible for taking ownership of their learning by completing any and all assigned at

home learning exercises. The 2015 NMC Horizon Report found that a flipped classroom model is effective because it gives students an opportunity to interact with, engage with, and learn from their peers. The traditional flip is the most recognized and most commonly used model of flipping the classroom (Johnson et al., 2015).

        In-class flip. The in-class flip has many of the same characteristics of the traditional flip, with the exception of students needing to complete video-watching or learning activities at home. In the in-class flip, all learning activities, including the introductory lecture or activity, is done within the classroom. The classroom is set up into stations where groups of student work independently, collaboratively, or a combination of the two, to complete the project-based, critical thinking activities. Gonzalez (2014) stressed the importance of having a few infinite stations where the activity is never really "over" but has many possibilities and variations that can be useful for students who complete an activity early. They can use these stations as reinforcement while waiting for the rest of their group to complete the original task. The difference between the in-class flip and simple station work is the role of the teacher. The teacher is free to move between the stations to guide learning, help clear up any misconceptions, "...but never having to redeliver the lesson itself" (Gonzalez, 2014). Students that need to see the video again, or would benefit from extra time at any particular station, are able to review those stations as needed because of the necessary flexibility of a flipped classroom.

        An in-class flipped classroom can also support current research that homework at an elementary age has a negative impact on learning and attitude toward school. As reported by Shumaker (2016), "If you examine the research—not one study, but the full sweep of homework research—it's clear that homework does have an impact, but it's not always a good one.

Homework given too young increases negative attitudes toward school. That's bad news, especially for a kindergartener facing 12 more years of assignments" (Shumaker, 2016, (http://time.com/4250968/why-parents-should-not-make-kids-do-homework/?xid=tcoshare).

Within the in-class flip model, the teacher has the ability to self-contain all the learning activities, keeping all the essential and necessary work within the confines of the school day. This model also eases worry and struggles for students without internet access outside of school.

Mastery flip. As identified by Bergmann and Sams (2012), the mastery flip has three main components: **"**Students work either in small groups or individually at an appropriate pace. The teacher formatively assesses students and gauges student understanding. Students demonstrate mastery of objectives on summative assessments. For students who do not master a given objective, remediation is provided" (p. 107).

At the beginning of a course, students are given a list of learning objectives, and the activities, lectures, and assessments that go along with those objectives. Through the course of the class, students are free to complete activities in their own time. As activities are completed, students demonstrate their knowledge in the summative assessments. If their performance on those assessments meets the criteria, they are free to move on to the next set of learning objectives. If not, they complete additional learning activities until they have mastered the concept.

As with any classroom model, the mastery model of a flipped classroom has its challenges. Deb Wolf, from the Sioux Falls, South Dakota, district commented "for students who had not been challenged in the classroom, this was an opportunity for them to just fly... for

others, it was an opportunity to take the time that they needed to move slower. And for some, self-paced became no pace (Ash, 2012. p. S7).

　　To overcome this barrier, she allowed students to work at their own pace through the given material, but she set due dates for certain learning activities and assignments.

　　The ineffective way to flip. Though there are multiple "correct" formats of a flipped classroom, improper procedure and implementation of flipped learning can result in failure. According to Siegle (2014), "Flipping the classroom is an easy model to get wrong. Choice is an essential component of a flipped classroom. The focus is on students' needs" (p. 55). If lectures are recorded, assigned as "homework," but the learning activities are not changed to suit the needs of the students, a flipped classroom cannot be effectively implemented. Teachers need to be flexible in the ways they meet the needs of their students. For many, that means evaluating and changing what they would traditionally have assigned as learning activities. An effective flipped classroom requires timely, careful preparation of learning content as well as learning activities (7 things you should know about flipped classrooms, 2012).

Reactions

　　Although there are many different facets to a flipped classroom experience, reactions to the pedagogy by groups of people have been positive. People are excited about this model of teaching and many look forward to further, more widely used implementation practices.

　　Students. In the Speak up Survey by Project Tomorrow and the Flipped Learning Network (2014), of the over 180,000 students who completed the survey of their flipped classroom experience, almost three-fourths of them stated that this model was a good way for them to learn. Students enrolled at Byron High School of Byron, Minnesota, experienced this

model of teaching when their math department chose to create their own curriculum in a flipped format style, rather than spend money on a new curriculum. The teachers devoted the time necessary to make high quality videos and meaningful, critical thinking activities in the classroom and student reactions were recorded in an end of course survey. Examples of students' comments include: "I personally like that I can get through the lesson quicker than when we have...class lecture. Then, when I do homework in class, I can have help right away, which means I ask more questions." "I liked how I could rewind and pause the lectures in case I didn't understand something." "I liked that we watched the concept at home, but then mastered the concept in class" (Fulton, 2012, p. 24).

Parents. Sometimes, especially in an upper elementary or high school setting, parents struggle to help their students with their assigned homework. Some parents have not used the particular set of math, language, or science skills, do not recall the correct facts, or are just uncomfortable with the subject in question. With a flipped classroom model, parents now have access to the same information that the students receive. They are able to see the exact information the students are presented with. This can enable them to better assist their student when they come across a challenge or a misconception. Having access to this content allows them to be more active and more involved in their student's learning (Hamdan et. al., 2013). Not only does this model of teaching allow parents to view the instructional video, but as Fulton (2012) noted, it also takes some of the pressure for immediate help off of the parent because their student is able to ask the critical thinking, deep understanding questions to the teacher the next day during the classroom activities.

Teachers. Reactions from the educators who are actually putting this model of teaching into action in their classrooms have been rather positive. Professional educators strive to make his or her teaching better. We are always looking for ways to effectively connect to our students. In the same manner, we look for ways to connect to and help our colleagues in our joint journey for professional development and resources. Teachers at the Byron School District are especially happy with the professional development and collaboration it allowed them to participate in. With the support of their administration, they have created a "...veritable open-source catalog of effective teaching techniques" (Fulton, 2012, pp. 24-25). If students are not connecting with a particular topic, teachers have developed a professional relationship that allows them to access another professional's videos on the same topic. They are not limited only to the way they, as individual teachers, would deliver information.

Administrators. One of the main job of an administrator is to evaluate the effective use of district resources; including time, money, and talents. In the 2013 Speak up Survey, 25% of administrators recognize the flipped classroom as having a significant impact on the teaching and learning that was happening in their districts (Project Tomorrow, Flipped Learning Network). This was a higher percentage than those that recognized mobile devices and apps as having the same effect. Administrators may also find it necessary to have flexibility in their school policies. If a school has a ban on personal devices or the use of YouTube on the school network, as the Byron, Minnesota, School District did, they may need to be flexible and understanding in their consideration of what is appropriate use and release such restrictions for this model of teaching to work effectively (Fulton, 2013).

       The Flipped Learning Network (2014) also identified specific support that is necessary for school administration to provide with the implementation of a flipped classroom model. They stated that, during observations, administrators need to note, even though the classroom seems loud and chaotic, whether or not the students are actively engaged and learning. They also urge the administrators to "serve as a buffer for teachers who flip their classroom. As with anything new, there are bound to be many questions and concerns from parents and even other teachers, and administrators should be prepared to address them" (Hamdan et al., 2013 p. 14). Administration support is an essential, key component in a successful flipped classroom learning environment.

Chapter 3: Recommendations

Based on the research and literature review provided, it is my recommendation that more research be conducted to get broader, more comprehensive information on the uses and effects of the flipped classroom. Implementation of a flipped classroom is multi-faceted, therefore, there are implications for the professionals who wish to put the design to use in their classroom.

Quantitative Data

To better understand the implementation, uses, and effects of a flipped learning model, more research needs to completed. The NMC Horizon Report stated, "While there is little national research on the effectiveness of the flipped classroom model as compared with traditional lectures, there are several experiments underway that are helping to establish a valuable baseline" (Johnson et al., 2015, p. 39). This model of teaching, though it is relatively new, is gaining in popularity. The body of research covered in this paper spanned from 2012-2015. As the popularity, use, and misuse of this model of teaching expands, so should the research. Data should be collected on flipped learning models and their use in elementary schools, middle schools, high schools, as well as higher education. There is a pool of research and knowledge on this topic currently available for high school and higher education. New research could focus on the implementation, uses, and effects of a flipped learning model in elementary and middle school groups.

Most research presented to date includes comprehensive data from one classroom, one teacher, one topic, year to year. If possible, it would be beneficial to see longitudinal data on one group of students throughout their education career. How does a single group of students react to the model the first time they see it? How was their learning impacted? How is student

reaction and learning impacted after several years of exposure to flipped classrooms? Was student achievement on tests impacted? If there was growth, was the growth constant over multiple years in a flipped classroom setting? Sometimes the implementation of a new method is enough to pique student interest, but I wonder if the interest and effects last over many years.

Qualitative Data

As this pedagogy grows and is implemented over the next few years, qualitative data could also be collected from teachers, students, parents, and administrators to compare and contrast the initial reactions, effectiveness, and concerns against the same topics after years of implementation. After the initial interest and/or pushback from various groups of people, do their understandings, attitudes, and concerns change over time?

Implications for Schools

Implications for administration. For a new approach to be successful, it is essential for administration to be supportive and open the ideas of their staff. If teachers are interested and ambitious about implementing a flipped learning model in their classrooms, the administration needs to be flexible, embrace the undertaking, and provide meaningful, useful, easy to access opportunities for professional development. Although teachers are generally very resourceful and ambitious when given a task they care about, they will still need support, ideas, and assistance in this undertaking.

Implications for teachers. It is important to point out that simply placing technology in the hands of professionals and instructing them to use it is not supporting their endeavors. Though providing necessary technology is a crucial step, follow-up is essential to being successful. It is not enough for a school district to provide students and staff with technology,

then leave the teachers to figure out the best way to use the devices. Implementation of

technology in the classroom implies a couple of things: the knowledge of basic and advanced

operations and features of the device provided, and a comfort level of using the new technology

with a group of students.

Time, resources, and patience is needed to effectively implement the use of technology

in the classroom, let alone using the technology to completely change the format and delivery of

curriculum in a flipped classroom model. Roehl et al. (2013) noted that teachers reported

spending two hours per topic to create the needed instructional materials during the initial

implementation of their flipped classroom. That preparation time was reduced after the

groundwork was completed. They spend less time creating lecture presentations, and were able

to use their time in class to better facilitate depth of student understanding and increase

knowledge retention. When asked about their flipped classroom, Bergmann and Sams (2012)

stated that they "...start each class with a few minutes of discussion about the video from the

night before" (p. 13) and that they are "...no longer the presenters of information; instead, we

take on more of a tutorial role" (p. 14). Implementing a flipped classroom will change the

preparation, planned activities, and the teacher's role in a classroom,

Flipping the Classroom

As discussed, there are a variety of models for flipping a classroom. However, it is

important to note that not all models of flipping are appropriate for all levels or situations in

education. Until students have a deep understanding of themselves, their learning style, and their

motivation to attain an education, the mastery flip model is not an appropriate fit. Because of

these elements, an elementary education setting is not the best vehicle for adopting a model of

flipped learning where the students are in complete control of the information they receive, the types of learning activities they perform, and the pace at which they complete the tasks. "The flipped classroom requires a lot of autonomous work, which may be disorienting to students who prefer to rely on the teacher as the leading source of information" (Johnson et al, 2015, p. 38). It is important for students to retain, analyze, and apply the information that is presented to them as they complete their learning activities; not simply go through a required set of motions to "get a grade." A flipped classroom model allows students to be more aware of the type of learner they are as well as their own learning processes (Roehl et al., 2013).

Consistent and thorough modeling of *how* a student navigates the learning materials is essential to the success of a flipped classroom. To contain, control, and observe student interactions with the learning materials can be easily achieved through the in-class model of a flipped classroom. In implementing this model, the teacher can easily monitor how the students use the information being presented, as well as walk them through using their technology concerns. In an elementary setting, I would suggest using the in-class flip model is the most appropriate for the age level. In high school, a traditional flipped classroom could be implemented successfully with the appropriate expectations, training, and monitoring.

The teacher in a flipped classroom is responsible for many tasks: creating or finding viable, essential information to present to the students; creating or finding meaningful, creative thinking activities to enhance and demonstrate student learning; assessing learning activities for effectiveness, misconceptions, and student learning; being available to students on a daily basis for immediate feedback, support, and enrichment. Because a flipped classroom model alters the role of the teacher and the allocation of time, teachers get greater insight regarding how students

interpret and understand information (Roehl et al., 2013). Using a flipped classroom model is not an easy task. It is crucial that a teacher complete his or her own research and adapt the pedagogy in a manner that fits their classroom.

Conclusion

There is more than one proper way to implement a flipped classroom. With available technology, expertise, and ambition, a teacher can effectively deliver instructional materials to students outside of the classroom then use available class time to enrich student learning, provide immediate feedback, and readily clear up misconceptions that stand in the way of true understanding and learning. Though there are some concerns, criticisms, and improper implementation, there is research and support for this modern pedagogy. It is critical that teachers do their own research before implementing this type of model in their classroom. Teacher, administrator, and classroom flexibility are essential to the success of a flipped classroom.

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