Deep exploration of the flipped classroom before implementing

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There is a new trend in education. What is old is new again. The flipped classroom is all the rave. Teachers, principals, and college professors are all implementing the flipped approach in their schools and university courses. However, they must possess the wherewithal to stop and deeply examine what the research reveals about this approach. This paper scrutinizes every aspect of the flipped classroom that educators would find beneficial before adopting it as a viable teaching strategy. This paper clearly explicates an understanding of its history, recommended practices, resources, effectiveness, benefits, and pitfalls. Everything an educator needs to know is embodied in this thorough investigation of the flipped classroom. This paper concludes with a summary of the research and suggestions for future studies.

Keywords: benefits of flipping, recommended practices in flipping, flipping research, flipping history, Khan Academy and flipping, criticism and flipping

INTRODUCTION & PURPOSE

The flipped classroom is experiencing the most successful resurgence of any method for delivering content in the classroom. There is certainly a renewed interest in implementing this digital approach for teaching today's students. Khan Academy has been at the forefront of this overnight sensation (Hennick, 2014).

The purpose of section one of this paper is to examine a definition, some history, and the theoretical basis for the flipped classroom. Other significant areas located in section two are examining the lecture method, today's students, and teaching pressures. The third section of the paper pertains to the following topics: benefits, advice before flipping, what critics say, available research studies, a summary of the research, and future studies. It concludes with closing comments.

SECTION ONE

Definition

The flipped classroom can be described as individual video-based learning outside the classroom and group learning inside the classroom (Bishop & Verleger, 2013). The classic definition is about videos taking the place of direct teaching with more individual time for students during class time. Homework is no longer done at home but in class, thus the term flipped or inverted classroom (Bergmann, Overmyer & Wilie, 2013).

The flipped classroom should not be described as a series of online videos that take the teacher's place and leave the students with no sense of direction (Bergmann, Overmyer & Wilie, 2013). Flipped classrooms that are successful embody these traits (Bennett, Kern, Gudenrath & McIntosh, 2012; Cohen & Brugar, 2013):

1. Students lead discussions in class of outside content studies and gain more knowledge.
2. Students demonstrate high order thinking skills.
3. Students apply content to contextually real situations.
4. Students mentor and collaborate with one another and own the learning and can review videos as needed.
5. Students ask deep questions and motivate one another and get to really build a relationship with the teacher.
6. Students engage in active learning and move from just sitting.

Though technology exist, teachers may not be integrating technology in a meaningful and positive way (Pilgrim, Bledsoe & Reily, 2012) but the flipped classroom can be what teachers are in need of.

The idea of flipping the classroom has gleaned lots of media attention from USA Today, The Globe, Washington Post, and CNN, though it has been around for over a decade (Johnson, 2013). The Khan Academy has been the rage with its free offerings of materials (Baker & Settle, 2013). The academy is about the work of Salman Khan who created a collection of online videos covering a plethora of subject areas known as the Khan Academy. Salman Khan was a hedge-fund analyst who quit his job in 2006 and has since received backing from Bill Gates and Google. Many people partially credit him with the popularity of the flipped classroom (Ash, 2012). The term flipped actually came from a man called Karl Fisch, teacher and technology expert, who first called it the *Fisch flip* but he credits Bergmann and Sams with it all (Sams,

2011). Some view flipping as an exchange of classwork for homework. It is also called backwards classroom, reverse instruction, flip teaching, and reverse teaching (Siegle, 2014). There is no one way to flip and some describe as a mind-set or an ideology but not a method (Siegel, 2014).

History

Two rural secondary teachers of chemistry, Jonathan Bergmann and Arron Sams are considered as the ones who popularized the flipped classroom (Handen, McKnight,P. McKnight, K. & Arfstrom, 2013; Siegle, 2014). Apparently, they noticed that students were missing class to attend competitions, games, or other activities and they had other students who had trouble with certain concepts which hindered completing homework until they got help in class. This led to using videos to record lectures, demonstrations, and presentations that they decided to post on YouTube for students to view (Handen, McKnight, McKnight & Arfstrom, 2013; Siegel, 2014).

Bergmann and Sams started a non-profit Flipped Learning Network (FLN) in 2012. It is known as the FLN Ning which is a free website offering information, resources, and what one needs to know when flipping a classroom. It has now reached 12,000 educators (Handen, McKnight, P., McKnight, K. & Arfstrom, 2013). Since the growth is expanding, the researchers at George Mason University with the Support of Pearson wrote a white paper to further explain the model (Handen, McKnight, P., McKnight, K. & Arfstrom, 2013).

In 2012, Jonathan Bergmann and Aaron Sams introduced their book, *Flip your classroom*: *Reach every student in every class every day*. The book explains (Hantla, 2014) using flipped activities from an AP chemistry class. If a teacher decides to flip, the authors recommend making his or her own videos that are short and animated. They suggest using another teacher in the video, adding humor, and following the guidelines for copyrighting. They give ideas for utilizing classroom time with students effectively. The next phase of the book described a more advanced model of flipping that lessened their paperwork because students could choose many ways to show learning. They also built an encouraging environment for student learning. This advance model is recommended to experienced teachers and not those new to the profession.

Theories

Social constructivism is at the root of the flipped classroom (Jarvis, Halvorson, Sedeque & Johnston, 2014). The flipped classroom is often linked to problem solving, inquiry learning, and active learning plus interpersonal communications (Jarvis, Halvorson, Sedeque & Johnston, 2014). In the flipped classroom, students learn new knowledge that they must connect to past learning and this causes them to realign their view of the world. They converse with peers in the classroom that ultimately lead to deeper learning. The process of learning as Piaget and Vygotsky explain it is apparent. But is that, not what an education should do, push us to probe and compete with others while adapting to the world around us and simultaneously being influenced by parents and friends in our immediate circle? The social constructivist theory undeniably fits with the benefits of the flipped classroom.

SECTION TWO

Lecture Method

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The lecture method is still number one in most classrooms (Roehl, Reddy, Shannon, 2013). Educators need to get beyond memorized learning to higher-level thinking processes. The flipped classroom offers active learning. Active learning approaches include small groups, individual, and cooperative groups where students collaborate, brainstorm, role-play, peer tutor, map, or produce projects (Roehl, Reddy, Shannon, 2013). The lecture method is described as a scripted speech to students with the hope that the learning of all the information will be regurgitated (Mazur, Harvard Professor, 2012). Lectures are described (Clark, 2007) as: 1. Creating passive students who are dependent on writing good notes when their attention is often lost after 10-20 minutes. 2. Delivering too much content for processing 3. Only presenting content at one special place at a specific time 4. Boring because presenters are unable to keep the attention of the audience. However, lectures can have worth if they are not too lengthy and if they can capture student involvement.

Today's Students

Students of today have been referred to as digital natives or millennial students. They have experiences with technology at an early age unlike other students in other generations. These students learn differently because social media that they use often is a way of life (Roehl, Reddy, Shannon, 2013). They need collaborative learning experiences. Mark Prensky (2001) discussed how these digital natives learn differently than those before them. They have different desires and not the same kind of patience with learning. The idea of getting these students actively engaged is a formidable task. They have information at hand and are familiar with participating in environments calling for involvement and reaching out to peers. Through the internet, they can ultimately connect with others around the world. Educators must engage them differently. Flip classrooms emphasize students as the center for learning and not the teacher as the lead act on stage but a facilitator in the background (Siegle, 2014).

Teaching Pressures

In training pre-service teachers, pressure is placed on faculty to offer them current ideas and methods that will prepare them to teach their future students. Pre-service teachers will need to prepare to teach students who have already participated in online learning and using technology daily (Vaughan, 2014). Statistics report that 97% of classrooms have computers and 93% have the internet available in classes daily (U.S. Department -National Center for Educational Statistics, 2011). Meanwhile, universities and school systems are looking for ways to save money on strained budgets (Berrett, 2012). In larger research universities this method can be a more efficient way of teaching to large class loads.

Faculty members could use their time differently and serve as part of the new transition in teaching and learning (Berrett, 2012). Flip classrooms utilize video lectures from renowned educational speakers. Politicians, policy persons, and other groups want to see how technology is tied to the education of students in colleges. After all, Noam Chomsky, an American linguist and philosopher, was accurate when he retorted that education's purpose is to train students to grow to the stage where they can learn on their own (Elets News Network, 2014).

SECTION THREE

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Benefits

There is a wide spread degree of curiosity about using the flipped classroom (Hennick, 2014). It is an approach implemented in Spanish, science, math, elementary, middle, high school, and it is used with older adults (Patel, 2013). It is imperative that possible benefits are explored here. Morgan (2014) declares that the flipped classroom allows for self-pacing yet students are assured of feedback from the teacher thus keeping the teacher aware of any misunderstanding of the content. Other advantages include students having access to the video to view whenever they need to. Another aspect deals with the fact that the teacher is free to create videos that can be challenging and can involve other co-workers with whom they can exchange views.

Parents can view the videos and can help with homework. At Byron High School in Minnesota, the district was able to save some money on textbooks when flipping started (Morgan, 2014). Teachers created lessons and posted to You Tube with the creation of a free Moodle site. Students also showed improvements academically and others wanted to partake in the flip, for example science, social studies, and language arts faculty (Morgan, 2014). Byron High was able to attract an even better caliber of educators and received a national award in math called the Intel School of Distinction in 2011 (Fulton, 2012, April). The flipped classrooms used the Khan Academy videos created by a Harvard business school graduate who was trying to aid his cousin in math and decided to place steps on You Tube, which marked the beginning of the successful Khan Academy.

In Los Altos, California in 2010, the district experimented with math for 5th graders and utilized Khan Academy. With success of the program, they branched out to all 5th, 6th, and 7th grades. This program allowed teachers to keep up with how well students were doing and how many they got correct or not correct and how much time was spent per problem. Teachers could see if students got the problems correct when hints were given.

Roehl, Reddy & Shannon (2013) explicated on how students got to reflect on their learning and how teachers gave immediate feedback. Teachers used voiceovers for videos, screen capture software and gave instructions with visual aids. Students asked questions at class sessions instead of interrupting a lecture. The class did not slow up because of students not attending due to sports, contests, or other extra-curricular activities. Teachers made changes to videos as needed.

There were 15,000 members surveyed through the National Center for Case Study Teaching in Science List-Serve which reported (Herreid & Schiller, 2013) that teachers could spend more time on research projects with students, teach science equipment, allow students to interact through activities (i.e., games, paragraphs, contests, problem solving). Students had time to think in and out of class. Students seem to enjoy participating in the flipped classroom. A physics teacher commented on how students viewed the podcast at home and when class sessions met, students did meaningful assignments applying what they learned from viewing (Herreid & Schiller, 2013). It seems that 86% of science faculty use lecture as main method for explaining (Gates & Mirkin, 2012).

Fulton (2012, October) discussed a survey from parents in the Byron School District in Rochester, Minnesota where 84% agreed that the flipped approach was number one method for teaching content. She continued with benefits such as how teachers could spend more time with what students did not comprehend. Teachers could provide many other sources for teaching and

were able to chunk the content as needed and not overload students. It is important to note that there is no one way for classroom flipping (Jarvis, Halvorson, Sadeque & Johnston, 2014).

Advice before Flipping

There is advice offered here to aid in understanding the possible impact of the flipped classroom. According to Spencer, Wolf & Sams (2011), classroom activities must be motivating enough so students will understand and produce good products. Teachers create activities that allow students to use the content they learn into real-life assignments. Many teachers do not use the classroom times with students wisely.

Teachers are not required to use their own videos but some recommended videos are Khan Academy, YouTube EDU, and PBS. Teachers should think carefully about which phase of a course to flip. Students need to understand the benefits. Educators need to survey students to figure out what kind of technology students have. Finding other options for students such as, DVDs or places where they can go is necessary. Plan ways to get students to watch videos for instance, using worksheets, questions to answer, and quizzes to take. Set deadlines for helping students keep up with assignments as Deb Wolf, a high school instructional coach, did in South Dakota (Ash, 2012). Flipping will not make a weak teacher a strong teacher (Ash, 2012).

Miller (2012) implored teachers to make a list of what and why students need to know the content from the video. Teachers should add flipping to a model that's already successful and find out early the technology available to support this process (Hennick, 2014). Teachers must include reflection time for assignments and offer a time and place for them to watch videos. Flipping can become a habit once started. Find teachers who have flipped and talk to them. Flipping will not replace teachers, but they can become more like counselors who have challenging experiences with students. Teachers get to experience the light bulb phenomena and see enthusiasm from students (Hennick, 2014).

Patel (2013) reminds teachers to keep podcast short and simple and make sure videos specifically connect to assignments. Take time to discuss with students this new flipping teaching strategy. On the other hand, Berrett (2012) reminds teachers that the feedback they give must be immediate and must hit the target. Figure out early which steps in the process are working for students.

McLean & White (2009) declare that creating podcast and vodcasts are tiring and will take more time than anticipated. If instructors have to be trained, it can get rather difficult. Do not assume students are comfortable with the technology. The survey from Harrison Group 2006 (Mclean & White, 2009) found that students spent more time downloading music ,85%, videos 10% and podcast and audio texts under 5%. Another concern is that small schools often do not have the resources or power needed to integrate the technologies as larger universities do.

If teachers decide to create their own video lessons, they need to make sure to (Siegle, 2014): 1.) Choose a recording spot carefully 2.) Organize ahead of time what to record, i.e., paragraph, sample poster project, a powerpoint book report 3.) Record the information as though talking to students and repeat as many times as needed for the course 4.) Save it in a place where it is easy to locate. 5.) Critically examine the examples included, tempo of the lesson, and the assessment assignments.

Critics

Before transitioning to the research studies, it is essential that the criticisms or pitfalls of this teaching strategy are explained clearly, in foreseeing comments that may be encountered from students, parents, administrators or colleagues. Herreid, Schiller, Herreid & Wright (2014) explicate on the student issues that are often prevalent. Students tend to resist this new method and may attend class ill-prepared, but this can be averted with the use of short online quizzes or in class quizzes or required assignments tied to information covered from reading or videos from the night before. Another problematic area may be locating quality videos. The best videos can be located at Khan Academy and BozemanScience.

When producing videos Siegle, (2014) encouraged the use of Camtasia Studio, Papershow, or ShowMe software programs or apps on the iPad like Educreations and Explain Everything. Post videos on YouTube, iTunes U or Podcasts (Vodcasting) or management systems like Blackboard or Moodle. Creating classroom videos is extremely time-consuming. Siegle (2014) recommends Jing as the most popular software program. Lectures and videos of no-cost are available on Apple's iTunesU, YouTube, TedTalks and Screencast-o-matic website (http://www.screencast-o-matic.com).

Morgan (2014) refers to the flipped method as a high tech method of the lecture unconcerned about how students really learn. Andrew Miller, ASCD Educational Consultant in Virginia, describes it as an old-fashioned approach or a better version of a terrible teaching strategy (the lecture). Khan Academy has encouraged inflated goals too exorbitant to accomplish because the problems of k-12 will not dissipate through digital transactions.

Talbert (2012) uncovers students' feelings of being alone in learning with a form of cultural shock at this opposite way of participating in a classroom. Instructors must ultimately collect numerous formative activity results to demonstrate student learning and to convince students of their progress. Instructors must diagnose and delineate areas of concern about what students are not learning as well. Handen, McKnight, McKnight & Arfstrom, (2013) digress on to a loss of the most loved, Socratic, in- your-face method of teaching. There is a fear of hiring poor, low-level teachers who would take the positions of the highest paid experienced teachers.

It is not fair to expect students to view videos for every class every evening. Videos must be short, 5 to 10 minutes for viewing outside of the classroom (Siegle, 2014). Teachers do not possess the skills to make all of the videos needed to teach the content for lessons. Educators will be forced to become more tech savvy than ever before as technology continues to grow (Roehl, Reddy & Shannon, 2013). Bergmann and Sams, the founders, explained (Roehl, Reddy & Shannon, 2013) how they checked students' notes every day from video watching the night before. Each student brought a question to class. They gave students time to adjust to the process and in time, saw improved questions brought to class. There was a change in thinking to a more deeply-fashioned as the school year progressed. There were financial considerations to ponder in the public schools and whether or not if students have the technology outside of school before deciding about this endeavor (Roehl, Reddy & Shannon, 2013).

The method relies on online materials and will be problematic unless there is a suitable technology infrastructure (Sparks, 2011). This method is still in its early stages, still developing (Sparks, 2011). The top-down implementation (making it a requirement for all) will not work, but teachers who want to flip and believe in flipping will make a difference (Hennick, 2014). Labs may not be open after school for students to work in, but they will need this time. Flipping should be for certain classes. Berrett (2012) reminds us that professors must answer questions at a minute's notice and this means additional time before class.

Education Next (2013) suggested that the flipped classroom may only work for upper-income, suburban or private schools. Parents are expected to provide the technology and it may cause students to get behind. Perhaps this will just highlight the inequities from district to district. It is questionable that the charter schools (KIPP, Rocketship, Alliance, and Summit) that demonstrate success for low-income students are not jumping on board with the flipping trend. This method will not likely result in massive improvements needed in learning in our country. Most students will continue to matriculate in the rectangular school houses that have adapted some form of technology for learning (Education Next, 2013).

Johnson (2013) sums up criticisms with 1.) it frees students from physically attending class 2.) it is a showdown of division-those who have the technology and those who do not 3.) it makes the teacher seem pretty much unnecessary 4.) it does away with a real-life teacher bringing a good in-person lecture.

Research Studies

Now we examine the studies available on this method. While there are limited empirical studies on the impact of the flipped approach on learning, there are research reports from teachers on the use of the approach. This section will summarize research from k-12 and higher education.

In Minnesota, at Byron High School (Fulton, 2012, June-July) the teachers decided to flip the curriculum in the math department. The teachers rewrote lessons, located materials on the internet, and created their own short videos, 10 or 15 minutes that students could watch at home. They saw a mastery from 29.9 percent in 2006 to 73.8 percent in 2011 on Minnesota Comprehensive Assessments and saw a rise on ACT scores from 2006 (21.2 on scale of 36) to 2011 (24.5). The school received the National Blue Ribbon School in 2010 by U.S. Department of Education. They were given the Intel's School of Distinction Award in high school math in September 2011.

At Clintondale High School in Michigan where majority were inner city kids (Johnson, 2013; Handen, McKnight, McKnight & Arfstrom, 2013), the school decided to flip all of its ninth grade classes in 2010. They saw failure drop close to 33 percentage points and the number of discipline cased went from 736 in 2009 to 249 in 2010 to 187 in 2011-74% drop in two years (Green, 2011). Parental complaints dropped (200 to 7). The school went to a flipped model in fall of 2011.

Musallam in 2010 wanted to determine the use of screencasts (a video recording of computer screen) as a pre-teaching approach for instructing an AP high school chemistry course. In examining pre-and post-assessments, he saw an increase in performance on assessments (Johnson, 2013).

Strayer (2012) compared the traditional introductory statistics class to a flipped statistics course through the use of field notes, interview focus groups, and the University Classroom Environment Inventory. The flipped classroom students were less satisfied with the structure of the classroom but became more open to newer approaches to teaching. Leicht, Zappe, Litzinger, and Messner (2012) decided to flip an architectural engineering course of freshmen. The results on the Student Assessment of their Learning Gains (SALG) showed that the flipped class of students outperformed the traditional classes with higher final exam scores and overall success in the class. Comments on the survey revealed more interest in the course, less intimidation of chemistry, and how useful the videos and powerpoints were.

Day and Foley (Bishop & Verleger, 2013) used the flipped approach in a senior-level computer interaction course. In comparing the experimental and control group, the students in the experimental section scored higher on all homework assignments, projects, and tests. At the University of California at Irvine, an introductory biology course used the flipped classroom. The results showed an increase on the average of 21% better on exam questions that were usually taught through traditional lecture. Professors reported (Papadopoulos & Roman, 2010) that students in an electrical engineering class after using the flipped method moved faster and helped their peers with learning. The test scores were well above those in the traditional courses.

Summarizing the Research

There are few quantitative and qualitative studies on the flipped approach (Handen, McKnight, McKnight & Arfstrom, 2013). But there is research that substantiates student achievement after using the approach. There are limited studies explicating the impact of the approach on groups such as the gifted or English Language Learners. There are surveys pertaining to principals and superintendents interested in the model as well as positive comments from parents.

Research on flipped classrooms has basically shown (Bishop, & Verleger, 2013) students rate the approach as positive but a few are not happy with the approach. The approach works best if a quiz is given after viewing videos prior to class meeting. Students like face-to-face teacher lectures but prefer the activity-based class meetings. Students want short videos over longer ones. In higher education classes in the United States (Vaughan, 2014), studies have demonstrated improvements in student engagement, preparation, and achievement for the flipped approach.

Future Studies

More studies are needed on student perceptions of the flipped model (Johnson, 2013). We need research to guide best practices (Jarvis, Halvorson, Sadeque & Johnston, 2014). There is little or no research to examine how the flipped approach impacts the infrastructure across campus or at other universities (Vaughn, 2014).

Closing

The flipped approach is not for every class or every teacher. Teachers would benefit from training in how to actively get students involved in the approach. There must be a change in thinking if this approach will work for teachers and students. What we can learn from this approach is how powerful active teaching is in the classroom. Trying to encourage students to come to class prepared is not a new battle for teachers because teachers understand the effect prepared students can have on how much can be learned. The most important feature in this approach is still the teacher who understands the learners and has a repertoire of many teaching methods. Bergmann and Sams, the founders, believe that teachers should use the videos they create and offer other sources as alternatives. In this digital age of differentiation, teaching will continue to evolve.

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