

A 2020 VISION

FOR PUBLIC EDUCATION in ULSTER COUNTY

**The Flipped Classroom.
An Approach to Teaching
and Learning**

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**The Benjamin Center, SUNY New Paltz
Ulster County School Boards Association**

The Flipped Classroom.

An approach to teaching and learning

Jonathan Bergmann and Aaron Sams, two chemistry teachers in Woodland Park, Colorado, needed to help students who had missed class - because of sickness, or varsity sports, or for other reasons - catch up on their school work. It was massively inefficient, in fact impossible, to try to teach each student each missed lesson, one at a time. So they decided to create a series of videos of their lectures for the absent students to watch at home. Word got out. Soon, Woodland Park students who had attended class began watching the videos for clarification as they worked on their homework assignments. Then, educators and students from other districts found and used the videos as well.

Watching all this, Sams realized that the videos could be used routinely to teach core course material the night before each class met, with class time the next day used to engage with students and ensure understanding; the conventional instructional model could be “flipped.” More teaching time was gained, and more effective teaching and learning achieved. The next school year, Bergmann and Sams began recording lectures for every class and every unit, flipping their classrooms completely (Bermann & Sams, 2012).

Now, teachers across the country are making the decision to flip their classrooms, offering short video lectures at home, and using class time for application of the material learned at home (Bishop & Verleger, 2013; Educuse, 2012; Herreid & Schiller, 2014). In a flipped classroom, “students gain first exposure to new material outside of class, usually via reading or lecture videos, and then use class time to do the harder work of assimilating that knowledge, perhaps through problem-solving, discussion, or debates” (Brame, 2013, p. 1). The teaching/learning effort thus becomes far more student centered and “class time is meant for exploring topics in greater depth and creating richer learning opportunities” (Hamdan et al, 2013, p. 5).

The change to the flipped classroom takes time, effort, and commitment on the part of teachers and students. In this essay, *A 2020 Vision for Public Education in Ulster County* explores the phenomenon of the flipped classroom and discusses its benefits and disadvantages, the resources necessary to make the flip, and the practical experience of some teachers as they transitioned to this new technique for teaching and learning.



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BENEFITS OF THE FLIPPED CLASSROOM

Those of us who have gone through traditional school – that’s most of us - are familiar with the traditional, lecture-formatted classroom. In this model, class time requires multitasking; students listen to an instructor speak, process the new information being conveyed, and write down key ideas for future reference.

However, there is research that suggests that this may not be the best mode of transmitting new material. According to Cognitive Load Theory, the working memory is limited in the amount of information it is able to process and store; when it is overwhelmed with information the process of learning is disrupted (Hamdan, M., McKnight, P., McKnight, K., & Arfstrom, K., 2013). Flipping a classroom accounts for this problem by allowing students to learn new material at their own pace: they can pause the video to take notes and process information; they can rewind and review the video if there is something they do not understand (Educause, 2012; Bergmann & Sams, 2012).

With the lecture delivered, teachers can dedicate class time to the active integration of new knowledge. In the flipped classroom model, class time is often used for student collaboration, skill development, presentations, problem solving – all to foster a deeper understanding of content (Mazur, Brown, & Jacobsen, 2015). Teachers can engage with individual students, or groups of students, to ensure the material has been mastered. Dedicating classroom time to the practical application of content gives teachers more time to assist students who are struggling, which is particularly helpful because it allows teachers to witness mistakes students make as they are making them; teachers gain a better sense of students’ thought processes, which, in turn, enables them to better tailor instruction to assist that student (Houston & Lin, 2012). Students who have mastered the material can move ahead with more

complicated tasks and engage in work that extends their learning (Herreid & Schiller, 2014).

Finally, flipped classrooms also have the unique characteristic of being able to educate parents alongside their children. Parents can watch the video lectures, thereby connecting them more closely to their child’s education (Bergmann & Sams, 2012).

CHALLENGES OF THE FLIPPED CLASSROOM

The flipped classroom model is heavily dependent on technology; students must have access to a computer (or similar device) and the internet so they can watch videos at home. Ensuring access to technology is the responsibility of educators. For students who do not have access at home, schools can increase the operating hours of computer labs at school or increase access to library computers. Where possible, some schools might consider providing all students with their own personal electronic device with internet access. Likewise, teachers must have access to, and be comfortable with, technology that will allow them to record and edit videos, and then upload them to the internet so that they are accessible to students.

Flipping a classroom requires considerable time and commitment on the part of the teacher. Planning, filming, and editing a quality video presentation is a time-consuming endeavor, especially for those not familiar with filming and editing technology. It takes time for teachers to become proficient with filming and editing equipment. In addition, striking the right tone and pace for a video presentation may take some experimentation. The engagement level of the videos is also critical; a lecture that is tedious in school will also be tedious on video. Teachers who have successfully flipped their classrooms state that the most promising videos are no more than 15 minutes long, depending on the age and attention-capacity of students, and often include some interaction between

teachers (one teacher teaches, another asks questions) or interaction with a presentation format, such as Prezi or PowerPoint. In addition to spending time creating videos, teachers must also re-conceptualize how they will utilize classroom time to accommodate more active learning.

And then there are students' responsibilities. Teachers who have flipped their classrooms have found that they had to teach their students how to engage with the videos. At first, many students watched the videos quickly and without absorbing the information. Teachers found that they had to demonstrate their expectations about video viewing. Some teachers use time during the first few days of school to watch a video with their class and demonstrate appropriate engagement with the video; how to take notes taking or rewind the video for clarification. Despite this effort, in some instances videos may go unwatched; just as with traditional homework assignments, some students will not complete them. Some teachers develop strategies to mitigate this, for example by requiring students to take a quick quiz when they come in to class the next day, or having students take notes on, or respond to questions in, the videos. Regardless, teachers must be prepared to deal with students who arrive to class unprepared, as class activities revolve around key components of the previous night's video.

As is true of all pedagogical approaches, the flipped classroom may be implemented poorly. Flipping a classroom creates the potential for active, engaged, student-centered learning, peer interactions, and personalized instruction. But none of this results automatically from moving direct instruction outside of the classroom. Teachers need to be committed to transforming their instruction and their use of classroom time. Students must develop self-management skills that allow them to engage with the videos and then be active learners in class. For teachers and students alike, the transition to a flipped model takes time, effort, and commitment.

TOOLS OF THE FLIPPED CLASSROOM: TECHNOLOGY

Technology is the primary tool of the flipped classroom. As mentioned previously, students need access to technology to be able to watch videos at home; equally important is educators' access to, and comfort with, the technology necessary to film, edit, and upload their videos. There are a variety of different video recording devices that teachers may use. For educators who already use PowerPoint or SmartBoards in their classroom, the use of screen casting software





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that records screen movement and allows for narrations to be recorded may be the most convenient way to create lecture videos (Bergmann & Sams, 2012). Other instructors use similar software but on a tablet device. Still others choose to set up a camera and film themselves lecturing. Some do this throughout a single school year, recording their class lectures in real time so they can be edited for flipped learning videos in the future (Bergmann, 2014).

The preferred mechanism for publishing and uploading completed lectures is widely dependent on a school district's technological infrastructure. There are a variety of venues available; choosing the right one for each classroom is important. Some teachers upload videos to YouTube and burn copies of lectures onto DVDs for optimum accessibility (Bergmann & Sams, 2012). Others make videos available through a district-based program, such as Office 365. Analyzing the various features of each potential website and picking out one that best suits the needs of the classroom is essential for smooth implementation of the flipped classroom.

Creating the video itself takes much time and planning. There are three stages to this process; recording, editing, and publishing. The success of the flipped classroom is very dependent on video quality (Bergmann, 2014; Bergmann & Sams, 2012); voice recordings must be done clearly with minimal background noise, and cameras or recording software must capture clear images. As for content, video recordings should be casual and use colloquial language that is accessible to students. The pace of the videos, their length, and the amount of information conveyed in each should match students' capacity given their age, skill-level, and attention span. The editing function allows educators to add additional notes or comments to aid in understanding and to keep videos concise and engaging.

OUTCOMES OF THE FLIPPED CLASSROOM

Several anecdotal studies are finding benefits from the flipped classroom. Three years after it flipped all high school math classes, one school district in Minnesota saw a 50 percent increase in the students passing the state math exams; another district in Colorado saw an increase in test scores in math, science, reading, social studies, and writing (Hamdan et al, 2012). In New York's Niagara Falls City School District, passing rates for the Algebra/Trigonometry regents increased by 20 percent (students achieving at the mastery level increased by 3 percent) after a teacher adopted the flipped model (Western, New York Regional Information Center, 2013). And more broadly, in a national survey of over 400 teachers who utilized the flipped model 67 percent reported increased test scores for their students (Hamdan, 2012).

In a survey of students and teachers who had been teaching and learning in a flipped classroom environment, Driscoll (2012) found overwhelming support for the model. Almost 80% of students reported that their interactions with peers and teachers during class time were more positive in flipped classes than in traditional courses. Students also report that in a flipped course they are more likely to engage in collaborative decision making with other students; use class time to engage in critical thinking and problem solving; and have greater opportunity to work at their own pace. Of the educators surveyed, 100 percent reported that student learning in their classroom became more active after they transitioned to a flipped model. Over 90 percent of educators stated that positive interactions with their students increased; students were more likely to engage in critical thinking; and instruction became more differentiated and personalized (Driscoll, 2012; see also Yarbrow et al, 2014).

Not all research on flipped classroom has shown positive outcomes, however. Some schools have not seen a substantial difference in test scores after flipping courses. These findings may have to do with implementation of the model, as proper implementation – quality videos and active learning during class time – is essential to its success (Bormann, 2014).

SNAPSHOT OF TEACHERS WHO ARE FLIPPING THEIR CLASSROOMS

We sought to learn from teachers in our region who have flipped, or are in the process of flipping, their classrooms. We looked for a range of models; flipping at the elementary, middle, and high school level, in different academic subject (math, science, ELA, and history), and with a range of experience with the flipped model. Below we detail these stories of the flipped classroom in action.

High school math: Geometry

A high school math teacher (geometry and calculus) is in her first year of flipping her classroom; she has made some of her own videos and also uses videos created by other high school math teachers. Her students are asked to complete notes as they watch the video at home and then upload the notes to the teacher's home page. This allows the teacher to see which students watched the video and also eliminates the need to collect notes in class—another time-saver. This teacher reports that she likes the model, particularly the ability to work closely with students in

class. She feels that it has allowed her to get to know her students much more quickly, and this in turn has allowed her to offer more targeted support – both for students who need extra help and for those who can do more advanced work.

Getting a flipped classroom up and running has not been easy. Making quality videos has been very time consuming. This teacher advocates strategic video making; tackling video creation slowly, making videos of the most challenging topics first (she has found that students prefer to learn from their teacher) and supplementing with existing videos, and then creating videos for all of the course topics more slowly, over time. This teacher has also been challenged by students who do not watch the videos at home and come to class unprepared. Her solution has been to require these students to watch the videos in class before they can engage with their peers in classroom activities. This teacher has had to spend considerable class time teaching students how to engage with the videos at home. She intends, in year two of her flipped classroom, to make this a focus of the first few days of class. Also, next year, she will use a flipped/blended instructional model in which some topics are flipped and some are not, depending on the needs of her students.

High school math: Calculus

Six years ago, two math teachers in a high school began to create videos of lectures for a few units in their shared course. The decision to create videos stemmed, in part, from a long time frustration with assigning math homework; they had experimented with different approaches, sometimes reviewing homework in class, sometimes simply checking to see if students did the work and giving credit for trying rather than correct answers, and sometimes posting the solutions to the homework online with the problem set. Regardless of approach, these teachers felt that homework -- which was essential for practice – was not reaching all of their students. While some students were able to grasp concepts quickly and easily, others were not. These struggling students needed guidance and support; leaving them on their own to solve problems at home was exacerbating their frustration and alienating them from the coursework further.



This teacher has had to spend considerable class time teaching students how to engage with the videos at home. She intends, in year two of her flipped classroom, to make this a focus of the first few days of class.



This notion of a “partial flip” is important. “The flipped classroom is a tool in your toolbox. You still have to determine what your students need and present information in a way that they will understand.”

From this point, these teachers decided that it would be productive to have students do the “homework” in class so that they could be there to provide support in real time. And they decided that creating videos of some of their course content, which students would then watch at home, would free up time during class for this interactive work. This effort has paid off; the team now has videos that cover all topics in their courses, and which they use strategically throughout the year, depending on the student need in their classes. But, rather than “flip” their classrooms entirely, this team has decided to utilize video lessons in multiple ways; sometimes to introduce a new topic, sometimes to reinforce difficult concepts, sometimes as a review of material that was “practiced” that day in class. Recovered class time is dedicated to discovery of new concepts, working through problems, and individualized support. But even still, sometimes, this team will introduce new material in lecture form during class – all depending on what students need.

This notion of a “partial flip” is important. “The flipped classroom is a tool in your toolbox. You still have to determine what your students need and present information in a way that they will understand.” And just as students learn in different ways, concepts themselves are best learned in different ways. “Some concepts lend themselves beautifully to exploration and discovery; some don’t.” The point; instructional videos, and the flipped model more broadly, is one of many instructional strategies that these teachers integrate into their instruction.

Students have reported that they like the flipped format, when it is used; they appreciate the practice and support that they receive in class and they find the videos accessible and engaging. The teachers appear in the videos together, with one teacher presenting the material and the other, often in a funny way, interrupting to ask clarifying questions. Thus, even though the content may be heavy (this is calculus, after all), the tone of the videos remains light and

fun. Students take a daily quiz when they first arrive in class; this is one way the teachers ensure students watch the videos.

The team feels that shift has been productive; they see an increase in student engagement and understanding of the material, it allows them to differentiate instruction more effectively, and frees up class time for the important work of integrating new knowledge. To others who are thinking about flipping their classrooms, whether they do it fully or partially, these teachers offer advice: 1) Go slowly. Start with just a few of your own videos and “borrow” from others – or have a hybrid traditional/flipped classroom. It takes a lot of time and effort to get started, but once you set up the infrastructure (videos and new lessons), it gets easier; 2) Take the time to teach students how to engage with the videos. Don’t assume they know how to do it; 3) Use class time to work with students and have them work together. Peers can often be a great support to one another; they are an underutilized resource; and 4) make sure the videos are interesting and engaging, just as good teaching should be; “‘Chalk and talk’ on the computer is just as bad as it is in the classroom.”

Middle School: ELA, Social Studies, Science, and Math

Two sixth grade teachers who teach in a team, one who teaches English and Social Studies and another who teaches Science, Social Studies and Math, have flipped their classrooms. They describe their classroom routine before and after the flip:

Before we flipped our class, we would spend about 30 minutes lecturing and having the students take notes. The remaining 10 minutes would be dedicated to discussion of the material. Now, since students are getting the lecture and notetaking through the video at home, the entire class time can be dedicated to discussion and active learning.

These teachers have been very deliberate about the creation of their videos, experimenting with different formats and finally settling on an approach that reaches their students; both teachers appear in all videos, their collegial banter providing an extra level of engagement for their students. These teachers have also found that pacing is important; videos are no longer than 10 minutes and visual presentations, when used, have about 36 words per slide (6 bullet points, 6 words per bullet). Students are expected to watch each video and follow along with a guided note sheet to help with comprehension. In addition, these teachers spend time at the beginning of each year teaching students how to watch these videos, modeling and practicing in class.

Videos are streamed through a program called Office Mix. In addition to featuring the videos, this program allows the teachers to collect information about their students' participation. For example, the teachers can monitor which students watch the video, the length of time students spend on each topic, and how many times students rewind the video, or rewatch a particular part of the video. This allows the teachers to see where students are struggling; they will then reteach that topic in class. Office Mix also allows the teachers to embed questions in the slides; students type their answers in as part of their assignment. The data generated by Office Mix is important to

the success of their flipped model; these data points, combined with students' notes, and interactions during class time, yield a wealth of information about their students' understanding of course material. "The analytics provided by the program and the notes and the questions they [the students] have to answer really give us a lot of information about what our students understand and the places they may need extra support."

Creating videos for all of the core academic subjects is challenging. Thus, this team began with Social Studies and then expanded to science. In Social Studies, videos focus on historical information and the skills necessary to analyze texts. During class time, students practice map skills, working with different types of historical sources, writing, and comprehension. Science video assignments cover scientific concepts and ideas, including the scientific method. Class time is spent in the lab, applying these concepts. And eventually, when the teachers are able to "flip" English Language Arts, video assignments will cover approaches to writing, such as compare and contrast, the elements of poetry, strategies for analyzing a text; class time will be used to practice these skills, discuss texts, and engage in collaborative peer writing.



Overall, the teachers find that their students are benefitting from the flipped model. Homework is more accessible and more fun. Class time is more engaging. “With the lecture out of the way, there is time for deeper exploration of, and engagement with, course content.” Finally, parents have also come to see the benefit of the flipped model. “At first, some parents were concerned about too much screen time,” but ultimately, they came to understand that the videos are just a different way for students to learn.

Elementary school: Second grade

The flipped classroom method is not just for upper grades. A second grade teacher, upon learning about the model, thought that it might be a good way to engage her young students. She and a co-teacher decided to begin with math. Together, they created videos, slowly and over time, of the topics within the second grade math curriculum. These teachers used the program Explain Everything, an interactive whiteboard, to create and edit their videos. Videos were then uploaded to a YouTube channel where they remain accessible to students. Videos are short – only about 1-3 minutes each.

Children watch the videos at home; sometimes they are then asked to solve math problems that correspond with the lessons they just watched. But in some instances, children watch the videos during class – either as review or for the first time. And often, students use the videos as a resource while they are working on applying the concepts; “it’s like having me (the teacher) times 10.” Students have access to the videos in class through iPads.

This teacher reports many advantages to using the flipped model in her classroom. Most significantly, the method frees class time for hands-on math activities; even though videos are only 1-3 minutes, she is happy to reclaim these minutes – and the transition time between activities – for group work and practical application of the material. Giving students time to process the material, through hands-on activities and sometimes group activities, has helped deepen student understanding, and exploration, of mathematical concepts. Along the same lines, the time gained from the lecture allows this teacher to give more attention to struggling students. And finally, the flipped

model – specifically the videos – allow for repetitive instruction; students can watch the videos as many times as necessary to make sure they understand the content.

This teacher has also observed greater independence among her students in the flipped classroom. Rather than running to the teacher when they have a question, students have learned to turn first to the video or to their peers in their working group to answer questions. And finally, this teacher has found that the videos are helpful to parents themselves, as they allow parents to learn alongside their children. This has been especially important given the introduction of the new math curriculum. “I have gotten a lot of positive feedback from parents. Parents are learning the new way that we are teaching math and they are then able to help their children.” Feedback from parents has been overwhelmingly positive.

Giving students time to process the material, through hands-on activities and sometimes group activities, has helped deepen student understanding, and exploration, of mathematical concepts.



Conclusion

The flipped classroom is an instructional strategy that requires a reconceptualization of the traditional approach to teaching and learning. This transition calls for a significant investment on the part of teachers and students; the time that it takes to make the videos; time to reconceptualize class time; and time for students to become accustomed to a new model of teaching and learning. And it also requires the commitment, and support, of administrators who allow teachers to try new and innovative teaching strategies. Many are making this commitment – across the country and here in Ulster County.

Author Bios

Lynne Drake is a high school mathematics teacher in the Rondout Valley Central School District, where she teaches Geometry, AIS Math, and College Statistics to general education and special education students. Prior to this, Lynne served in the field of education in a variety of capacities, including as an adjunct lecturer at Mount Saint Mary College; director of the Fletcher School Board, Fletcher VT; director of education at the First Congregational Church, Essex, VT; and founder of *Vermont Success by Six*, a grant-funded local preschool program that was free to all town residents. Prior to entering the field of education, Lynne worked with the IBM Corporation, where she held several positions including account marketing representative, manufacturing/quality engineer, and business analyst. Lynne received a Bachelor of Science in Mechanical Engineering and a Bachelor of Science in Engineering and Public Policy from Carnegie-Mellon University and a Master of Science in Education from Mount Saint Mary College. She is a member of the Association of Math Teachers of New York State and the Kappa Delta Pi International Education Honor Society.

Micaela Kayser has worked with the Benjamin Center on a variety of education-related projects and has co-authored on three additional Benjamin Center publications. Her work with the Benjamin Center was included in the 2015 and 2016 SUNY New Paltz Research Symposiums. In 2015, Micaela was selected to attend the NEW Leadership New York Summer Institute, a leadership development program for college women and also completed an internship at Maternal-Infant Service Network, a nonprofit dedicated to family and community health and wellness. Micaela graduated from SUNY New Paltz in the spring of 2016 with a degree in Women's, Gender, and Sexuality Studies and now works at the Emma Willard School in Troy, NY as the Coordinator of Advancement Services.

Robin Jacobowitz is the director of education projects at the Benjamin Center for Public Policy Initiatives at SUNY New Paltz. Previously, Robin worked with Janice Hirota and Associates on an evaluation of school reform initiatives in New Orleans, Washington DC, New York City, and Dallas. She also worked at New York University's Institute for Education and Social Policy, where her research centered on the growth and development of charter schools in New York State, the organizational structures that facilitate teaching and learning in New York City small high schools, and leadership transitions in new schools in New York City. She worked with the University of Chicago's Chapin Hall Center for Children, where her research focused on the relationship between constituency building and policy work in effecting systemic school reform in New York State. Prior to beginning her career in research, Robin worked with the Public Education Network in Washington DC, where she provided technical assistance to local education funds around the country on issues of school governance, school health, and public engagement. Robin holds a MEd in education policy from the Harvard University Graduate School of Education, and a Ph.D. from the Robert F. Wagner Graduate School of Public Service at New York University. She is currently a trustee on the Kingston City School District Board of Education and serves on the board of the Teaching Empathy Institute, and the executive committee of the Ulster County School Boards Association.

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Gerald Benjamin, Janis Benincasa

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