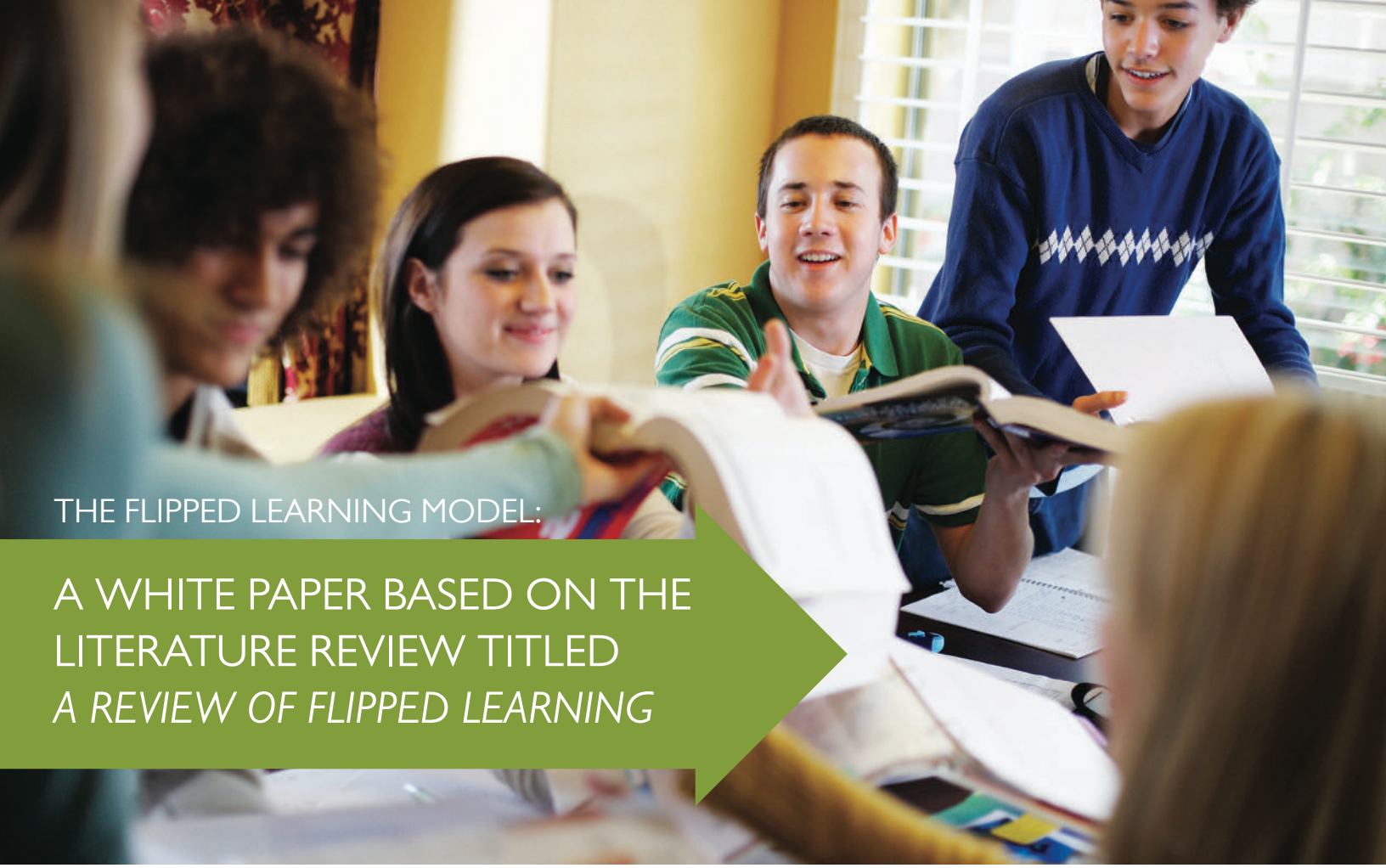

THE FLIPPED LEARNING MODEL:

A WHITE PAPER BASED ON THE LITERATURE REVIEW TITLED *A REVIEW OF FLIPPED LEARNING*

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A teacher stands at the front of the classroom, delivering a lecture on the Civil War and writing on a white board. Students are hunched over desks arranged in rows, quietly taking notes. At the end of the hour, they copy down the night's homework assignment, which consists of reading from a thick textbook and answering questions at the end of the chapter. This dramatic, defining period in our nation's history, which left questions unanswered that are as relevant today as they were then, has been reduced to a dry, familiar exercise. The teacher is acutely aware that many students do not understand the day's lessons, but does not have the time to meet with them to help during the 50-minute class period. The next day the teacher will collect the homework and briefly review the previous night's reading assignment. But if students have additional questions there won't be time to linger; the class cannot fall behind schedule. There is a lot of material to cover before the test at the end of the unit.

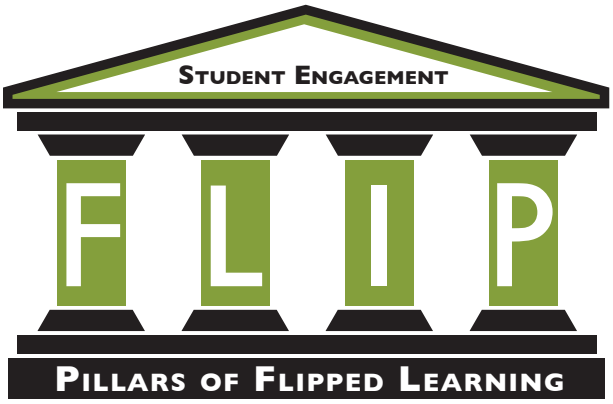
Although it conflicts with decades of research into effective practices, this model of instruction remains all too common in American K-12 and postsecondary classrooms. However, more and more educators now recognize that the learning needs of students, rather than the curriculum pacing guide, should drive their instruction. Educators are developing ways to personalize learning, using technologies such as video, digital simulations, and computer games. However, unless the traditional teaching model is altered, technologies such as these will have limited effects. One alternative model gaining attention and advocates is called Flipped Learning. In this model, some lessons are delivered outside of the group learning space using video or other modes of delivery. Class time, then, is available for students to engage in hands-on learning, collaborate with their peers, and evaluate their progress, and for teachers to provide one-on-one assistance, guidance and inspiration.

Two rural Colorado chemistry teachers, Jonathan Bergmann and Aaron Sams, are often referred to as the pioneers of Flipped Learning. Concerned that students frequently missed end-of-day classes to travel to other schools for competitions, games or other events, they began to use live video recordings and screencasting software in 2007 to record lectures, demonstrations, and slide presentations with annotations. Those materials were then posted on the then-nascent YouTube for students to access. In a book on their work called *Flip Your Classroom: Reach Every Student in Every Class Every Day* (2012), Bergmann and Sams reported that after they flipped their classroom, students began interacting more in class and, because time could be used more flexibly, students who were behind received more individual attention while advanced students continued to progress.

In 2012, Sams and Bergmann started the not-for-profit Flipped Learning Network™ (FLN) to provide educators with the knowledge, skills, and resources to successfully implement the Flipped Learning model. The online Community of Practice called the FLN Ning, is a free website for educators who have flipped or wish to flip their classes. To gauge the growth of interest, in January 2012, about 2,500 educators were members; by March 2013, more than 12,000 educators were participating in the Network's Ning.

With interest continuing to grow, the Flipped Learning Network™, with the support of Pearson and researchers at George Mason University, undertook a comprehensive review of research relevant to the model.[1] This white paper defines and describes the Flipped Learning model, briefly note its historical foundations and address common misconceptions. We discuss some of the learning theories that underlie Flipped Learning and describe limited empirical research findings.

1 See www.flippedlearning.org/review for full length review.



DEFINING FLIPPED LEARNING

In a Flipped Learning setting, teachers make lessons available to students to be accessed whenever and wherever it is convenient for the student, at home, in class, during study hall, on the bus to a game, or even from a hospital bed. Teachers can deliver this instruction by recording and narrating screencasts of work they do on their computers, creating videos of themselves teaching, or curating video lessons from trusted Internet sites. Students can watch the videos or screencasts as many times as they need to, enabling them to be more productive learners in the classroom. Since direct instruction is delivered outside the group learning space, teachers can then use in-class time to actively engage students in the learning process and provide them with individualized support.

Those are the basic elements of a flipped classroom but, as with traditional classrooms, no two flipped classrooms are identical. While there is no "how-to" list associated with the Flipped Learning model, there are unifying themes. A cadre of experienced educators from the Flipped Learning Network, along with Pearson (2013), identified those four Pillars of F-L-I-P™, an acronym of Flexible Environment, Learning Culture, Intentional Content, and Professional Educator.[2]

FLIPPED LEARNING REQUIRES FLEXIBLE ENVIRONMENTS

Flipped classrooms allow for a variety of learning modes; educators often physically rearrange their learning space to accommodate the lesson or unit, which might involve group work, independent study, research, performance, and evaluation. They create Flexible Environments in which students choose when and where they learn. Flipped educators accept that the in-class time will be somewhat chaotic and noisy, as compared with the quiet typical of a well-behaved class during a lecture. Furthermore, educators who flip their classes are flexible in their expectations of student timelines for learning and how students are assessed. Educators build appropriate assessments systems that objectively measure understanding in a way that is meaningful for students and the teacher.

2 The four Pillars of F-L-I-P™ are **F**lexible Environment, **L**earning Culture, **I**ntentional Content, and **P**rofessional Educator.

FLIPPED LEARNING REQUIRES A SHIFT IN LEARNING CULTURE

In the traditional teacher-centered model, the teacher is the main source of information, the teacher is the "sage on the stage" (King, 1993), i.e. the sole content expert who provides information to students, generally via direct instruction lecture. In the Flipped Learning model, there is a deliberate shift from a teacher-centered classroom to a student-centered approach, where in-class time is meant for exploring topics in greater depth and creating richer learning opportunities. Students move from being the product of teaching to the center of learning, where they are actively involved in knowledge formation through opportunities to participate in and evaluate their learning in a manner that is personally meaningful. Students can theoretically pace their learning by reviewing content outside the group learning space, and teachers can maximize the use of face-to-face classroom interactions to check for and ensure student understanding and synthesis of the material. Flipped educators help students explore topics in greater depth using student-centered pedagogies aimed at their readiness level or zone of proximal development, where they are challenged but not so much so that they are demoralized (Vygotsky, 1978).

FLIPPED LEARNING REQUIRES INTENTIONAL CONTENT

Flipped educators evaluate what content they need to teach directly, since lectures are an effective tool for teaching particular skills and concepts, and what materials students should be allowed to first explore on their own outside of the group learning space. They continually think about how they can use the Flipped Learning model to help students gain conceptual understanding, as well as procedural fluency. Educators use Intentional Content to maximize classroom time in order to adopt various methods of instruction such as active learning strategies, peer instruction, problem-based learning, or mastery or Socratic methods, depending on grade level and subject matter. If they continue to teach using a teacher-centered approach[3], nothing will be gained.

FLIPPED LEARNING REQUIRES PROFESSIONAL EDUCATORS

Some critics of Flipped Learning have suggested that the instructional videos employed in the model will eventually replace educators. That is misguided. In the Flipped Learning model, skilled, Professional Educators are more important than ever, and often more demanding, than in a traditional one. They must determine when and how to shift direct instruction from the group to the individual learning space, and how to maximize the face-

3 The teacher-centered approach as described by Huba and Freed (2000) emphasizes a passive student role in learning as teachers transmit knowledge, outside of the context in which it will be used. The teacher is the primary information giver and evaluator, and assessment is used to monitor learning, with an emphasis on the right answers.

to-face time between teachers and students. Gojak (2012) noted that the right question for educators to ask themselves is not whether to adopt the Flipped Learning model, but instead, how they can utilize the affordances of the model to help students gain conceptual understanding, as well as procedural fluency when needed. During class time, educators continually observe their students, provide them with feedback relevant in the moment, and continuously assess their work. Professional Educators are reflective in their practice, connect with each other to improve their trade, accept constructive criticism, and tolerate controlled classroom chaos. While Professional Educators remain very important, in a Flipped Learning model, they take on less visibly prominent roles in the classroom.

RESEARCH ON FLIPPED LEARNING

Quantitative and rigorous qualitative research on Flipped Learning is limited, but there is a great deal of research that supports the key elements of the model with respect to instructional strategies for engaging students in their learning. As mentioned throughout this paper, a key feature of the Flipped Learning model is the opportunity to increase active learning opportunities in the classroom by shifting direct instruction outside of the larger group learning space. A significant body of research on active learning strategies supports the effectiveness of these approaches in increasing student learning and achievement (e.g., see Prince, 2004).

Active learning provides students with opportunities to interact with content through reading, writing, listening, talking, and reflecting (University of Minnesota Center of Learning and Education, 2008). Evidence indicates that active learning also improves student academic performance (Hake, 1998; Knight & Wood, 2005; Michael, 2006; Freeman et al., 2007; Chaplin, 2009); increases student engagement and critical thinking; and improves student attitudes (O'Dowd & Aguilar-Roca, 2009). Akinoglu and Tandogan (2006) showed that problem-based active learning in science courses has a positive influence on student academic achievement and attitudes and conceptual development. The researchers also found that students who engaged in active learning had significantly fewer misconceptions.

Eric Mazur at Harvard University is a leading researcher on "peer instruction" (1996), which emphasizes the kind of in-class interactional elements made more practical in a flipped classroom. In a talk he gave in 2011, he discussed how assistive technology allowed students to respond and give feedback during the peer instruction session, demonstrating how the process maximizes time with the instructor and increase the focus on higher order thinking skills. In traditional settings, students use such time for note taking and repeating information.[4]

In Mazur's model, students are engaged by having them confront the logical progression of their thinking and their misconceptions. "Once you engage the students' minds, there's an eagerness to learn, to master," Mazur explained (Berrett, 2012). Bloom (1984) observed that the constant feedback and correction students receive significantly improves learning and achievement. Additionally, decades of research on how student misconceptions can interfere with learning, indicate the importance of strategies to identify and overcome those misconceptions (e.g., Lochead & Mestre, 1988).

4 Keynote at the Building Learning Communities conference in Boston, 2012.

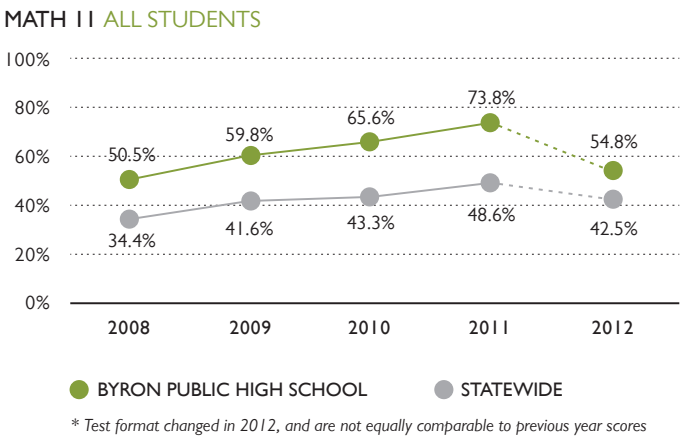
In addition to research on active learning and peer instruction that supports several proposed mechanisms of the Flipped Learning model, Ramsey Musallam, a chemistry teacher in San Francisco and adjunct professor of education at Touro University, researched the effects of pre-training (receiving instruction prior to in-class instruction) on in-class learning. His study found, not surprisingly, that students who had studied material outside of class found it to be easier to learn new material in class (Musallam, 2010). This and other studies (Ayers, 2006; Mayer, 2009) suggest that pre-training may be an effective means of managing intrinsic cognitive load, thus facilitating learning.

Little formal data exist to show the effect of Flipped Learning on special populations, such as English language learners. But it is reasonable to think that they would benefit in several ways. Marshall and DeCapua (2013) note that, in traditional classrooms, English language learners "put most of their effort into the lower levels" of Bloom's Taxonomy (understanding and remembering) as they attempt to follow the teacher's instruction. In the flipped classroom, the teacher moves lower levels of the taxonomy outside of the class where students work on mastering concepts and can pause, rewind and review the lesson at any time. In class, the teacher and students can focus on the upper levels of the taxonomy (applying, analyzing, evaluating, and creating). The researchers also note this model increases opportunities for in-class interaction with native speakers, which can help English language learners further develop their academic language proficiency and confidence in their speaking abilities. As more classes are flipped and data are collected on learners with diverse needs and backgrounds, it will be important to monitor the effects and possible benefits.

FLIPPED LEARNING RESULTS

K-12 EDUCATION

While there is little empirical research on the effects of Flipped Learning on student achievement, the research that does exist generally consists of teacher reports on student achievement after adopting the model (based on course and/or state test scores), descriptions of flipped classrooms, course completion rates, and survey research measuring an array of outcomes, such as teacher, student and parent attitudinal changes. This research, as well as case studies such as the following, further suggests that the Flipped Learning model is promising and warrants further inquiry.[5]



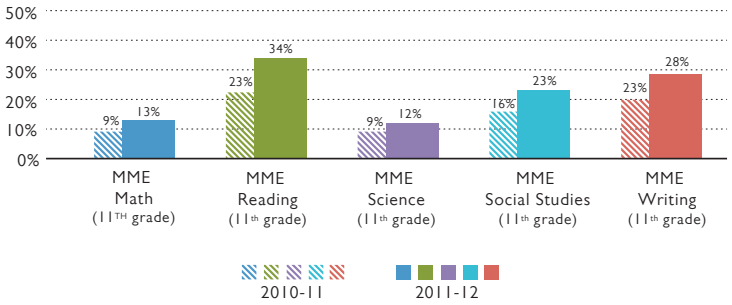
** Test format changed in 2012, and are not equally comparable to previous year scores*

Byron High School in Minnesota embraced the Continuous Improvement model in 2006 in an attempt to improve student achievement in mathematics. In 2006, less than one-third of students (29.9%) passed the state mathematics test (Minnesota Comprehensive

5 More detailed descriptions of these as well as several other case studies, are found in the full literature review of Flipped Learning, available at www.flippedlearning.org/review. Likewise, an executive summary is available at www.flippedlearning.org/summary

Assessments) and ACT composite scores averaged 21.2. The school's textbooks were outdated but no money was available to replace them. In 2009 the math department decided to eliminate textbooks. The teachers wrote a curriculum, identified materials available for free on the Internet, and flipped their high school math classrooms (Fulton, 2012). The teachers committed themselves to monitoring achievement data and analyzing students' needs. By 2011, the percentage of students passing the state test had increased to 73.8%, and the school's average ACT composite score had improved to 24.5. Moreover, by 2012, 86.6% of Byron's seniors had completed four or more credits of math. In recognition of these gains, Byron High School was designated a National Blue Ribbon School in 2010. The school also won the Intel Schools of Distinction award for High School Mathematics in 2011 (Fulton, 2012).

CLINTONDALE ACHIEVEMENT INCREASES ON MICHIGAN MERIT EXAM (MME)



Teachers at Clintondale (MI) High School struggled to connect with students using lecture-centered teaching models. Located in a suburb of Detroit, three-quarters of Clintondale's students were from low-income families. To better address the students' needs, the school flipped all of its 9th grade classes in 2010 (Clintondale High School, 2013). By the end of the first semester, they were seeing results. According to the school's principal Greg Green (2012), failure rates dropped by as much as 33 percentage points. Additionally, the number of student discipline cases dropped from 736 in 2009 to 249 in 2010 and to 187 in 2011, a drop of 74% in two years. Parent complaints also dropped after the change in instructional models, from two hundred down to seven. Encouraged by these results, the principal converted the entire school to a Flipped Learning model in fall 2011.

HIGHER EDUCATION

Flipped Learning is also being used in higher education and, similar to the early indications from K-12, seems to be resulting in improved student performance and student and instructor morale. In one example (Papadopoulos & Roman, 2010), students in an electrical engineering class watched lectures on their own and worked on exercises and problems during class time. The professors observed that students progressed faster enabling them to cover more material at a greater depth. Three-quarters of the students in those classes said they frequently or always helped their peers with their learning. Test scores exceeded those of students in the traditional learning environment.

The Introduction to Digital Engineering course at California State University, Los Angeles for freshmen and sophomores has been largely devoted to collaborative project-based learning since 2008. The class was flipped to increase professor-student interactions and make learning more active. The shift seems to have been deepened students' understanding and improved their design skills (Warter-Perez & Dong, 2012).

Not all research on Flipped Learning in higher education has indicated positive effects. It may not be the best structure, for example, for an introductory course. Most students who enroll in those courses may not have developed deep interest in them. Also, they may not have the skills they need to solve problems that are not clearly defined. For example, students in a flipped college introductory statistics course reported being less than satisfied with the way they were prepared for the tasks they were given (Strayer, 2012).

Students in a research methods and statistics class were unsatisfied with the instruction they received on line but appreciated the opportunity to collaborate with peers in the classroom (Frederickson, Reed, & Clifford, 2005). There were no significant differences found in improvements in knowledge and reductions in anxiety between the two versions of the course.

A study of a computer applications course in which some students took a flipped version and some did not also found no significant differences in test scores (Johnson & Renner 2012). One reason might have been that the course instructor was asked to offer the two versions, absent any perceived need.

PERCEPTIONS FROM TEACHERS, ADMINISTRATORS, AND PARENTS

A modest amount of research exists from individual educators who practice the Flipped Learning model and their views on behalf of their pupils. Until recently, Flipped Learning has been mainly a grassroots movement, but now principals and superintendents are inquiring more about this model, as well as parents of students in flipped classes. A number of surveys have been conducted with these three groups and are highlighted below.

Teachers: In fall 2012, over 466,000 K-12 students, parents, teachers, and administrators participated in the annual Speak Up online surveys facilitated by the national education nonprofit organization, Project Tomorrow© (2013). Specific questions about Flipped Learning were asked for the first time. The survey defined Flipped Learning as a model in which students watched instructional videos as homework and class time was used for "discussions, projects, experiments and to provide personalized coaching to individual students." Of the more than 56,000 teachers and librarians who responded, 6% indicated they were using videos they found online and 3% said they had already created videos as part of flipping their classroom.

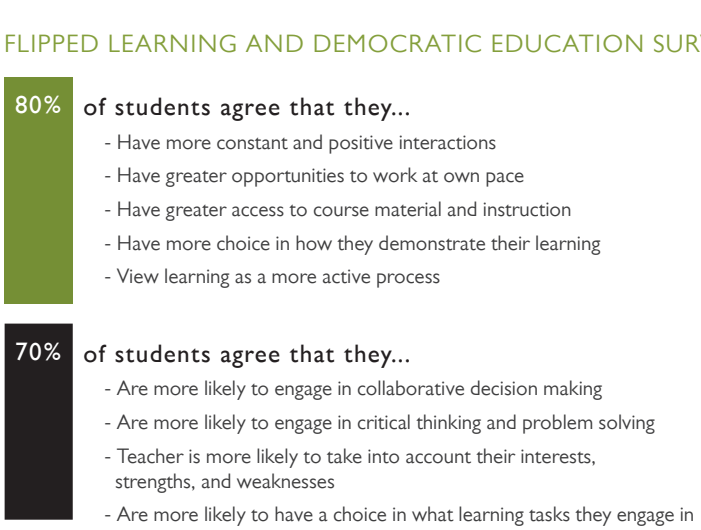
> "This new model is challenging teachers to reflect on their practice and rethink how they reach their students. It is an approach that encourages students to set the pace for truly individualized instruction. It is a catalyst for teachers, administrators, and students to change the way things have always been done."
>
> *Joe Corcoran, Principal,*
> *Harriet Gifford Elementary School, Elgin, IL*

The survey also found that 18% of teachers and 27% of administrators said they were interested in trying Flipped Learning this year. Twenty percent of teachers said they wanted to learn more about how to create instructional videos for their students to watch and 15% wanted to learn how to implement a flipped classroom model.

Nearly 60% of the students in grades 6-12 who participated in the Speak Up surveys agreed with the statement that Flipped Learning "would be a good way for me to learn." The May, 2013, issue of the School Administrator, published by the American Association of School Administrators (AASA) (www.aasa.org) dedicated the publication to Flipped Learning: Upending time on task in school and at home. http://www.aasa.org/

A survey of 450 teachers, conducted by ClassroomWindow in conjunction with the Flipped Learning Network (2012), found that teachers who were using Flipped Learning associate it with improved student performance and attitudes and increased job satisfaction. Of the teachers surveyed, 66% reported their students' standardized test scores increased after flipping their classrooms. Eight in 10 perceived an improvement in their students' attitudes towards learning. Nearly 90% reported an improvement in their own job satisfaction, with 46% reporting significant improvement.

Students: Nearly 60% of the students in grades 6-12 who participated in the Speak Up surveys agreed with the statement that Flipped Learning "would be a good way for me to learn." Close to 80% of student respondents to the Flipped Learning and Democratic Education survey in 2012 said they experienced more frequent and positive interactions with teachers and peers during class time.[6] All of the 26 educators surveyed agreed that, since flipping their classrooms, learning has become more active. Over 90% said that positive interactions between students and teachers have increased. The survey was small but it does suggest that Flipped Learning is changing the mode of in-class instruction. The students surveyed said they have more access to course materials and instruction; more opportunities to work at their own pace; more choices of how to demonstrate their learning; and that they were more likely to view learning as an active process. (Child Trends, 2010).



Parents: The Flipped Learning model differs from the traditional classrooms in significant ways. Whenever children's homework changes, as it will with Flipped Learning, parents need to be on board. With Flipped Learning, parents may welcome the opportunity to watch videos with their children to gain a better understanding of what they are learning and may become more involved as a result. Parents of 5th grade math students who participated in a pilot project in Stillwater, Minnesota reported that their children's attitudes towards math were either the same or improved, their children were doing better in math, and wanted the flipped approach to be continued (Stillwater, 2012).

Karen Cator, former director of the office of educational technology for the U.S. Department of Education, also says that Flipped Learning may increase parents' participation in their students' learning. Cator acknowledges that while the trend is growing, more research is required in order to determine its effectiveness (Baker, 2012).

6 Flipped Learning and Democratic Education survey conducted by Tom Driscoll at Teachers College, Columbia University in 2012 was completed by 26 educators and 203 students from across the United States.

Administrators: Of the more than 6,000 administrators who responded to the same SpeakUp survey, 23% said that their teachers are using videos they found online and 19% reported that their teachers are creating their own videos for use in Flipped Learning. Teachers and site administrators agreed that the following hindrances, however, are keeping them from flipping their classrooms: concern that students might not have access to the Internet at home; the teachers' needs for professional development to help them learn to make or find high quality videos; and how to best utilize the additional classroom time (Speak Up survey, 2012).

"I am certain many of my colleagues across central Illinois thought I had indeed flipped out... We were proposing the entire high school staff. Our failure rate was simply too high to accept. Principal Don Willett and I set out to change the course of our education content delivery system — and ultimately the lives of our 350 students."

Patrick Twomey, Superintendent, Havana School District #12 Havana, IL

CONCERNS ABOUT FLIPPED LEARNING

Skeptics of Flipped Learning say that there is little that is new in it. They say that good teachers always try to meet the needs of individual students and use the tools that will help them do that. That is true. And, as noted previously, the potential of Flipped Learning lies not in the videos but in how delivering direct instruction in a different environmnet opens up time and space inside the classroom to engage in higher leverage instructional practices and individualize learning. Teachers need to be thoughtful about how to maximize the opportunity for students to become active learners who are empowered to take charge of their own learning. Even critics acknowledge that the changeover to the Flipped Learning model encourages teachers to re-evaluate their teaching (e.g., Stumpenhorst, 2012).

Another concern is voiced by teachers and others who believe Flipped Learning undervalues the power of good, engaging, face-to-face Socratic teaching. Critics worry they won't have the opportunity to do that kind of teaching because class time is devoted to students collaborating, student-generated and -led activities, and other interactive exercises. However, Marshall (2013) points out that teachers are more important than ever in Flipped Learning. However, instead of the teacher lecturing to students, their role is to "lead from behind." In other words, the teacher has the tasks of "observation, feedback, and assessment" and guiding the learners' thinking, in the best spirit of the Socratic Method. The difference, and perhaps a major benefit, according to Marshall (2013) is that this instruction is spontaneous, cannot be planned out, and is relevant for the learners at that moment. Furthermore, the learners themselves can fill these same three roles as they observe and provide feedback to each other during class and as they assess their own learning.

Gary Stager, an educator, speaker, and journalist, is a critic of Flipped Learning. He voiced three major concerns during a 2012 radio debate with Aaron Sams on Southern California Public Radio (2013). First, he asserts that, the model emphasizes traditional homework and lectures, although their position is flipped. Second, he says that the demand for Flipped Learning results from flaws in the curriculum, which require that students study ahead of time. Finally, he argues that the Flipped Learning model is a means of standardizing learning. He worries that in the future that the direct instruction delivered via video will be outsourced to mediocre, low-cost teachers to replace more highly paid veteran teachers.

Should Flipped Learning devolve into little more than lectures and routinized, low-level homework exercises, Stager would certainly have a point. An instructional model is but a framework and, whether it succeeds or not, depends almost entirely on the implementation. Boring lectures can be delivered digitally almost as easily as they can be presented in class and class time in a Flipped Learning model could be taken up with filling out worksheets and doing computerized drills. But that is not the intent nor is it inevitable. Indeed, teaching successfully in a flipped classroom is even more demanding than is traditional teaching. So, if Flipped Learning is to succeed, teachers will need to be trained and supported in how to engage students more deeply in content.

In regard to Stager's concern about mass-produced, cheaply made videos becoming the mainstay of flipped classrooms, Sams and Bergmann think that the model works best when teachers make their own videos for their own classes. However, the use of videotaped lessons does make it possible for the teacher to find great instruction produced by others, such as those found on Khan Academy or TED-Ed. Those lessons could introduce students to an alternative style of teaching or supplement lessons on subjects or provide lessons in areas in which their teacher is not expert.

Another concern that is raised is that not all students have access to the high-speed Internet or computers. While this is a legitimate concern, it should be noted that home access to computers and the Internet has expanded greatly over the last two decades. In 2010, almost six out of every ten children ages 3 to 17 used the Internet and almost 85% had access to a computer at home. Moreover, the ways that even low-income students can access digital content are increasing rapidly. (Child Trends, 2012)

Flipped Learning might not work for all educators and students. Not all educators are successful in their implementations and there have been students who after trying the flipped classroom experience, prefer traditional learning. In their book, Bergmann and Sams (2012) noted that for lower elementary grades, Flipped Learning might be appropriate for certain lessons or units, but not entire classes.

Moreover, as we illustrate throughout this paper, more qualitative and quantitative research needs to be done to identify how the potential of the model can be maximized. The existing research clearly demonstrates that the Flipped Learning model can be one way to create a classroom environment that is learner-centered. This is something that most teachers want to do but are constrained by the current organization of schools and other barriers. Michael Gorman (2012) observed that any learner-centered educator would provide activities in the classroom that are action based, authentic, connected and collaborative, innovative, high level, engaging, experience based, project based, inquiry based, and self-actualizing. The Flipped Learning model provides that bridge to a learner-centered classroom environment, thereby enabling deeper learning (Bergmann & Sams, 2012) that educators are seeking.

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