FLIPPED CLASSROOM AND FLIPPED LEARNING

The terms **Flipped Classroom** and **Flipped Learning** are often used as synonyms. However they are different concepts.

Flipped Classroom

A Flipped Classroom is a form of blended learning in which students learn content outside classroom and in-class time. The process used for the exposure prior to class can vary, from simple textbook readings to podcasts to lecture videos or screencasts.

Flipped Learning

Flipped Learning is "a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter"[1].

Flipping a classroom can lead to Flipped Learning. However, to engage in Flipped Learning, teachers must incorporate **four pillars** into their practice.

(TIP: Click on the letters)

[1]Flipped Classroom vs. Flipped Learning: What's the Difference? Published Jan. 21, 2015 by Sarah Bright in
https://blog.capterra.com/flipped-classroom-vs-flipped-learning-whats-the-difference/

GO FOR TIPs

TIP 1

THINGS YOU SHOULD KNOW ABOUT: FLIPPED CLASSROOMS, Educause – Learning Initiative

Annex I

Flipped Classroom.pdf

TIP 2

FLIPPED LEARNING VÍDEO

https://facultyinnovate.utexas.edu/flipped-classroom

TIP 3

Noora Hamdan et al. A REVIEW OF FLIPPED LEARNING, Flipped Learning Network, 2013

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"FLIPPING" YOUR CLASSROOM, Faculty Innovation Center, University of Texas at Austin

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THE FLIPPED LEARNING TOOLKIT, Playlist of YouTube videos

TIP 8

INTERACTIVE POLLING AND GAMIFICATION TOOLS, NOVA Inovação Pedagógica

Annex IV

Interactive Polling and Gamification Tools.pdf

UNIVERSIDADE NOVA DE LISBOA

Scenario

For the past two weeks, Kyle has been taking a flipped course in designing food gardens. Before he attends each class, he watches videos of short lectures recorded or recommended by his instructor. Each lecture comes with a brief online quiz that offers him immediate feedback on whether he missed any essential points. Today as he enters class, he glances at the schedule on the whiteboard. For the first half hour, teams will discuss how the content of the video lectures on microclimates, insect predation, and disease control will inform their team projects. Professor Dalton circulates among the tables to see if anyone has questions.

Kyle's team will be repurposing an area the size of an urban backyard into a visually appealing garden that is also a functional food source. It's part of the larger class project to reclaim a strip of city land by building a demonstration food garden. "I think we should bring in disease-resistant blueberries, grapes, and pome fruits," says Coleen, looking at the rough drawings they have made so far. Dalton stops to look over their design. "Check the nursery catalogs on the front table," he suggests. "Disease-resistant strains are clearly marked in their listings." As they search the catalog and discuss which diseases might be a problem in dwarf apples, pears, blueberries, and grapes, Kyle enters their cultivar choices in their Google Docs space. They are turning to a discussion of microclimates and plant placement when a chime signals discussion is over.

In the second half of the class, team monitors each retrieve two flat boxes from the front of the class. One box contains a stack of pins and various leaves preserved in plastic. The second box has a foam insert topped by a paper grid; each square is labeled with a nutritional deficiency or a disease common to food plants. During the next half hour, each team is to identify the disease or nutritional deficiency and pin the correct leaf in the right spot on the grid. Dalton is on hand, directing attention to clues and sometimes challenging their choices.

As he leaves, Kyle reflects that the hands-on activities have given him a far better grasp of the information and more confidence in what he has learned than he could have gotten from an in-class lecture.

1 What is it?

The flipped classroom is a pedagogical model in which the typical lecture and homework elements of a course are reversed. Short video lectures are viewed by students at home before the class session, while in-class time is devoted to exercises, projects, or discussions. The video lecture is often seen as the key ingredient in the flipped approach, such lectures being either created by the instructor and posted online or selected from an online repository. While a prerecorded lecture could certainly be a podcast or other audio format, the ease with which video can be accessed and viewed today has made it so ubiquitous that the flipped model has come to be identified with it.

The notion of a flipped classroom draws on such concepts as active learning, student engagement, hybrid course design, and course podcasting. The value of a flipped class is in the repurposing of class time into a workshop where students can inquire about lecture content, test their skills in applying knowledge, and interact with one another in hands-on activities. During class sessions, instructors function as coaches or advisors, encouraging students in individual inquiry and collaborative effort.

2 How does it work?

There is no single model for the flipped classroom—**the term is widely used to describe almost any class structure that provides prerecorded lectures followed by in-class exercises**. In one common model, students might view multiple lectures of five to seven minutes each. Online quizzes or activities can be interspersed to test what students have learned. Immediate quiz feedback and the ability to rerun lecture segments may help clarify points of confusion. Instructors might lead in-class discussions or turn the classroom into a studio where students create, collaborate, and put into practice what they learned from the lectures they view outside class. As on-site experts, instructors suggest various approaches, clarify content, and monitor progress. They might organize students into an ad hoc workgroup to solve a problem that several are struggling to understand. Because this approach represents a comprehensive change in the class dynamic, some instructors have chosen to implement only a few elements of the flipped model or to flip only a few selected class sessions during a term.

3 Who's doing it?

A growing number of higher education individual faculty have begun using the flipped model in their courses. At Algonquin College, a video production class has been using this model to explain the workings of editing software, a procedure that is notoriously difficult to explain in a standard lecture. Short tutorial video lectures let students move at their own pace, rewind to review portions, and skip through sections they already understand,

more >>

meaning students come to class able to use the software and prepared to do creative projects with their peers. A particularly successful example of a blended and flipped class in accounting at Penn State accommodates 1,300 students. In-class time is used for open discussion, a featured guest speaker, or hands-on problem solving where instructor support is supplemented by student assistants. At Harvard University, one physics professor not only employs the flipped model but has also developed a correlative site, Learning Catalytics, that provides instructors with free interactive software enabling students to discuss, apply, and get feedback from what they hear in lecture.

4 Why is it significant?

In a traditional lecture, students often try to capture what is being said at the instant the speaker says it. They cannot stop to reflect upon what is being said, and they may miss significant points because they are trying to transcribe the instructor's words. By contrast, the use of video and other prerecorded media puts lectures under the control of the students: they can watch, rewind, and fast-forward as needed. This ability may be of particular value to students with accessibility concerns, especially where captions are provided for those with hearing impairments. Lectures that can be viewed more than once may also help those for whom English is not their first language. **Devoting class time to application of concepts might give instructors a better opportunity to detect errors in thinking**, particularly those that are widespread in a class. At the same time, collaborative projects can encourage social interaction among students, making it easier for them to learn from one another and for those of varying skill levels to support their peers.

5 What are the downsides?

The flipped classroom is an easy model to get wrong. Although the idea is straightforward, **an effective flip requires careful preparation**. Recording lectures requires effort and time on the part of faculty, and out-of-class and in-class elements must be carefully integrated for students to understand the model and be motivated to prepare for class. As a result, introducing a flip can mean additional work and may require new skills for the instructor, although this learning curve could be mitigated by entering the model slowly.

Students, for their part, have been known to complain about the loss of face-to-face lectures, particularly if they feel the assigned video lectures are available to anyone online. Students with this perspective may not immediately appreciate the value of the hands-on portion of the model, wondering what their tuition brings them that they could not have gotten by surfing the web. Those who see themselves as attending class to hear lectures may feel it is safe to skip a class that focuses on activities and might miss the real value of the flip. Finally, even where students embrace the model, their equipment and access might not always support rapid delivery of video.

6 Where is it going?

As the flipped class becomes more popular, **new tools may emerge to support the out-of-class portion of the curriculum**. In particular, the ongoing development of powerful mobile devices will put a wider range of rich, educational resources into the hands of students, at times and places that are most convenient for them. Greater numbers of courses will likely employ elements of the flipped classroom, supplementing traditional out-of-class work with video presentations and supporting project-based and lab-style efforts during regular class times. At a certain level of adoption, colleges and universities may need to take a hard look at class spaces to ensure they support the kinds of active and collaborative work common in flipped classes.

7 What are the implications for teaching and learning?

The flipped classroom constitutes a role change for instructors, who give up their front-of-the-class position in favor of a more collaborative and cooperative contribution to the teaching process. There is a concomitant change in the role of students, many of whom are used to being cast as passive participants in the education process, where instruction is served to them. **The flipped model puts more of the responsibility for learning on the shoulders of students while giving them greater impetus to experiment.** Activities can be student-led, and communication among students can become the determining dynamic of a session devoted to learning through hands-on work. What the flip does particularly well is to bring about a distinctive shift in priorities—from merely covering material to working toward mastery of it.

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A REVIEW OF FLIPPED LEARNING

WRITTEN BY

Noora Hamdan and Patrick McKnight, Ph.D. George Mason University

Katherine McKnight, Ph.D. Pearson's Center for Educator Effectiveness

Kari M. Arfstrom, Ph.D. Flipped Learning Network

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AUTHORS

Noora Hamdan, Master's Student, George Mason University

Patrick E. McKnight, Associate Professor of Psychology, George Mason University

Katherine McKnight, Principal Director of Research, Center for Educator Effectiveness, Pearson

Kari M. Arfstrom, Executive Director, Flipped Learning Network

INTRODUCTION

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 pages from a thick textbook and answering the 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, if familiar, exercise. The teacher is acutely aware that many students do not understand the day's lesson but does not have the time to meet with them individually during the 50-minute class period. The next day the teacher will collect and briefly review the homework assignment. If students have additional questions there won't be much 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.

Educators have been working to break this lecture-centered instructional model by shifting the focus from the curriculum pacing guide to student learning needs as the driver of instruction. They are, increasingly, turning to an alternative model of instruction called Flipped Learning in which digital technologies are used to shift direct instruction outside of the group learning space to the individual learning space, usually via videos. Offloading direct instruction in this way allows teachers to reconsider how to maximize individual face-to-face time with students. Time becomes available for students to collaborate with peers on projects, engage more deeply with content, practice skills, and receive feedback on their progress. Teachers can devote more time to coaching their students, helping them develop procedural fluency if needed, and inspiring and assisting them with challenging projects that give them greater control over their own learning.

Regarded as the pioneers of Flipped Learning, in 2007, two rural Colorado chemistry teachers, who were concerned that students frequently missed end-of-day classes to travel to other schools for competitions, games or other events, began to use live video recordings and screencasting software to record lectures, demonstrations, and slide presentations with annotations. Those materials were posted on the then-nascent YouTube for students to download and access whenever and wherever it was convenient. But the mode of delivery turned out to be less important than what it made possible. In a book on their work called Flip Your Classroom: Reach Every Student in Every Class Every Day (2012), the two teachers, Jonathan Bergmann and Aaron Sams, reported that, after they flipped their classroom, students began interacting more in class. Moreover, because time could be used more flexibly, students who were behind received more individual attention while advanced students continued to progress.

In early 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 goals of the organization are to provide professional learning opportunities on Flipped Learning; to conduct, collaborate and disseminate relevant research on Flipped Learning; and to act as the clearinghouse for distributing best/promising practices for current and future "flipped" educators. Preceding the FLN was an online Community of Practice called the Flipped Learning Ning, which is a free website for educators who have flipped or wish to flip their classes. It is hosted by the Math and Science Teaching Institute at the University of Northern Colorado and maintained by Jerry Overmyer. One gauge to measure the interest in Flipped Learning is indicated by the number of participants in the Ning; in January 2012, there were 2,500 members; by March 2013, more than 12,000 educators had signed up. [1]

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1 More information about the Flipped Learning Network™ can be found at www.flippedlearning.org. To join the Ning, a free online community of practice, go to www.flippedclassroom.org.

As technologies and broadband become more widely available and as the focus on integrating technology into learning increases, interest in Flipped Learning will likely continue to grow. In recognition of this interest, the Flipped Learning Network, with the support of Pearson Education and researchers at George Mason University, undertook a comprehensive review of relevant research. In this review, we define and describe the Flipped Learning model, briefly note its historical foundations and address common misconceptions. We discuss learning theories that underlie the model and describe current, although limited empirical research findings. We also describe concerns that have been raised.
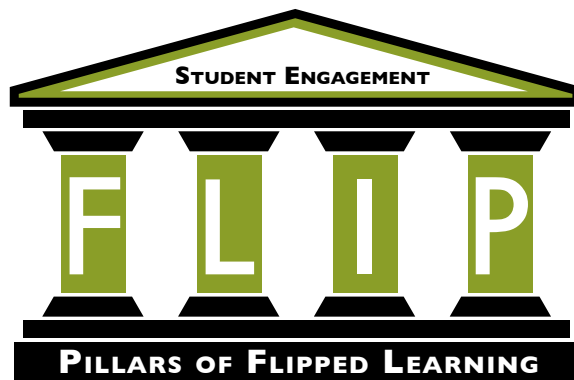
DEFINING FLIPPED LEARNING

In the Flipped Learning model, teachers shift direct learning out of the large group learning space and move it into the individual learning space, with the help of one of several technologies. Teachers record and narrate screencasts of work they do on their computer desktops, create videos of themselves teaching, or curate video lessons from internet sites such as TED-Ed and Khan Academy.[2] Many educators start flipping their classroom by using these readily available materials. The videos or screencasts are available for students to access whenever and wherever it is convenient—at home, during study hall, on the bus, even in the hospital—as many times as they like, enabling them to come to class better prepared (Musallam, 2011). Capitalizing on the students' preparation, teachers can devote more time to opportunities for integrating and applying their knowledge, via a variety of student-centered, active learning strategies such as conducting research or working on projects with classmates. Teachers also can use class time to check on each student's understanding and, if necessary, help them develop procedural fluency. Teachers can provide individualized support as students work through the activities designed to help them master the material, meeting them at their readiness level.

Flipped Learning has been compared to online, blended, and distance learning because of the screencast or video components, but, there are clear differences. Online education, for example, occurs only remotely, and the teacher and student are never face-to-face (Oblinger & Oblinger, 2005). Virtual class meetings, assignments, and lectures happen online through a course management website usually, but not always, asynchronously. Sometimes the lectures and other activities are augmented by group chats or other means of facilitating collaboration and peer instruction. Blended classes also have an online element, but that usually occurs during class time along with direct student-teacher contact (Allen, Seaman, & Garrett, 2007). Students' experiences in face-to-face sessions vary, however, and are not necessarily different than what occurs in a traditional classroom.

That is also the case in some flipped classrooms. The use of videos or other digital technologies to deliver content outside of class does not guarantee that anything different will occur during class time. However, due to the emphasis on students becoming the agents of their own learning rather than the object of instruction, the Flipped Learning model can enable educators to make the shift from teacher-driven instruction to student-centered learning.

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2 TED-Ed (ed.ted.com) has an entire library of educational videos, made specifically accessible to professional educators who have flipped their classrooms. Likewise, Khan Academy has over 4,000 videos (khanacademy.org), many focusing on math and science, from which to select. Salman Khan, the website's founder, has said that while the Academy "has been associated with the idea of the 'flipped classroom'…the concept was actually conceived by others before Khan Academy existed" (Khan, 2012).

STUDENT ENGAGEMENT

FLIP

PILLARS OF FLIPPED LEARNING

FOUR PILLARS OF FLIPPED LEARNING

Just as no two traditional classrooms are identical, such is the case with flipped classrooms. Because Flipped Learning focuses on meeting individual student learning needs as opposed to a set methodology with a clear set of rules, a cadre of experienced educators from the Flipped Learning Network, along with Pearson's School Achievement Services (2013), identified the key features, or pillars, of flipped classrooms that allow Flipped Learning to occur. The four Pillars of F-L-I-P™ are Flexible Environment, Learning Culture, Intentional Content, and Professional Educator.

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.

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).

A REVIEW OF FLIPPED LEARNING

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 explore first 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, nothing will be gained.[3]

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-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, they take on less visibly prominent roles in the flipped classroom.

RESEARCH AND INSTRUCTIONAL FOUNDATIONS OF FLIPPED LEARNING

Quantitative and rigorous qualitative research on Flipped Learning is limited; however, there is an established body of research that supports the key elements of the model, which are built on various instructional foundations to shift from a teacher-centered to a student-centered approach to instruction. As mentioned throughout this review, a key feature of the Flipped Learning model is the opportunity to maximize student learning opportunities in the classroom by deliberately shifting direct instruction to outside of the group learning space. The emphasis on maximizing one-on-one interactions turns the focus to student-centered instruction that more actively involves students in the learning process. These approaches are commonly said to involve "active learning," defined as "the process of having students engage in some activity that

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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.

forces them to reflect upon ideas and how they are using those ideas" (Michael, 2006). Other relevant research on various instructional foundations include peer instruction, priming, and pre-training. There is a growing body of research on using the Flipped Learning model with diverse student populations as well.

ACTIVE LEARNING

A substantial body of research on student-centered, active learning strategies supports the effectiveness of these approaches in increasing student learning and achievement (e.g., Prince, 2004; Michael, 2006). Active learning is associated with improved student academic performance (Hake, 1998; Knight & Wood, 2005; Michael, 2006; Freeman, 2007; Chaplin, 2009), and increased student engagement, critical thinking, and better attitudes toward learning (O'Dowd & Aguilar-Roca, 2009). When problem-based active learning occurs in science courses, for example, students report learning more, and their attitudes toward class improve (Akinoglu and Tandogan 2006). Moreover, misconceptions are significantly reduced.

Student-centered models are usually defined in opposition to "teacher-centered" models (Michael, 2006). Teacher-centered models focus on the acquisition of knowledge outside of the context in which it will be used, and instructional delivery includes lecture, homework, and exams, used for assigning grades (Huba & Freed, 2000). Little time is allotted for teachers to work directly with students to guide them as they attempt to meaningfully apply the information. This approach has been described as a "one-size-fits-all" model of instruction, in which effective teaching is characterized as presenting information well, and those who can learn, will learn (Huba & Freed, 2000). In contrast, teachers using a student-centered approach engage students in actively constructing knowledge and they work together to evaluate students' learning (Huba & Freed, 2000). According to Michael (2006), students build mental models of what is learned, deliberately test the validity of those models, and fix faulty models. He cites multiple studies supporting that students learning in this way are more likely to achieve meaningful learning.

PEER INSTRUCTION

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 2011, he demonstrated the strategies he uses with his students during a keynote address at the Building Learning Communities conference in Boston. He discussed how assistive technology allowed students to respond and give feedback during peer instruction sessions, maximizing the time available with the instructor and making it possible to increase the focus on higher order thinking skills. In the traditional setting, students used such time for note taking and repeating information.

Characteristics of Mazur's model include teachers engaging students by helping them examine their logic to reveal their misconceptions. Mazur explained, "Once you engage the students' minds, there's an eagerness to learn, to master" (Berrett, 2012). Bloom observed earlier (1984) that the continuous feedback and correction students receive during one-on-one interactions significantly improves learning and achievement. Focusing on Bloom's findings, teachers have been trying to integrate one-to-one interactions with their students in the classroom long before Mazur. The Flipped Learning model can facilitate this type of one-on-one attention by relegating the lecture portion of the traditional classroom to the outside, and allowing for more one-on-one interactions as teachers guide students in the integration and application of the content in class.

PRIMING

Another relevant area of research related to the potential impact of the Flipped Model is focused on the effects of preparing learners with direct instruction outside of the classroom, prior to receiving in-class instruction. Research on learning suggests some potential mechanisms by which this flipped approach might be effective. A large body of research on the effects of priming on memory indicates that when learners are exposed to particular stimuli, for example a set of facts, their memory or recall of that stimulus is improved due to their previous experience with the stimuli (Bodie et al., 2006). By providing students with direct instruction outside of the classroom, they are in essence "primed" for the active learning tasks carried out in the flipped classroom.

PRE-TRAINING

Research on the effects of pre-training on learning is a similarly relevant area for the Flipped Learning model. One of the tenets of pre-training is to reduce the cognitive load on learners, to enable them to process information more efficiently. According to Cognitive Load Theory, there is a limit to the amount of information that can be used, processed and stored by the working memory, and overloading that limit undermines the learning process (Chaudry, 2010). Ramsey Musallam, a San Francisco chemistry teacher and adjunct professor of education at Touro University, researched the effects of pre-training (receiving some instruction before in-class instruction) on the intrinsic cognitive load of students in an advanced high school chemistry class. Intrinsic cognitive load is a facet of Cognitive Load Theory that describes the effect of the learning environment on learning complex subjects. Musallam (2010) found a significant relationship between mental effort and pre-training for students, indicating that students needed to use fewer cognitive resources to learn new material when they received pre-training. This and other studies (Ayers, 2006; Mayer, 2009) suggest that pre-training may be an effective method of managing the intrinsic cognitive load and, thereby, provides one potential mechanism of the effect of the Flipped model on learning.

DIVERSE LEARNERS

While there has been little formal data collected that disaggregates the results of Flipped Learning for diverse subgroups of learners, the model suggests that different subgroups might benefit from the student-centered support from both the teacher and fellow classmates.

Regarding language learners, for example, 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 instructional delivery. In the flipped classroom, the teacher moves lower levels of the taxonomy to outside of the group learning space, where students can then work on mastering concepts on their own time and pace. When using video, for example, students can pause, rewind, and review the lesson at any time. In class, the teacher and students can then focus on the upper levels of the taxonomy (applying, analyzing, and creating). This has potential to allow struggling learners more opportunities to understand and improve their recall before they come to class, as previously described in the research on cognitive load. Marshall and DeCapua also note that the Flipped Learning model increases opportunities for in-class interaction with native speakers, which can

> "I've just finished reviewing lecture …for the second time. I personally like this flip classroom so far. I can spend my time study as much as I want and flip classroom makes my study livelier. Reading textbook alone can be bored some time. As…English learner…, I have some difficulties catching something in class. Flip classroom helps me a lot. However, I still like to go to class and have real conversation with Dr. M and my classmates."
>
> *Nattasiri, English learner from Thailand*

help English language learners further develop their academic language proficiency and confidence in using the language. As more classes are flipped and more data are collected on learners with diverse needs and backgrounds, it will be important to evaluate the potential benefits of the Flipped Learning approach for these student populations.

THREE K-12 CASE STUDIES

As noted previously, there is little rigorous empirical research on the effects of Flipped Learning on student achievement. However, the research that does exist consists of teacher reports on student achievement after adopting the model; descriptions of flipped classrooms; student, parent and teacher survey research; and numerous case studies documenting changes in student outcomes such as engagement, test scores, and disciplinary problems. Although limited, the research is promising, and warrants further inquiry.

The next section focuses on three case studies highlighting the Flipped Learning experience from three high schools that implemented the model for different reasons.

BYRON (MN) HIGH SCHOOL

The performance of Byron High School's students in math was perennially low. In 2006, fewer than one-third of students (29.9%) passed the state mathematics test (Minnesota Comprehensive Assessments) and ACT composite scores averaged 21.2. The scores prompted the school to analyze student performance data and take a critical look at its teaching. But the efforts to address the needs of students were limited by the fact that the school also was facing a financial crisis, which made replacing outdated textbooks impossible. Faced with this challenge, in 2009, Byron's math department came up with an ambitious idea: abandon all textbooks. Lead by math teacher Troy Faulkner, the school's math department wrote curriculum, identified open source materials, and adopted the flipped learning model (Fulton, 2012).

MATH 11 ALL STUDENTS
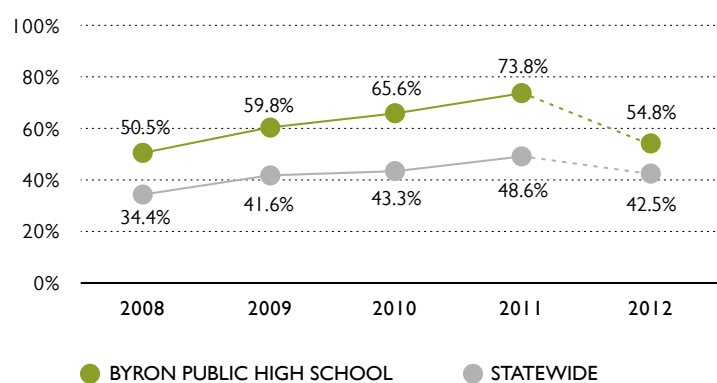
* Test format changed in 2012, and are not equally comparable to previous year scores

After flipping their math classrooms, the teachers found that engagement increased and students began exceeding expectations. By 2011, nearly three-quarters (73.8%) of students passed the state math test, more than double the performance from just three years earlier, and the ACT composite scores improved to 24.5. Moreover, by 2012, 86.6% of Byron's seniors 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).

WOODLAND PARK (CO) HIGH SCHOOL

Woodland Park High School in Colorado faced a different problem—students were missing too many end-of-day classes because of extracurricular activities. Because Woodland Park is located in an isolated, rural community, many student athletes had to leave school early in order to compete at other schools. In working to find a solution, chemistry teachers Jonathan Bergmann and Aaron Sams (2012) realized that flipping their classrooms might be the way to ensure that those students who were missing class could still access the in-class lectures. They began discussing the potential of new software that would allow slide presentations, along with voice and annotations, to be recorded and converted into video files that could be easily distributed online.

In the spring of 2007, Sams and Bergmann started recording and posting their live class lessons using screencast software. After flipping where direct instruction and homework took place, students' interactions with one another in these classes increased. According to the educators, students who were behind began to receive the individual attention they needed to catch up to their peers, even as advanced students continued to be challenged.

CLINTONDALE (MI) HIGH SCHOOL

CLINTONDALE ACHIEVEMENT INCREASES ON MICHIGAN MERIT EXAM (MME)
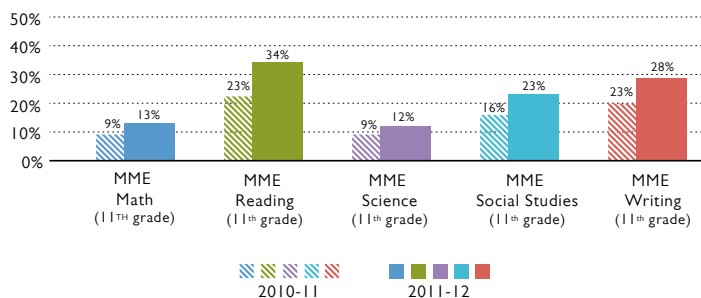
The challenges of the teachers at Clintondale High School, located in a close-in suburb of Detroit, will be familiar to their peers around the world: their lecture-centered teaching was not connecting with their students, three-quarters of whom were minorities from low-income families. After hearing about Flipped Learning, the school in 2010, led by principal Greg Green, implemented the model in all freshman classes. By the end of the first semester, the school was seeing results. According to Green (2012), failure rates dropped by as much as 33 percentage points. The number of student discipline cases fell from 736 in 2009 to 249 in 2010 and to 187 in 2011, a drop of 74% in two years. Parent complaints also dropped, from 200 down to seven after the change in instructional models. Encouraged by these results, the principal converted the entire school to the Flipped Learning model in fall 2011.

FLIPPED LEARNING AND HIGHER EDUCATION

Flipped Learning is also being used in higher education, and results have been documented in student academic performance and student and instructor morale. Kelly Walsh, Chief Information Officer at the College of Westchester in White Plains, NY, became interested in how instructional technologies and tools could be used to improve learning outcomes by making learning more engaging and more productive for students and teachers. He reported on several higher education institutions that have successfully implement Flipped Learning models. The short cases that follow were included in Walsh's implementation report (2010).

Upon applying an "inverted" model of learning (similar to the Flipped Learning model, where lecture material is delivered outside of class and students do guided work in class) in an electrical engineering class, Papadopoulos and Roman (2010) saw that students progressed through material faster, that students understood topics in greater depth, and additional content could be covered without sacrificing the quality of the course as a whole. Additionally, they found that 75% of students frequently or always helped other students in the class. In terms of student performance, test scores exceeded those in the traditional learning environment. On a pre-test, students in an inverted class answered about the same proportion of questions correctly, compared to their counterparts in a traditional classroom (18.3% and 17.1%, respectively; the differences were not statistically significant). At posttest, the difference in scores for the two groups was statistically significant, with students in the inverted class answering 31.2% of questions correctly, and those in a traditional class answering 24.1% of questions correctly.

Faculty at California State University, Los Angeles in 2008 flipped the freshman and sophomore Introduction to Digital Engineering course in order to increase opportunities for collaborative project-based learning. The shift was intended to address what was perceived to be the limited professor-student interaction and the prevalence of passive learning in engineering classrooms. In a post-course analysis, flipping the classroom seemed to be effective in helping students understand course material and develop design skills (Warter-Perez & Dong, 2012). Their findings were reinforced by satisfaction surveys and focus groups in which over 70% of students said the class learning environment was more interactive. In the same study, all students strongly agreed that the new learning environment allowed them to gain better hands-on design skills and agreed that the flipped class helped them to learn the content better. Overall, the results suggest that flipping the classroom in this instance had a positive effect on student learning and helped extend learning objectives.

However, not all research on Flipped Learning in higher education has reported positive effects. It may not be the best structure, for example, for an introductory course. In one study, 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). The reason may be that students in introductory courses have not yet developed a deep interest in the content, and thus may be frustrated when they encounter tasks that are not clearly defined. However, even in the introductory course, students indicated that they were more open to cooperative learning and innovative teaching methods (Strayer, 2012).

In another instance, the students who experienced web-supported learning versus lecture-based learning in a research methods and statistics course were less satisfied with the web-based instruction; however, they were more satisfied with the peer collaboration stimulated by this learning environment (Frederickson, Reed, & Clifford, 2005; Crouch & Mazur, 2001). There were no significant differences in students' knowledge and anxiety levels between the two versions of the course (Frederickson et al., 2005). In looking at the effect of the flipped classroom model on a computer applications course, Johnson and Renner (2012) found no significant differences between mean test scores of those who experienced the flipped classroom components and those students who did not. They also found no benefit to using the flipped method of classroom instruction in a secondary computer applications class. These results might be explained by the fact that the instructor of this course was asked to implement the Flipped Learning instruction method 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

An online survey of 450 teachers conducted in 2012 by the Flipped Learning Network in conjunction with ClassroomWindow found that teachers associate Flipped Learning 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. In the same survey, 80% of teachers perceived an improvement in their students' attitudes towards learning. Nearly nine in ten of the teachers surveyed reported that their job satisfaction also improved, with 46% reporting significant improvement.

While the Flipped Learning model was not the intended topic of this research, it does warrant inclusion because of the related findings on use of video by teachers. In a nationally representative survey of 1,401 pre-K-12 classroom teachers, PBS and Grunwald Associates (2010) found that 68% of teachers believed that using videos helped to stimulate discussion, 66% associated videos with increased student motivation, and 62% said they helped make them more effective. Over half (55%) said they were more creative when they used videos. A majority of teachers (61%) also said students prefer videos over other types of instructional resources and just under half (47%) said videos stimulated student creativity.

The 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. Overall, close to 80% of students in flipped classrooms agreed that they have more constant and positive interactions with teachers and peers during class time; they said they have more access to course materials and instruction; are more able to work at their own pace; they can exercise more choice in how they demonstrate their learning; and they viewed learning as a more active process. Close to 70% reported that they are more likely to have a choice in what learning tasks they engage in; they are more likely to engage in collaborative decision making with other students; they are more likely to engage in critical thinking and problem solving; and that the teacher was more likely to take into account their interests, strengths, and weaknesses. According to Driscoll (2012), these results suggest how Flipped Learning can democratize the learning environment.

80% of students agree that they...
- Have more constant and positive interactions
- Have greater opportunities to work at own pace
- Have greater access to course material and instruction
- Have more choice in how they demonstrate their learning
- View learning as a more active process

70% of students agree that they...
- Are more likely to engage in collaborative decision making
- Are more likely to engage in critical thinking and problem solving
- Teacher is more likely to take into account their interests, strengths, and weaknesses
- Are more likely to have a choice in what learning tasks they engage in

Of the educators surveyed, 100% agreed that after flipping their classrooms, learning became more active. Over 90% said that positive interactions with their students increased; students had greater access to course material and instruction, students could work at their own pace; students were more likely to engage in critical thinking; and instruction became more differentiated and personalized. Close to 80% reported that positive interactions between students increased; that students became more likely to engage in collaborative decision-making; and that students were more likely to have choices in how they demonstrated what they'd learned. Over 50% agreed that students were more likely to have a choice of which learning tasks to engage in.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©. Specific questions about Flipped Learning were asked for the first time in that survey. 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.

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 survey agreed with the statement that Flipped Learning "would be a good way for me to learn." Teachers who have implemented Flipped Learning also report feeling re-energized by their heightened interaction with students (Baker, 2012).

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).

Administrators need to support and motivate professional educators as they transition to flipped classrooms. Flipped Learning Network board members Jon Bergmann and Brian Bennett identified several ways administrators can do this during a fall 2012 webinar titled "Flipped Learning: What it Means for District Administrators." Their recommendations align with what others have noted as strong leadership skills for managing change (e.g., Marzano et al., 2005). First, when observing flipped classrooms, administrators should pay attention to whether students are engaged and learning, although classrooms may seem louder and more chaotic than traditional classrooms. Also, administrators need to encourage teachers as they struggle to master the new model. They should communicate to their teachers that they recognize the challenges involved and listen to their concerns. Administrators also need to serve as a buffer for teachers who flip their classrooms. As with anything new, there are bound to be many questions and concerns from parents and even other teachers, and administrators should be prepared to address them.

The March 2013 issue of the School Administrator, published by the American Association of School Administrators (www.aasa.org), was dedicated to the topic of flipped learning. Many leaders weighed in:

"What I observed…in the classroom at Piedmont Elementary School exemplifies the potential for personalized learning through flipped instruction."

Matt Akin, School Superintendent, Piedmont City School District Piedmont, AL

"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

"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

It is also critical that administrators ensure that the technology department is providing adequate support to teachers. Bergmann and Bennett noted that flipping works best when the IT staff is on board and supports the changes. Encouraging teachers who have made the flip to work together and support one another is also critical (Schoolwires, 2012).

PARENTS

Whenever children's homework changes, as it will with Flipped Learning, parents need to be on board. Flipped Learning Network members Katie Lanier and Crystal Kirsh presented a webinar in March, 2013 titled "Engaging and Informing Parents in the Flipped Learning Process." Their premise is that change can be difficult and therefore the need for ongoing communication is critical to success. They suggest teachers keep parents informed through written communications or through a short illustrative video (or both) prior to implementing this model. They suggest that updates be provided mid-year and at year-end, along with a short survey to elicit parents' views of the experience. Educators, along with their administrators, should inform parents why this change is being made and set expectations for students and parents as to how this

model differs from the previous classroom structure. Explaining the shift directly to parents can help avoid difficult situations before they occur (Schoolwires, 2013).

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 and engaged as a result. Parents will gain greater understanding of what their children are learning and how the teacher teaches. 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 that they wanted the flipped approach to be continued.

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 toward Flipped Learning is growing, more research is required in order to determine its effectiveness (Baker, 2012).

CONCERNS ABOUT FLIPPED LEARNING

Some have argued that the student-centered instruction and engaged, active learning made possible in a flipped classroom represents what should already be occurring in classrooms (Stumpenhorst, 2012). They also contend that Flipped Learning is not a defined model but is, instead, the result of teachers using different tools to meet individual students' needs. This is a valid observation. The flipped classroom model does not eliminate the lecture or other means of direct instruction. Instead, it removes lectures from the group learning space to maximize the amount of time teachers have to spend with individual students and students have to spend working with one another. Flipping the classroom provides more time to address the needs of individual students and enables more active and engaged learning, without sacrificing the amount of material that can be covered. It is true that the Flipped Learning model is not the only way to facilitate good teaching. However, effective teaching may be better enabled and flourish more readily in flipped classrooms.

Another concern is voiced by those who want to use the Socratic Method to engage students in the material as it is being delivered. These teachers believe that a flipped classroom sacrifices actual instruction in order to increase opportunities for student collaboration and activities generated and led by students. However, as Marshall (2013) points out in her model of Flipped Learning, one key role for teachers is to "lead from behind." In other words, the teacher engages in "observation, feedback, and assessment" during class and, in the process, guides the learners' thinking, in the best spirit of the Socratic Method. The difference, and

Students weigh in about Flipped Learning

Kaitie, a high school senior said, "For the first time ever I had the ability to "pause the teacher" while watching the lectures online. Working on my own timetable allowed me to explore learning styles and techniques, and to hone in on the way that I learn best. Another reason I enjoy the flipped class so much is the stress-free environment it creates. I cannot remember a time when I was stressed out about my flipped chemistry classes. I most definitely have been stressed about other classes that are not taught in the flipped classroom model, and I looked forward to my flipped class. The bottom line is that I learned in the flipped classroom. And that learning that occurred helped me get through many classes in high school, simply by learning how to learn."

From Kylie, a high school senior: "The flipped teaching model allowed me to learn at my own pace and made a huge impact on my education. Almost overnight, my grades went from Bs and Bs to all As. I began to understand complex problems that I never before grasped. When I took the ACTs a second time after my junior year, I ended up scoring a 22 on the test! I was thrilled, and couldn't believe how much I improved. With my new grades and ACT score, I realized that there were a lot of options for me beyond high school, and I would no longer have a limited future. I truly believe that the flipped classroom has changed my life, and opened many doors. This year has been a really exciting one for me: I have enjoyed thinking of what my education will bring in the next few years."

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 expressed three concerns about the model during a radio debate with Aaron Sams on Southern California Public Radio (2013). First, he argued that the Flipped Learning model places too much emphasis on lectures and homework, neither of which is productive, and merely flips the position of the two. Next, Stager said that the need to flip the classroom is symptomatic of a bloated curriculum. Because schools are trying to cover too much content, some of it has to be taught outside of class. He also contended that, rather than opening up classroom time for student-centered instruction, the Flipped Learning model requires standardizing the learning experience and will further the privatization of education and the elimination of most teachers. He predicts that mediocre teachers will be hired to create videos of lectures that are not customized for the specific needs of a class.

As is true of all models, Flipped Learning can be done poorly. This literature review has stressed that flipping the classroom creates the potential for active, engaged, student-centered learning, peer interactions, and personalized instruction. But none of these result automatically from moving direct instruction outside of the group learning space. Stager is concerned that flipping the classroom is a way to replace teachers with videos. But, as has been amply illustrated, skilled, professional teachers are critical to success in a flipped classroom. Teachers have to know how to facilitate learning, and not just be able to proficiently communicate content.

Sams and Bergmann (2012) share Stager's concern about generic videos substituting for teachers delivering instruction adapted to the needs of the students in their own classroom. Ideally, teachers will make their own videos and, as the model spreads, it will be important for teachers to have opportunities to gain the skills required. However, it should also be acknowledged that videos produced by other teachers who have a different style may better serve the needs of some students. In addition, teachers are not necessarily experts in all facets of their field. They can supplement their own knowledge by selecting videos of other teachers who may be more knowledgeable in some areas.

Concerns also have been raised about students having unequal access to technology. While this is a legitimate concern, it is important to note that home use of computers and the internet is increasing rapidly. In a survey conducted in 2010 by Child Trends, 57% of children aged 3 through 17 had used the internet at home, nearly three times the percentage in 1997 (22%). Almost 85% of students had access to a computer at home (compared to 15% in 1984). It is true, however, that Hispanic and African American children, children whose families who have lower incomes, and children whose parents are less educated have less access to computers and the internet. More than 90% of White and Asian/Pacific Islander children have computers they can use at home, compared to about three-quarters of Hispanic and African-American children. About two-thirds of White and Asian/Pacific Islander children can access the internet at home, compared to just under half of Hispanic and African-American children (Child Trends, 2012).

It is likely that these disparities will lessen over time. Meanwhile, there are multiple ways to deliver instruction digitally. The simplest is to download the material to memory device that can be plugged into the home computer. Video lessons also can be made available via Smartphones, which are increasingly ubiquitous. Similarly, parents who have iPods or iPads can set up a free iTunes account and students can then subscribe to receive the material. Teachers can burn lessons onto DVDs that can be viewed on computers in the school or public library or at home.

It is important to note that Flipped Learning might not work for all educators and students or with all grades and subject matters. Not all educators will succeed with it and some students may prefer traditional classroom approaches. In their book, Bergmann and Sams (2012) noted that Flipped Learning might be appropriate for certain lessons or units in some lower elementary grades, but not entire classes. Research that focuses on who benefits, in what ways and in what contexts, from the Flipped Learning model, would help educators to understand when flipping the classroom would benefit learners and when it might not be warranted.

CONCLUSION

As illustrated throughout this paper, more qualitative and quantitative research needs to be done to identify how the potential of the model can be maximized. But the existing research clearly demonstrates that the Flipped Learning model can be one way to create a classroom environment that is learner-centered. The Flipped Learning model should by no means be thought of as a panacea for solving all educational issues, rather, it might be one way to enable learning. 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. Gojak (2012) noted that the right question is not whether or not to flip your classroom, instead, professional educators ought to ask how they can use the affordances of this model to become more effective as teachers and increase students' conceptual understanding, as well as procedural fluency (where necessary). 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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The University of Texas at Austin
Faculty Innovation Center

"Flipping" Your Class

Overview

"Flipping" the class reverses the traditional class setup: students acquire basic content outside of class, and then work together in class on application-oriented activities. Whether you want to flip one class session or an entire course, the following questions will help guide you through the essentials.

Curate (Borrow or Buy existing materials)	Create (Build your own materials)

Where to Start:

- What topics within your course have you noticed students struggling to understand the material?
- What misconceptions are common within your field?

F Figure out where "flipping" makes the most sense for your course

Which topics within a unit would be better served if students were given the opportunities during class to actively apply their knowledge and skills?

What learning outcomes need to be refined or introduced to target higher order use of knowledge and skills?

UT Instructors are using:

- Homework problems with a classroom-response system
- Team-based Learning
- Peer Instruction
- Case-studies
… for large and small classes.

L Look for in-class activities requiring students to apply what they are learning

What activities have you developed that are currently rushed through during class due to time constraints? What homework questions could be tackled during class?

What activity could be designed that would appropriately challenge students to apply concepts and engage them in the types of thinking common in your field?

Evidence-based Practices

- Create 3-5 video segments lasting 3-5 minutes
- Check for understanding
- Hold students accountable for doing pre-class work

I Identify the content students will engage to prepare for class

What existing resources would supply students with the information needed and how would you check their understanding?

What essential content do students need to acquire before class that would be best served by producing your own videos [3-5 segments lasting 3-5 minutes each]?

Student Perspective

- Jimmy Wadman, UT student, shares his experience in his CH301 Chemistry class: www.utexas.edu/know/2012/1 1/19/course-transformation-chemistry-education/

P Prepare students for the unique roles everyone will have during class

What expectations and procedures need to be communicated to students regarding how they prepare for class and engage during class?

What additional tools or techniques would help you in your role as a "cognitive coach" where you develop and challenge students to engage in ways of thinking within your field?

Transforming a course takes both time and commitment, so starting with a single class session by focusing on what and how students are learning at that scale often works well. Flipping is an iterative process, so as you implement these practices, reflect on what works well and what needs to be modified.

Interactive Polling and Gamification Tools

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Interactive Polling Tools

Interactive Polling Tools (also called student response systems, 'clickers', or classroom response systems) have been used in higher education teaching for many years now and can be a quick and easy method for gaining insight for both teachers and students.

As with many software applications, Interactive Polling Tools are an ever-evolving technology, moving from fairly "low tech" clicker technology to today's more "tech savvy" iterations that operate online using mobile devices.

Mentimeter

Link: https://www.mentimeter.com/

Description:

Mentimeter is a polling tool that provides instant feedback during lecture classes. It allows users to create an interactive learning environment by surveying students in real-time during class and view results instantly.

Mentimeter is simple yet powerful, with a pleasing visual interface. The free version is somewhat limited, however it is a great polling tool if you have large class-sizes and only wish to ask 2-5 questions during each lecture. Presentations are quick to setup and easy to use for both lecturer and student alike. Educational discounts are offered on paid licences. Increased functionality, such as exporting analytics, can be obtained in the paid versions.

Mentimeter is a perfect tool for those who want minimal setup, easy deployment, polls that can build into existing presentations, have large class sizes, and don't require exportable analytics or LaTeX embedded into questions.

Features:

- Free and (low cost) paid versions.
- Unlimited class size.
- Offers innovative question types such as live word cloud, image choice, and matrix.
- No installations/set-up required for students.
- Examples and templates available for inspiration.
- Allows a great deal of customisation for each question type, including time limits, background images, and game-style questions.
- Responses can be displayed directly in PowerPoint / Keynote / Google slides.

- The free version is limited to 5 multiple choice quiz questions or 2 "other type" questions per presentation.
- Responses can only be exported as PDFs or images (jpgs) when using the free version (screenshots collected during the presentation). For excel export capabilities, the paid version is needed.
- There is no simple way to share polling slides between accounts for use across multiple classes.

Screenshots:
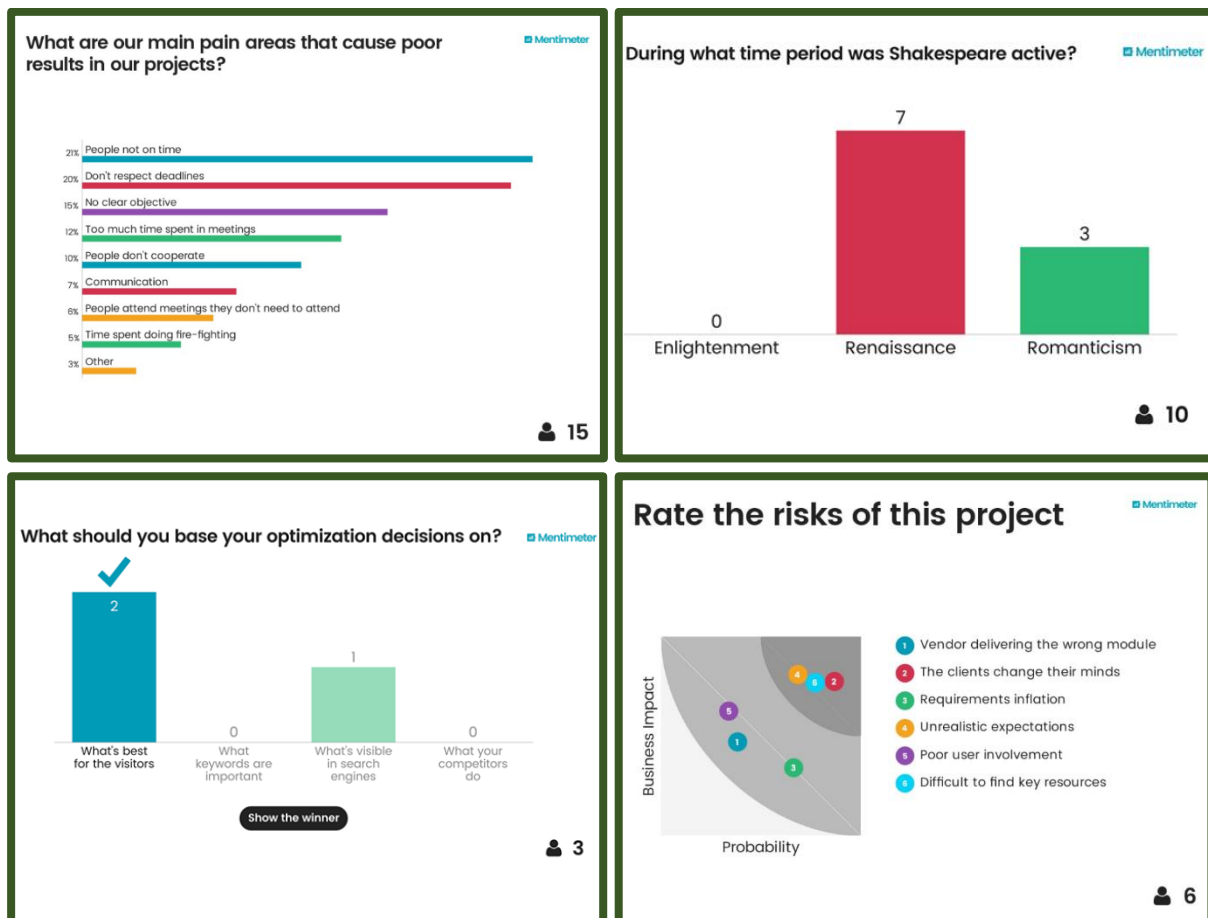
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Poll Everywhere

Link: https://www.polleverywhere.com/

Description:

Poll Everywhere is a powerful web tool for creating and distributing polls. Students can vote on your poll either through SMS or via the web using the generated link you will provide them. Poll Everywhere allows you to display the results of the poll in real-time.

Poll Everywhere is simple to use and very powerful, with an easy to use interface and scope to build equations into questions. The free version is somewhat limited, but this is a great polling tool if you have small class-sizes. Presentations are quick to set up and easy to use for both lecturer and student alike. Paid versions offer different pricing plans that extend functions beyond basic features.

Poll Everywhere is a perfect tool for those who want minimal setup, easy deployment, polls that can build directly into existing presentations, exportable analytics, and LaTeX functionality. The import/export function makes sharing quizzes between users particularly easy. The cost does make it somewhat prohibitive for large class groups.

Features:

- Free and paid versions.
- Unlimited number of questions per poll.
- No installations/set-up required for students.
- Supports LaTeX.
- Import questions from CSV files.
- Responses can be displayed directly in PowerPoint / Keynote / Google slides in real-time.
- Question bank for easy re-use and templating.
- Allows for multiple-choice and open-ended questions with textual response.
- Multiple user account (paid only).
- Export analytics for each question as a spreadsheet.
- Free version allows only 40 responses per poll.

Screenshots:

Socrative

Link: http://socrative.com/

Description:

Socrative is one of the most well-known (and widely used) Interactive Polling Tools. It is a robust app and free to for class sizes <50. You can create questions in various formats (like a quiz, a simple quick question, a space race game, or an exit ticket) and results are displayed in real-time. The interface is easy to use for both lecturers and students.

It is easy to see why *Socrative* is one of the best-known polling tools – it is simple yet powerful, with a pleasing visual interface. The free version has limited, however this is a great if you have small class-sizes. Quizzes are fast to setup and easy to use for both lecturer and student alike.

Socrative is a perfect tool for those who want minimal setup and easy deployment into small-mid sized classes, quiz sharing between users, exportable analytics, and don't need LaTeX embedded into questions.

Main features

- Free and (low cost) paid versions.
- Unlimited questions per poll.
- No installations/set-up required for students.
- Multiple-choice and open-ended questions with textual response.
- Easily share quizzes between different accounts.
- Allows some question customisation.
- Ability to download PDFs of existing quizzes.
- Responses can be visualised in real-time with options for answer explanation boxes.
- Response analytics can be exported to as spreadsheet or viewed online as charts, with a variety of configuration options.
- Free version only allows 50 responders per poll.
- Polls cannot be built directly into existing presentations.

Screenshots:

![VoxVote logo] VoxVote

Link: https://www.voxvote.com/
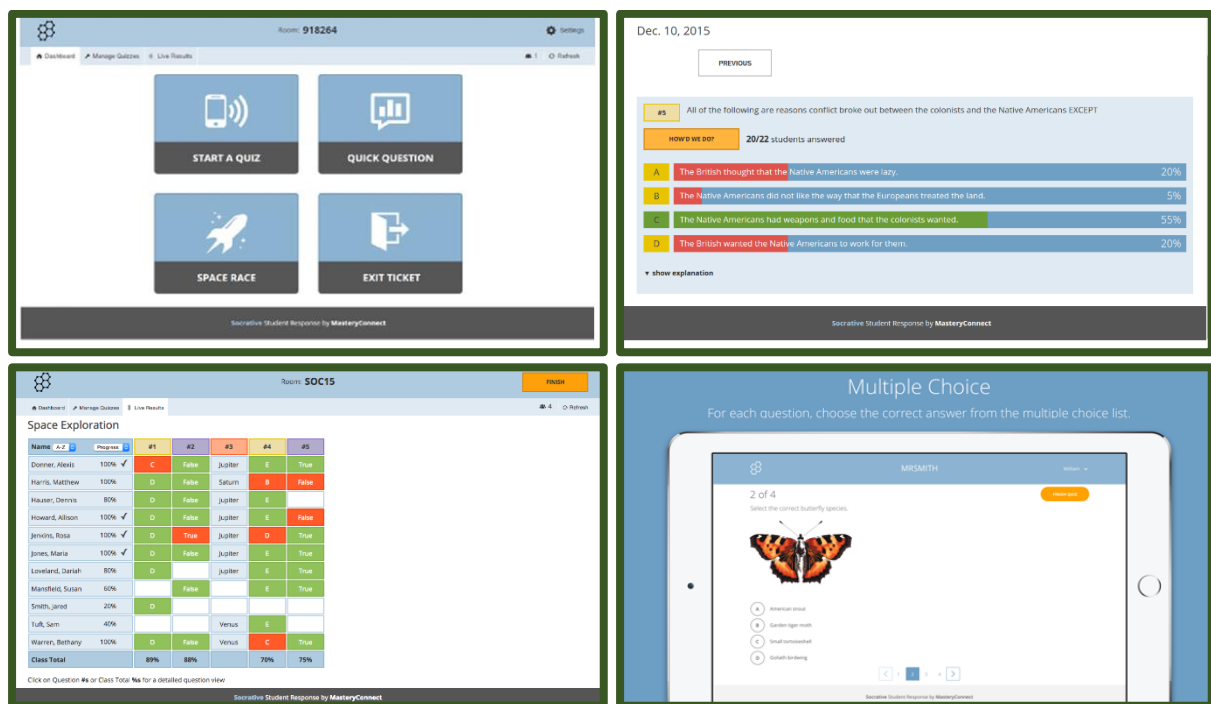
Description:

VoxVote is a free mobile voting platform with unlimited audience, which adds interaction to an event. Audience can use their smartphone and add answers to live polls, quiz or create a wordcloud based on their responses. *VoxVote* runs worldwide on a cloud scalable platform.

The *VoxVote* platform is freely available for end users who are in the audience. For speakers on stage, it has interactive designer features for managing events and editing questions (VaaS - Voting as a Service)

Voting app can be found on http://live.voxvote.com and in the app stores.
Designer platform can be found on https://designer.voxvote.com .

VoxVote runs on Azure, the Microsoft scalable cloud platform, located in Europe.

Main Features:

- Audience nicknames / who already joined
- Anonymous voting (this improves audience responses).
- Secure voting with https, and eyeblink fast.
- Unlimited Audience - it can be 50 users or 1000+ users (available in the free version).
- Single and Multiple response question types.
- Ranked questions with "Other please specify" free text input.
- Open Answer / Free text input, with Wordcloud (TextCloud) and frequency reporting.
- Weighted Average. Calculates a weighted average based on user votes and weights per answer option.
- Questions and Answers module, messaging module for questions from audience and centralized moderating.
- Live graph results. All votes are realtime plotted on the chart.
- Keyboard controls to start/stop and navigate to control questions and layout of the chart screen.
- PIN: Personal access code. A random 5 digit access code is generated for audience access.
- Create presentation slides within VoxVote (available in the paid version).
- Question Images - add image to a question (available in the paid version).
- Add instant new questions from the audience or a new topic.
- Run a VoxQuiz™ - Quiz option to see who scores best on a topic.
- Logo/Branding - add a company logo as a default logo, or specific event logo's on the live voting pages.
- Smartphone voting.
- Historic overview from archived and running events.
- Live crossing and weighted calculated results.
- Email summary to all participants.
- Custom voting URL https://yourdomain.voxvote.com (available in the paid version).

Screenshots:
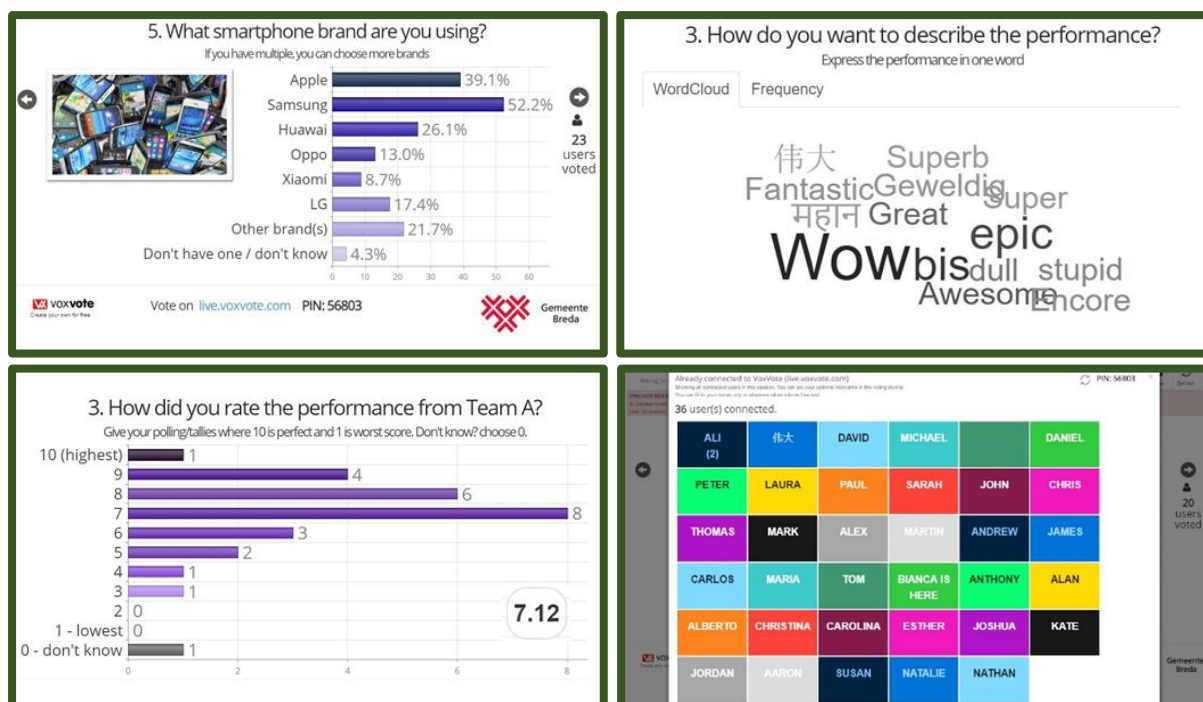
wooclap Wooclap

Link: https://www.wooclap.com/

Description:

Wooclap is an EdTech tool that allows students to play a role in their own learning. It is a collaborative platform for classes, conferences and training sessions. Intuitive and simple, *Wooclap* makes presentations interactive.

Main Features:

Live learning

- ▪ *Multiple choice questions*
  Participants choose one or several answers, the results of which are presented as a histogram.

- ▪ *Rating*
  Audience rates statements on a scale, so it is possible to analyse trends in public opinion.

- ▪ *Poll*
  Polls are multiple choice questions to which there is no right answer.

- ▪ *Find on image*
  Locate a correct area on an image.

- *Word cloud*
  Word cloud that rearranges itself in real time and emphasises the most recurring words.

- *Open Questions*
  Participants type in their insights freely.

- *Guess a number*
  The audience answers questions with a numerical value. The average, maximum, and minimum will be displayed on the screen.

- *Prioritisation*
  Participants will attribute exactly 100 points to the different propositions, thereby assigning a certain degree of importance to each of the elements.

- *Sorting*
  Participants sort elements in a specific order.

- *Matching*
  Audience can match elements from two columns.

- *Fill in the blanks*
  Audience can complete a text with missing words.

- *Quick Slide*
  Allows to quickly insert additional or useful text and images into your presentation.

- *Brainstorming*
  Participants share their opinions on a given topic and sort their ideas by category.

- *Video*
  Enter a video's URL (DailyMotion, Vimeo, YouTube) or mp4 file to add compelling content to the presentation.

Comparison

- Allows to ask the same questions multiple times and compare the results from one session to another.

Gamification

- Competition mode stimulates participation and makes presentations even livelier.

Live messaging

- *Wall of messages*
  Gathers messages and questions during a presentation and displays them.

- *Reactions*
  Reaction to messages sent by their peers.

- *Message categories*
  Structure Q&A sessions by organising the messages into different categories.

- *Moderator*
  Select interesting questions and delete irrelevant ones.

Distance learning

- *Survey*
  Gather feedback right after a class, conference or training session (anonymously or authenticated).

- *Homework*
  Ask the audience to answer a series of questions from home, at a pace of their choosing.

- *Files*
  Share files with the audience at any time.

Results

- *PDF*
  Visualise global performance, make adjustments, and move forward with the audience.

- *CSV/Excel*

  Wooclap works with Excel to allow results exportation from the presentation to a spreadsheet.

- *Grid*
  Downloads the grid of results to observe individual and global performance.

LMS & SSO

- *Moodle, Blackboard & Canvas*
  Educators can export a list of questions from Moodle, Blackboard, and Canvas to Wooclap and vice versa.

- *SSO, SAML, CAS*
  No need to create new accounts. Using SSO, students and teachers can log in to Wooclap with their university credentials.

PowerPoint, PDF, Keynote & Google Slides

- *PowerPoint plug-in*
  Wooclap PowerPoint plug-in integrates questions directly into a PowerPoint presentation.

- *Google Slides*
  Adds a Google Slide presentation to Wooclap.

- *PDF & Keynote*
  Allows to integrate Wooclap questions in a PDF and Keynote presentation.

Screenshots:
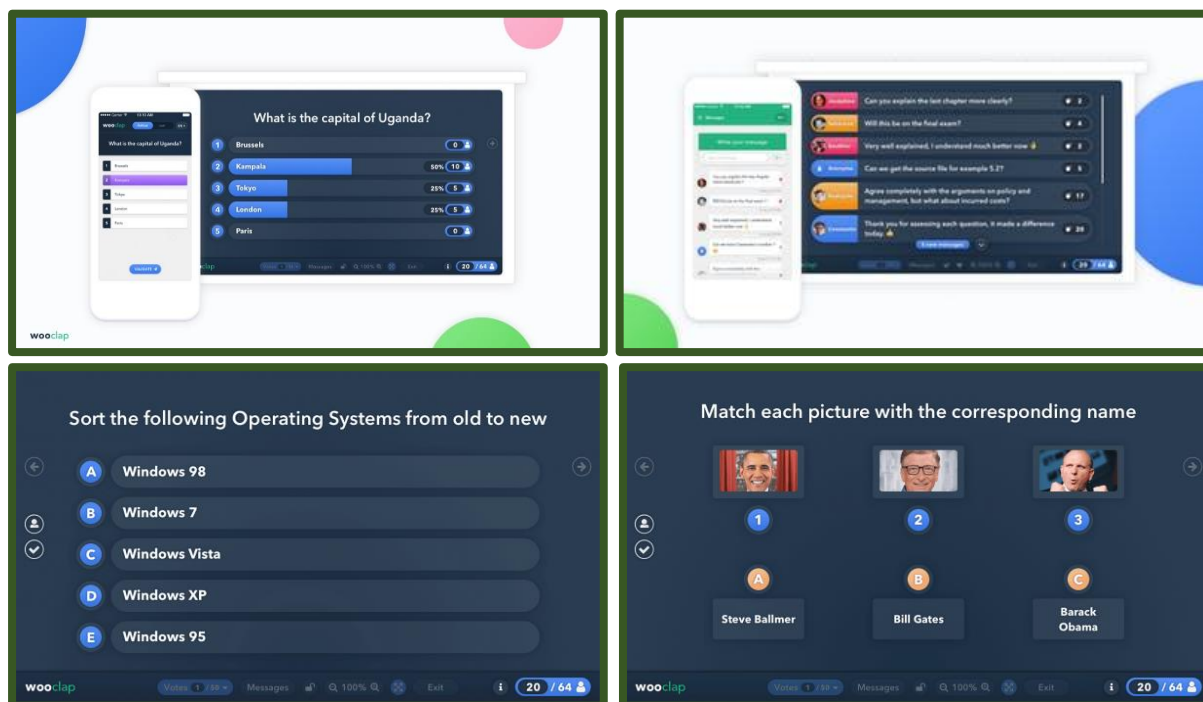
Gamification Tools

Gamification adds game mechanics into nongame environments, like a website, online community, classroom, learning management system or business' intranet to increase participation. The goal of gamification is to engage with students, consumers, employees and partners to inspire collaborate, share and interact.

Gamification works by providing audiences with proactive directives and feedback through game mechanics and game dynamics added to online platforms that lead to the accomplishments of business goals and objectives.

A compelling gamification experience taps into a participant's emotions and demonstrates, easily, the best activities an audience can complete that make an impact on mutually shared goals. As students, employees or customers interact with a gamification program, they receive immediate feedback on performance and are guided towards new achievements.

Kahoot!

Link: https://kahoot.com/

Description:

Kahoot! is a free game-based learning platform that makes it easy to create, share and play learning games or trivia quizzes in minutes. *Kahoot!* serves as a student-response tool for administering quizzes, facilitating discussions, or collecting survey data. It is a game-based classroom response system played by the whole class in real time.

Main Features:

Features	Basic	Pro	Premium
	Use basic features to create, play, and host games outside of the classroom and in-class.	Unlock more question types, collaborate with colleagues, and access advanced reports.	Access our full suite of question types, distance learning tools, and play school-size games.
Price	Free	€3 per teacher / month (billed annually)	€6 per teacher / month (billed annually)

Features	Basic	Pro	Premium
Student-paced games (Challenges)			
Class-sized games	✔	✔	✔
School-sized games			✔
Personalized learning			✔
Live games			
Class-sized games	✔	✔	✔
School-sized games			✔
Distance learning tools			
Teach students outside of the classroom by hosting games via videoconferencing	✔	✔	✔
Assign student-paced challenges for students to play at their own pace	✔	✔	✔
Create and play			
Play millions of community-made games by subject and grade	✔	✔	✔
Create basic games with multiple choice quiz questions	✔	✔	✔
Choose from half a billion questions in our question bank	✔	✔	✔
Add images as answers for pre-readers and math students	✔	✔	✔
Access millions of high quality images with image library		✔	✔
Use image reveal to change up the game and focus players		✔	✔
Add slides between questions to give players more info		✔	✔
Add polls to gather player feedback		✔	✔
Add puzzles to test deeper understanding		✔	✔
Mix different question types in one game		✔	✔
Add open-ended questions			✔
Add word cloud questions (Coming soon)			✔
Edit premium ready-to-play games			✔
Customize			
Auto-generate or verify nicknames	✔	✔	✔
Change music to stir up the class	✔	✔	✔
Brand games with school logo and colors			✔
Assess and share			
View and share advanced reports		✔	✔
Organize kahoots in folders		✔	✔
Access your school's team space		✔	✔
Create a public profile (upon request)			✔
Support and administrate			
Online support	✔	✔	✔
Priority support		✔	✔
Pay by invoice		✔	✔
Site license			✔
Sharable license key			✔

Screenshots:

Quizizz

Link: https://quizizz.com/
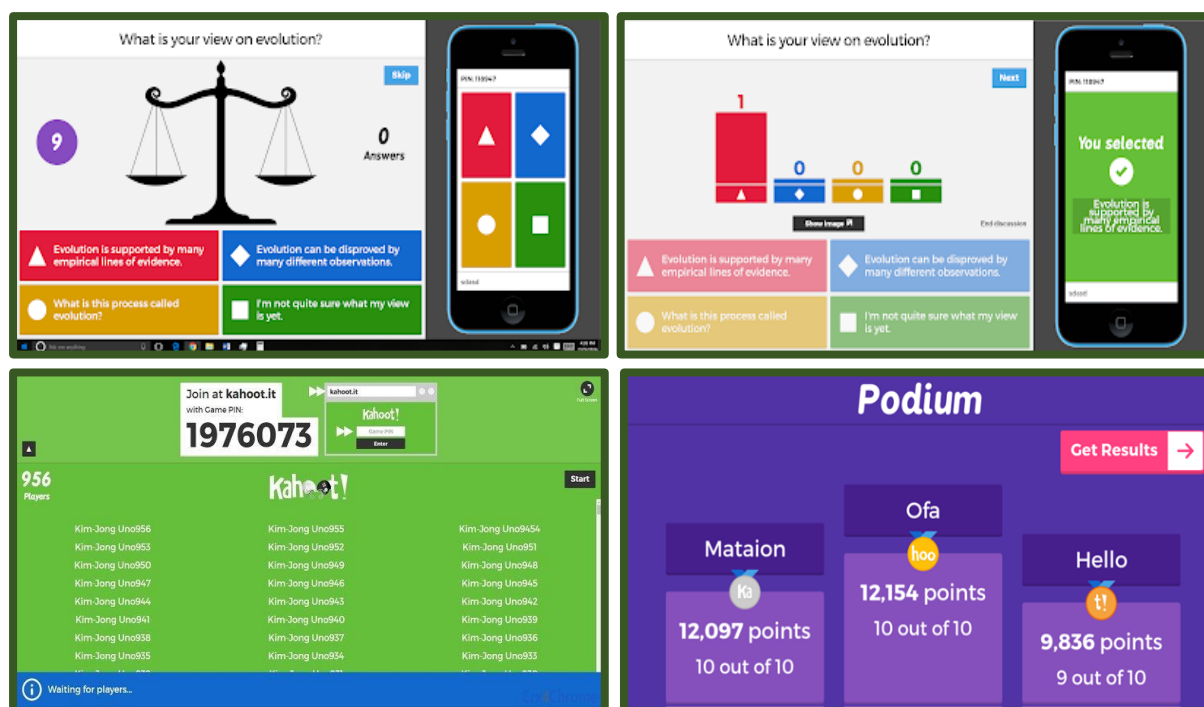
Description:

Quizziz is an online assessment tool that allows teachers and students to create and use one another's quizzes. After providing students with a unique access code, a quiz can be recorded live as a timed competition or used as a homework with a specific deadline. After the quizzes have been completed, students can review their answers. Furthermore, the resulting data is compiled into a spreadsheet to give the instructor a clear visual of the students' performance in order to analyse trends in which areas might need the most focus in the future. This immediate feedback can be used by teachers to revise future learning activities and altar the focus of material by putting a larger emphasis on concepts that students are struggling with.

Main Features:

Quizizz allows you to conduct student-paced formative assessments in a fun and engaging way for students of all ages. The salient features include:

- *Student-paced:* Questions appear on each student's screen, so they can answer questions at their own pace, and review their answers at the end.

- *BYOD:* Can be played by students using any kind of device with a browser, including PCs, laptops, tablets, and smartphones.

- *Thousands of public quizzes:* teachers around the world create thousands of questions on Quizizz every day. This community effort generates great content that everyone can use.

- *Quiz Editor:* Quizizz creates quizzes by allowing the user to pluck questions from any quiz, easily add images from the internet, auto-save progress and tons of other features.

- *Reports:* Quizizz reports give detailed class-level and student-level insights for every quiz. The reports can be downloaded as an Excel spreadsheet.

- *Quiz Customization:* Teachers have multiple options to customize their quiz session to toggle the level of competition, speed, and other factors.

Screenshots:
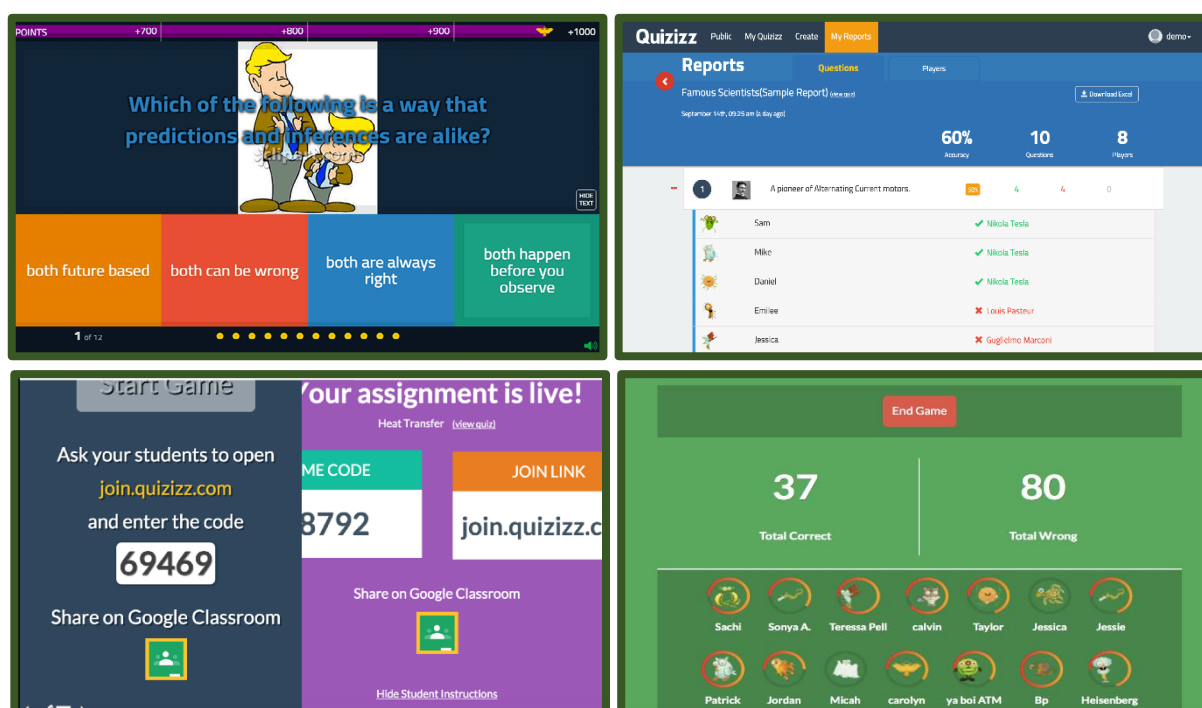
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Quizlet

Link: https://quizlet.com/

Description:

Quizlet is a free mobile and web-based study application that allows students to study information via learning tools and games, including flashcards, study and game modes.

The *Quizlet* website, which is also available as an app, includes text-based and visual study materials. Students can add audio and images to flash cards and use tools that quiz them, test their spelling, lets them import and label diagrams, and advance their progress in a game if they enter correct answers. The *Quizlet Learn* feature mixes true and false, multiple-choice, and other types of questions and, based on performance, increases difficulty over time. Subjects range from a set simply called "Numbers" to the highly specific "Underwater Diving Disorders."

Main Features:

- *Learn Feature*
  This feature can be great for students to study sets because the questions will increase in difficulty as they go on. The difficulty is determined by which questions you have previously gotten incorrect. During progress the answer will be shown and words will either enter categories of "New", "Seen", "Familiar", or "Mastered". The strength of this tool is that it will remember the progress made and adapt the game to assist the learner. By using this tool students are seeing more of the words that they do not know automatically.

  There is a mobile version of Learn. Students will still be answering multiple choice questions in order to match the definition to the term. They will still have a progress bar, but will not be able to review their information until the end.

- *Flashcards*
  This feature allows students to view flashcards on the computer or on their mobile phone. This effectively eliminates the need to carry bulky flashcards around in order to study. Students now have access to thousands of terms at the touch of their fingers.

  The mobile version is very similar as it offers all of the same features. Simply tap the card to reveal the definition.

- *Write Feature*
  Students will have to remember the term from memory and type it correctly to match the definition. There is also the option of typing the definition of a term.

  The mobile version is very similar in its layout. Students must type the term or definition correctly. They will be corrected when it is wrong or they have the option of clicking "Don't know".

- *Spell Feature*
  This feature requires audio. This tool is designed to help students improve their spelling. It is similar to the Write feature, but students will listen to the correct answer as well. They simply have to type what they hear in order to answer correctly. This will improve the students spelling of words while familiarizing themselves with the definition. The option of listening to the definition is available but it requires the entire thing to be typed correctly.

  There is no mobile version of this feature.

- *Test Feature*
  This is designed to be set up like a normal summative assessment. There are customizable options while taking this test and four different question types: Written, Matching, Multiple choice, and True/False. There is also the option of recalling the term or the definition. This feature can be a great way to check for understanding after a lesson or prepare students by studying words. At the end of the test, students submit their answer to see how they did. Is possible to print the test or test results out. By printing these tests students can utilize Quizlet without access to technology in the classroom.

  There is a mobile version of this feature.

- *Match Feature*
  This is the first of three "game" features. This is as simple as the name suggests. Drag or click the term and definition which is scrambled along with others. It is a competition against classmates for the fastest time. If a term and definition are incorrectly matched then there is a time penalty.

  There is a mobile version of this feature that works similarly.

- *Gravity*
  This game mode forces students to think fast in order to keep on advancing to the next level. Similar to the Write feature, students will not have an answer bank of terms and must know them well. There is the option to see the definition or term and have to correctly type the opposite. For most cases typing the term would be ideal. As the game starts an asteroid is slowly descending towards your planet. The term/definition must be written in order to blow it up before it reaches the planet. Students are rewarded with more points for how fast they answer correctly.

- *Quizlet Live*
  This game requires at least four students to play and the more the better. Students will be broken into teams where they will have to collaborate in order to reach success. Each student will be given a handful of terms. On all of the team's screen, there will be a definition and only one student has the correct term. If the team gets 12 definitions in a row they win. If someone misclicks then the team returns back to zero.

- *Quizlet Teacher*
  While Quizlet can be used successfully in a classroom without paying, they offer an upgraded teacher version for $34.99 a year. While there are not any additional major features, it is possible to customize sets and games more. Perhaps one of the most important features offered in this upgrade is to track individual student progress. This allows to collect data on each student in class. It's possible to check the frequency they study and how successful they are. This data can prove to be an invaluable tool as an educator.

Screenshots:

Quizalize

Link: https://www.quizalize.com/
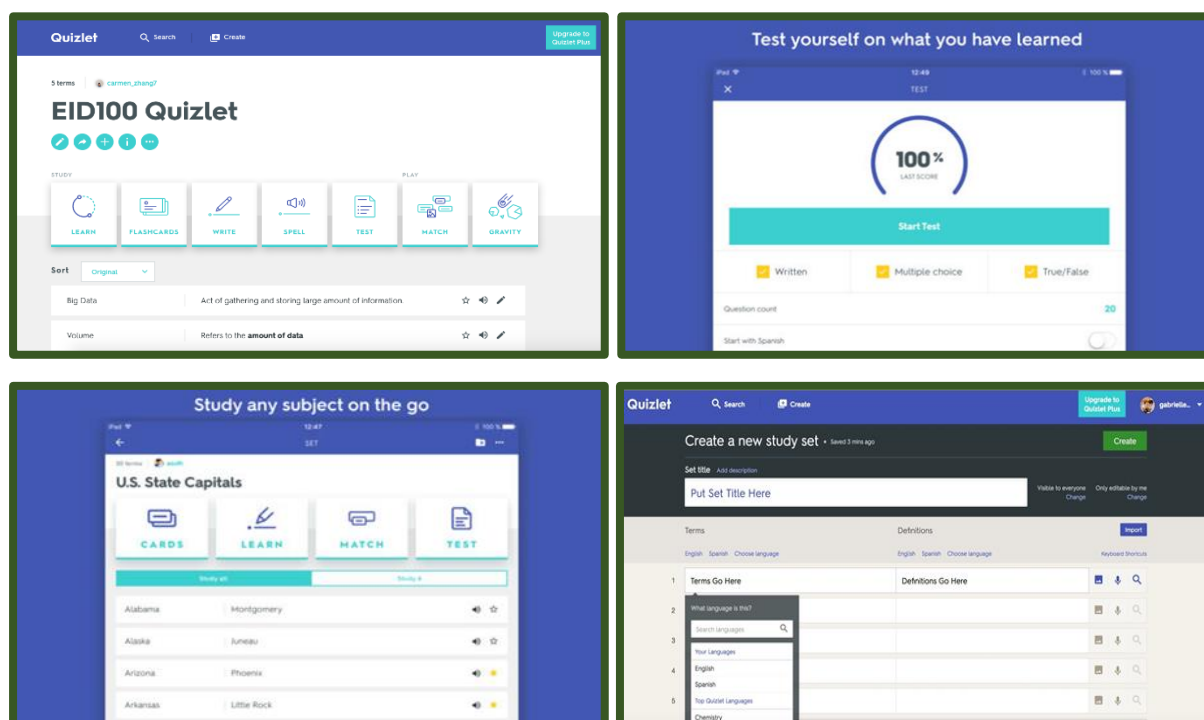
Description:

Quizalize is an online platform for classroom polling and assessing that can be accessed by computer, tablet, or mobile phone. Teachers can create quizzes to test students' knowledge in the classroom, then see the results propagated in the Teacher Dashboard through data reports. *Quizalize* can be integrated into Zzish, a popular learning app management system that many teachers and schools might already be using.

Main Features:

- *Free teacher dashboards*
  See class report for the most recent activity completely free.

- *Differentiated teaching*
  Assign different students different quizzes appropriate for their level.

- *Team game view*
  Use Quizalize as a whole in class quiz game. Engage and motivate students.

- *More than flashcards*
  Easily create multiple choice questions and other types.

- *Rich insight*
  Get detailed reports on each student's strength and weaknesses.

- *Progress Tracking*
  Record student results over time and demonstrate progress.

- *Personal student reports*
  Give each student the individual feedback they need to improve.

Screenshots:

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Gimkit

Link: https://www.gimkit.com/
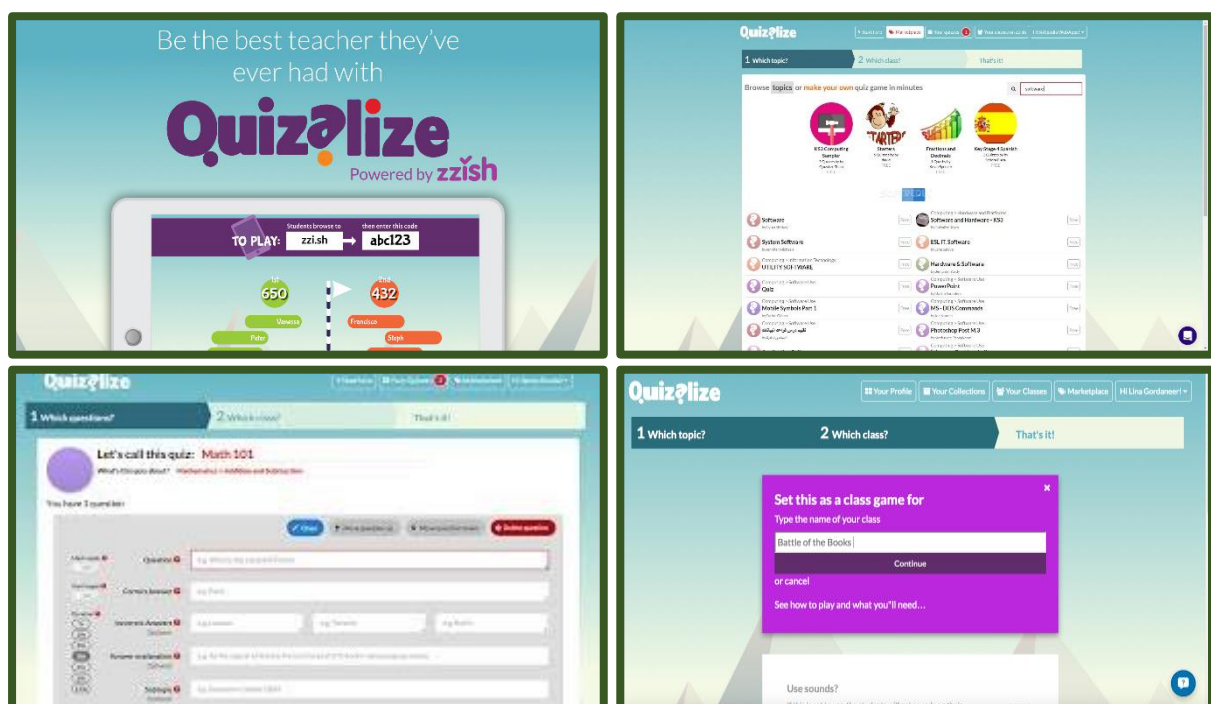
Description:

Gimkit is an easy to set up group quiz based assessment tool which is fast-paced. Unlike other solutions, *Gimkit* has a monetization component where students build up in-game cash that can then be used to purchase in-game upgrades. You can also paste any *Quizlet* into *Gimkit*. *Gimkit* can be used in any classroom to introduce or review concepts; it's like a mashup of *Kahoot!* and *Quizlet*.

Main Features:

These are *Gimkit* plans:
Basic:

> Free

> - Live Games
> - Assignments
> - Classes

Pro:

> $9.99 per month or $59.88 annually.

> The pro version is having all basic version features plus the following add-ons:

> - Unlimited kitz
> - Unlimited edits
> - Audio questions
> - Image uploads

Groups:

> This version is further divided into two categories: *Gimkit school* and *Gimkit Department*.

> - School: $1000 per year, and all teachers can use the platform.
> - Department: $650 per year wherein up to 20 teachers can have access.

How to use

First, is required to sign up to create an account, set up groups, and then create the first "kit." Questions and answers can be created from scratch, from a Quizlet set already created or import a CVS file.

When setting up a game, there are quite a few options to choose from. Under the Game Goal category, it's possible to select Time (time limit), Target (each player hits a target score), Race (first one to the target amount wins), or All-In (all students combine to a total score goal). It is also possible to give a starting cash amount, which can help them unlock bonuses faster.

In order to play Gimkit, a kit must be selected on the dashboard, choose play and then post the game code on the board. Students join without an account by putting in the code into their computers.

Students answer questions on their own device at their own pace. Throughout a Kit, each student will get exposure to the questions multiple times to ensure mastery.

After every game, Gimkit generates a report detailing what class needs help on. Individual reports allow to help specific students.

Gimkit isn't only used in a live class setting. Gimkit is available for homework assignments which are graded automatically.

There's a feature called KitCollab which allows students to take charge of their own learning. The class builds the Kit by each student contributing a question.

Gimkit is updating its features on a regular basis to make it more user-friendly for both teachers and students.

Screenshots:
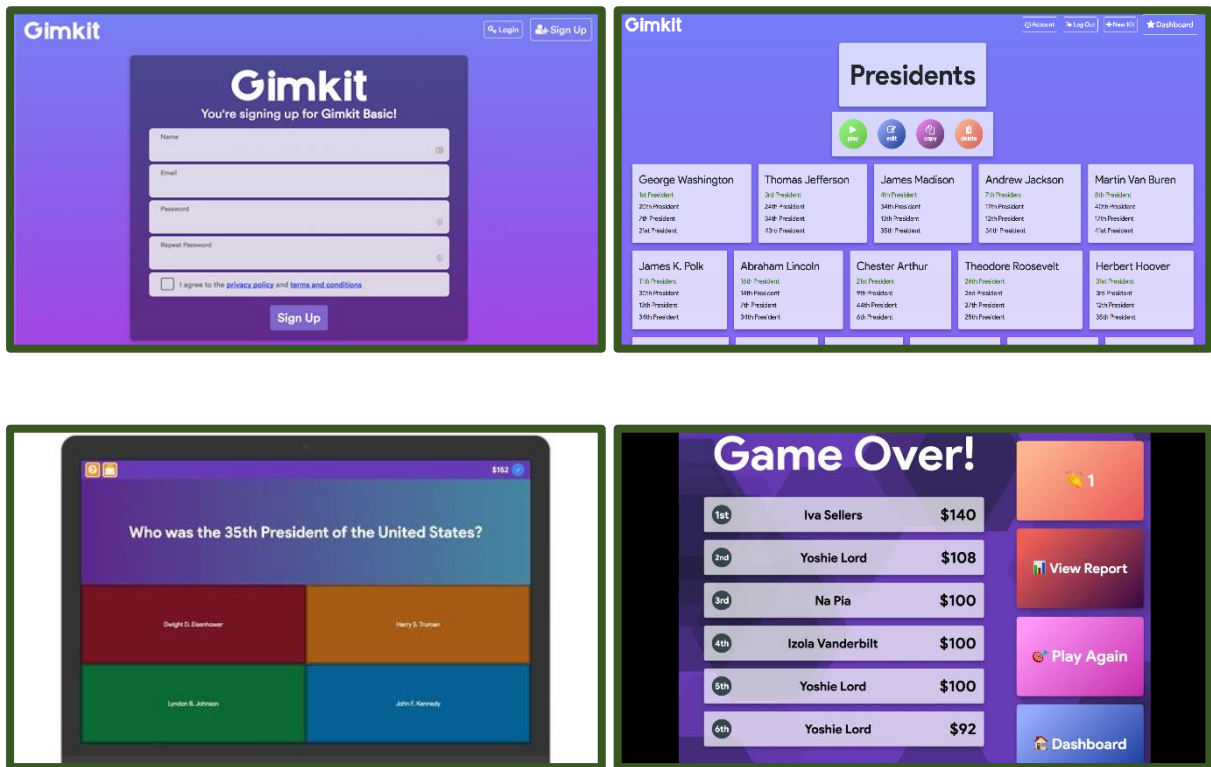
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Additional documents

Table I – Interactive Polling Tools:

Table I - Interactive
Polling Tools.pdf

Table II - Gamification Tools:

Table II -
Gamification Tools.pdf

Student Response Systems – Comparative table:

Student Response
Systems.pdf

Other sources/references used on this document:

https://www.capterra.com

https://socialcompare.com/en/comparison/student-response-systems

https://www.sydney.edu.au/

https://www.bunchball.com/gamification

http://todallycomprehensiblelatin.blogspot.com/2018/11/kahoot-vs-quizizz-vsquizlet-live-vs.html

https://ditchthattextbook.com/game-show-classroom-comparing-kahoot-quizizz-quizlet-live-and-quizalize/

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	i>Clicker	Poll Everywhere	Acadly	Top Hat	Socrative	TurningPoint
Logo	iClicker	Poll Everywhere	Acadly	TOP HAT	socrative	TURNING technologies
Link	http://iclicker.com	http://polleverywhere.com	http://acadly.com	http://tophat.com	http://Socrative.com	http://turningtechnologies.com
Voting technology	Clickers/Web/App	Web Based/App	Web based/App	Web Based/App	Web based	Clickers/Web/App
Student License Cost	Lifetime clickers are $30.99/$41.99 (free 6-month access to the mobile solution included)	Free	Free for individual classrooms. Pricing plans for university-wide use with LMS integration.	$24 for 4 months, $36 for 12 months, or $72 for 5 yrs.	Free version (50 cap.); Pro version $59 per instructor (150 cap. per activity)	Licenses available at $20.99/1yr or $37.00/4yr.
PEDAGOGICAL FEATURES						
Presentation Tool	✓ Present with anything (slides, video, website, etc.). No import of content required.	✓ Can Integrate Polls with PPT	✓ Survey results available on all student devices instantly. No Powerpoint plugin - data can be exported to CSV files.	✓ Can present through PowerPoint using the Top Hat widget	⊗	✓ Hardware and software options available to control presentations and polling.
Asynchronous Content Access	- iClicker Reef/Cloud- Can send session history with questions, images, and answers to student to be used as a study guide outside of class.	⊗	✓ Students and professors can engage with, and view the results of all activities outside and after the classroom as well.	✓ Files in Classroom Module	⊗	✓ Self-paced options for hardware and app. Create and deliver any type of assessment.
Student Performance Analytics	✓ Campus Analytics - Insight to usage across your campus, department, and classrooms	✓	✓ Students can access their performance statistics. Professors can export results any time.	✓ Gradebook with student performance - Students and professors have access to their own accounts	✓ Limited	✓ Various reports available to monitor student or class progress.
Advanced Question Types	✓ Multiple Choice, Short Answer, Numeric, Target, Anonymous Survey	✓ Mul Choice, Word Cloud, Q & A, Rank order, Image, Survey, Open ended	✓ Multiple choice, True-False, Word Clouds, Poll or Survey options, shuffle options to personalize experience, hard/soft deadline behaviour.	✓ 6 question types: Multiple Choice, Word Answer + Word Cloud, Sorting, Numeric, Click on Target, Matching	⊗	✓ Many options available including WordCloud, competition polling options, comparative slides, and essay.
Automatic attendance	✓ Reef/Cloud - GPS technology to confirm students' locations when they "check-in" to class.	⊗	✓ Mesh network based one-tap attendance.	✓	⊗	⊗
Student to Student Interaction	⊗	⊗	✓ Discussions and student-led Q&A, including voting, anonymous querying and comment reactions.	✓ Discussion Tool, Anonymous Discussions	⊗	⊗
ADMINISTRATIVE FEATURES						
Integration with LMS	✓ Seamlessly integrate with all major LMS platforms, including Blackboard Learn, Canvas, Desire2Learn, Moodle, and Sakai. LTI available. generate Excel reports of aggregate and individual response data.	✓	✓ LMS integration available in the premium (paid) version. Free version supports CSV exports.	✓ Direct integrations available for leading LMS. Sync rosters and export grades instantly to LMS.	⊗	✓ Direct integrations available for leading LMS. Sync rosters and export grades instantly to LMS.
Campus Wide Funding-Option	✓ With Reef/Cloud	✓ $3500-1000 Students	✓ Available. Pay per active user model.	✓ $30K-50K for17000 FTE	✓ Free	⊗
Vendor Faculty Support	✓ Comprehensive online materials and dedicated support	✓ Institution has Acct Manger	✓ In-built support with 24-hour turnaround time for all users, training videos, webinars and one-on-one demos.	✓ Extensive Online Doc's, and Question Form	✓ Online User Guide	✓ Dedicated training team for implementation and extensive online documents and information for all users. Online chat and phone support available.
Accessibility Features	✓ Has Voluntary Product Accessibility Template (VPAT)	⊗	✓ Screen-reading and keyboard navigation. VPAT available.	✓ ADA readers	⊗	✓ ResponseWare offers screen readers. Hardware option available for the visually impaired.
STUDENT FEATURES						
Vendor Student Support	✓ Online support portal with FAQs, videos, user guides, etc.	⊗ No Online Docs	✓ In-built support with 24-hour turnaround time for all users.	✓ Extensive Online Doc's, and Question Form	⊗	✓ Online step-by-step registration documents. Phone support and online chat available.
Game Interaction	⊗	✓ Competitions with MC Questions	✓ Leaderboard available to faculty. It is their discretion to share it with students.	✓ Tournament with leaderboard	✓ One preset game	✓ Competition features available for teams or individuals.
Multiple Device Compatibility	✓ i>clicker +, i>clicker 2, REEF Polling (any smart device)	✓	✓ Available on Android App, iOS App, Desktop Website and Mobile Website.	✓ SMS option for basic cell phones, smart phones, tablets, computers	✓	✓ App available for Android and iOS devices. Web browser option available for browsers.
Feedback to Teacher	⊗	⊗	✓ Several ways to reach out to the professor, including discussions and Q&A.	✓ Instant Feedback to teacher, everything is saved in the Gradebook, can compare sessions or questions	⊗	✓ Devices and ResponseWare allow for communication to the teacher.
Text/SMS Response	⊗ - No SMS, but does have short answer up to 16 characters	✓	⊗	✓ - offline mode and SMS option	⊗	⊗
COMMENTS	Market leading hardware known for it's simplicity and reliability. All remotes work alongside the mobile solution, REEF polling, to create a blended classroom if needed.	Multiple Language Support	Includes one-tap attendance that discovers students in the professor's proximity at the tap of a button.	Integration of PowerPoint, questions, pages, discussions, and quizzes. Really easy to use. Provides one-on-one training for professors.	50 Students Max per room; Pro version = 150 Max per room	Direct PowerPoint integration or poll over top of any application. Clickers and ResponseWare work in the same environment to meet the needs of all learners and environments.

	Echo360	ARSnova	ClassQuestion	Infuse Learning	OMBEA
Logo	echo360 active learning	(logo)	ClassQuestion	InfuseLearning	OMBEA
Link	http://echo360.com	https://arsnova.eu/mobile/#	http://classquestion.com	infuselearning.com	http://ombea.com
Voting technology	Web Based/App	Web Based	Web/Web App	Web Based	Clickers/Web
Student License Cost	Free	Freeware GNU License	Free for students and teachers	Free	$18-yr for web, $40 per clicker
PEDAGOGICAL FEATURES					
Presentation Tool	✔ Can present with uploaded slides	✗	✔ Presentation is web-based	✗	✔ Easy to use PowerPoint integration and standalone software for KeyNote, Google Slides etc.
Asynchronous Content Access	✔ Slides and videos can be accessed anytime	✔	✔ Students have access to question history and their answers	✔	✗
Student Performance Analytics	✔ Large amount of student engagement analytics	✔	✔ View charts of student results and fully featured gradebook	✔ Limited	✔
Advanced Question Types	✔ Multiple Choice, short answer, Image,ordered list, numerical		✔ Multiple choice questions, polls, correct answer/participation tracking	✔	✔
Automatic attendance	- An attendance score can be generated based on entering the online classroom	✗	✗	✗	✗
Student to Student Interaction	✔ Student Answered Q's	✗		✗	✗
ADMINISTRATIVE FEATURES					
Integration with LMS	✔ LTI integration in Blackboard	-	✔ Export to any format, Canvas quick export option	✗	✔
Campus Wide Funding-Option	✔ $10K-1000 Students	✔ Free	✔ Free	✔ Free	✔ $7000-$20000
Vendor Faculty Support	✔	✔ Free	✔ Online support and user guides	✗	✔
Accessibility Features	✔ Many capabilities within Blackboard- also has ASR and ability for outside notetaker.	✔ 2 languages	-	✔ Multiple Languages	✔
STUDENT FEATURES					
Vendor Student Support	✔	✔ Free	✔ Dedicated student support channel	✗	✔ Comprehensive online guidebook.
Game Interaction	✗	✗	✗	✗	✔ Competitions with leaderboards
Multiple Device Compatibility	✔ Web Based, iPad App	✔	✔ Works on phones, tablets, laptops, almost anything with a web-browser	✔	✔ Clickers + any web enabled device
Feedback to Teacher	✔	✔	✔ Ability to make survey-like questions	✗	✔
Text/SMS Response	✔	✗	✗ - No but short answers supported	✗	✔
COMMENTS		Very cool!	Completely free (donation supported). Easy to use and works on devices students already own!		OMBEA displays live feedback on people's opinions and knowledge. It's super-easy to use with your Microsoft PowerPoint slides for voting, engagement and assessment.

	Qwizdom	Reef Polling by I>Clicker	Sendsteps	Shakespeak	ViaResponse
Logo	Qwizdom	REEF Polling by i>clicker	sendsteps	shakespeak	Response
Link	http://qwizdom.com	http://reef-education.com	http://sendsteps.com	http://shakespeak.com	http://viaresponse.com
Voting technology	Clickers/Web/App	Web Based/App	Web/SMS	Web/SMS	Web Based/App
Student License Cost	QVR Student App purchase: $9.95/yr or $24.95/5yr Q6 Clicker: Student purchase $49, no ongoing costs	First 14 days are free. $9.99/Term $15.99/1yr $21.99/2yr $31.99/4yr	Free up to audience of 20 € 15 per extra audience member per year	Free up to audience of 20 € 0.10 per extra audience member per year.	$20 6 months
PEDAGOGICAL FEATURES					
Presentation Tool	✔ PowerPoint Integration and Survey Bar works over web or most software applications	✔ Present with anything (slides, video, website, etc.). No import of content required.	✔ Integrates within PowerPoint	✔ Integrates within PowerPoint	⊗
Asynchronous Content Access	✔ Self-paced mode for both QVR (response app) and clickers.	- Can send session history with questions, images, and answers to student to be used as a study guide outside of class.			⊗
Student Performance Analytics	✔	✔ REEF Analytics - Insight to usage across your campus, department, and classrooms	✔ Various reports available to monitor your audience and see exam results	✔ Various reports available to monitor students and see exam results	✔
Advanced Question Types	✔ Text Input, Numeric, Equations and Mixed Expressions	- Most popular features used by instructors included	✔ Multiple choice, open, wordcloud, quiz questions, survey functionality	✔ Multiple choice, open, wordcloud, quiz questions, survey functionality	✔
Automatic attendance	⊗	⊗	⊗	⊗	⊗
Student to Student Interaction	⊗	- REEF Quizzing (beta) - Incorporate group activities and collaborative learning	⊗	⊗	✔ Discussion Tool
ADMINISTRATIVE FEATURES					
Integration with LMS	✔ Blackboard, Moodle, Eduphoria Aware, Extramarks, Accuity, and PLATO	✔ Seamlessly integrate with all major LMS platforms, including Blackboard Learn, Canvas, Desire2Learn, Moodle, and Sakai. LTI available. generate Excel reports of aggregate and individual response data.	✔ Seamless LMS integration available Excel reports	✔ Seamless LMS integration available Excel reports	✔
Campus Wide Funding-Option	✔ Campus wide funding for QVR. Request a Quote.	✔ Campus-wide licensing available	⊗	✔ € 5500 unlimited students and teachers	✔ 10K-1000 Students
Vendor Faculty Support	✔ Contact Tech Support via Phone or Online Ticket, Online Reference Materials	✔ Comprehensive online materials and dedicated support	✔ Dedicated support team	✔ Dedicated support team	✔
Accessibility Features	✔	✔	✔ 15 languages	✔ 15 languages	⊗
STUDENT FEATURES					
Vendor Student Support	✔ Online FAQs, support tickets and reference materials	✔ Online support portal with FAQs, videos, user guides, etc.			✔
Game Interaction	✔ 4 game options, Fast Track, Baseball, Mission to Mars and Quandary (Jeopardy Style)	⊗	✔ Play quizzes and see who wins	✔ Play quizzes and see who wins	⊗
Multiple Device Compatibility	✔ Use clickers alongside QVR response app. App is available for any web-enabled device.	✔ Any smartphone, tablet or laptop with a Web browser. iOS app, Android app, and works alongside i>clicker + and i>clicker 2	✔ Use within PowerPoint only. Answering can be done on any device via web or sms	✔ Use within PowerPoint only. Answering can be done on any device via web or sms	✔
Feedback to Teacher	✔	✔	✔ Survey functionality integrated for students to fill out	✔ Survey functionality integrated for students to fill out	⊗
Text/SMS Response	⊗ - No SMS, but short text answer option is available.	⊗ - No SMS, but does have short answer up to 140 characters	✔ Includes SMS responding	✔ Includes SMS responding	⊗
COMMENTS	With over 30 years of industry experience, Qwizdom audience response solutions offer the highest performance and reliability.	The mobile-optimized engagement solution that works alongside traditional i>clicker remotes if needed	Direct PowerPoint integration, 15 languages, very easy to use. You can find tutorials on this link: sendsteps.com/en/how-it-works	Direct PowerPoint integration, 15 languages, very easy to use. You can find tutorials on this link: sendsteps.com/en/how-it-works	

Interactive Polling Tools

	Mentimeter	Poll Everywhere	Socrative	VoxVote	Wooclap
Link	https://www.mentimeter.com/	http://polleverywhere.com	http://socrative.com	https://www.voxvote.com/	https://www.wooclap.com/
Starting Price	$8.00/month/user	$19.00/month/user	Free version (Student version) Pro version $59 per instructor	$109.00/one-time/user	$5.00/month/user
Description	Free-to-use, interactive presentation platform that allows real-time interaction between presenters and their audiences: making meetings enjoyable, engaging, and inclusive.	Web-based platform for K-12, non-profit and higher education sectors that help presenter customize presentations with questions, invite audience to engage through SMS or pages and generate reports.	Online student response system that allows teachers to easily create polls, quizzes and other educational exercises for their class and monitor their students' response and progress in real time.	For event organizers, speakers on stage, quiz hosts, teachers, presenters, or everybody who presents on stage and want live interaction with their audience.	Cloud-based audience response system that helps educational organizations digitize learning via smartphones and tablets with multiple choice questions, interactivity, gamification and more.
Ideal number of Users	1 - 999	1 - 1000+	50 (Free version) 150 (Pro version)	1000+	1000+
Ease of Use	"Is a great tool when creating interactive slides in undergraduate classes. It permits both the students and the professor to participate actively in the class." "It is fast and easy to use. Excellent charts to present the poling of the results which is quite handy to verify how your audience feel about a presentation."	"Easy to use, install and vote anonymously on questions during presentations. Makes audience participation fun and interesting with real-time voting statistics during the presentation." "The solution is easy to use, offers many question types and is very accessible since anyone with an IP-enabled device and browser can participate in the polls."	"Teachers can easily use Socrative to create quizzes and games for their students. It can give instant feedback and results to teachers, and is a fun way to start off each class period, review for an upcoming assessment, or just for a quick interactive poll."	"It's easy to use for the teacher and the students. The polls were fun for the students and it gave me a direct feedback of what to improve for my nexts classes." "It is easy to use, and we love it particularly because it does not require any special instruments in order to use it - just any internet connected device."	"Easy to use interface, very intuitive. This is the next level of interactivity you want with your audience. We talk a lot about social interaction but less about live interaction. This should take your conferences to the top!"
Product Features					
Commenting / Notes				✓	
Data Analysis Tools	✓	✓	✓		✓
Feedback Collection	✓	✓	✓	✓	✓
Gamification		✓	✓	✓	✓
Live Results Tracking	✓	✓	✓	✓	✓
Moderation	✓	✓	✓		✓
PowerPoint Integration	✓	✓		✓	✓
Q & A	✓	✓	✓		✓
SMS Polling / Voting		✓	✓		✓
Platform					
Web/Installed	☁	☁	☁	☁	☁
Mobile	iOS / Android	iOS / Android	iOS / Android	iOS / Android	
Support					
24/7 (Live Rep)					
Business Hours	✓	✓		✓	✓
Online	✓	✓	✓	✓	
Training					
In Person					✓
Live Online	✓	✓			✓
Webinars	✓	✓	✓		✓
Documentation	✓	✓	✓	✓	✓

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Gamification Tools

	Kahoot!	Quizizz	Quizlet	Quizalize	Gimkit
Logo					
Link	https://kahoot.com/	https://quizizz.com/	https://quizlet.com/	https://www.quizalize.com/	https://www.gimkit.com/
Starting Price	Basic: Free Pro: €3 per teacher/month (billed annually) Premium: €6 per teacher/month (billed annually)	Free	Basic: Free Quizlet Plus: $15 per year	Teacher Basic: Free Premium for Teachers: $5.75 per teacher/month (billed annually) Premium for Teams and Departments: $4.50 per teacher/month (billed annually) Premium for Schools and Districts: Custom pricing	Basic: Free Pro: $4.99 per month ($59.88 billed annually) Pro Pass: $9.99 per month (billed annually) Groups: Custom pricing
Need an account	✔	✔	✔	✔	✔
Has an iOS or Android app	iOS, Android	iOS, Android	iOS, Android	Android	
Questions and answers	✔	✔	✔	✔	✔
Can include images	✔	✔	✔	✔	✔
Can include videos	✔	✔	✔	✔	
Options for self-paced or timed	✔	✔	✔	✔	✔
Interactive slides including draggable, drawable and fill-in responses for questions			✔		
Gamified for fun competition in class	✔	✔	✔	✔	✔
Can ask an instant question during a lesson		✔	✔		
Can search for games/quizzes made by others	✔	✔	✔	✔	✔
Includes options for math-type equation	✔	✔	✔	✔	
Can scramble questions and answers	✔	✔	✔	✔	✔
Goal Setting/ Tracking / Performance Metrics	✔	✔	✔	✔	✔
Leaderboards / Activity Tracking	✔	✔	✔	✔	✔
Reporting options	✔	✔			
Support	✔	✔	✔	✔	✔
Webinars	✔	✔	✔	✔	✔

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