Implementing a Flipped Classroom in a Unit on Slope

by

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Abstract

As instructional technology increases, educators seek ways to incorporate it into their curriculum. One effective method teachers use is the flipped classroom. It can be challenging to incorporate a flipped classroom; thus, this curriculum project was designed to support its implementation. The curriculum project presents an exemplar on using remote instruction with the Algebra topic of slope. During the Spring 2020 global pandemic that resulted in the shutdown of public schools, many teachers looked to the flipped classroom for best practices in remote instruction. This project was designed to highlight instructional technology to support remote instruction as well as presenting the best practices for the flipped classroom.

Introduction

With technology on the rise, many teachers are looking for ways to implement instructional technology into their classrooms. Knowing where to start can be challenging. Thus, this curriculum project was designed to address the common questions of how to implement the flipped classroom in an algebra classroom. Flipped classroom instructional practices are relatively new with limited research and models for teachers to follow. With that, educators need to understand the benefits and challenges of a flipped classroom as well as knowing how to implement and adapt it for their own class. With the rise of technology and student access to computers, the flipped classroom may support learning for many students.

The purpose of this project is to provide an exemplar showing how the flipped classrooms can be implemented and to provide some great resources. At this stage in the research, a flipped classroom is a strategy that teachers can use that mixes face to face teaching with more independent work using technology. This project presents how flipped classrooms provide teachers with more time to differentiate instruction, to support struggling learners, and to encourage both independent and collaborative study" (Kirvan, 2015). During the global pandemic of Spring 2020, teachers and students turned to remote instruction and learning, respectively. The flipped classroom presents the middle ground between a traditional classroom and fully online. Many teachers who already implemented a flipped classroom made a smoother transition during this time of crisis.

Literature Review

A flipped classroom is an instructional strategy that takes an online approach at home. Students often complete the main learning at home and then practice what was learned in the classroom the following day. This allows teachers to differentiate more in class and create

lessons that better meet the learning needs of all students. Through research, educators are able to see the many benefits of a flipped classroom. A flipped learning approach can enhance student motivation and keep them engaged in learning mathematics. Teachers need to create "meaningful activities that students see as worthwhile" and "if students understand and value how they can use the skill now and, in the future, they will likely be more motivated to learn it" (Banda, 2009, p. 147). Conceptual understanding is very important in a mathematics classroom. By flipping a classroom, "such a transition is consistent with the Common Core State Standards for Mathematics, which emphasize a balance between conceptual understanding and procedural knowledge and skills" (Kirvan, 2015, p. 202). Additionally, Kirvan (2015) stated that the flipped classroom allowed for more exploration time and better classroom time management.

Through research, it has been found that there are also challenges of a flipped classroom. For example, students do not always watch the videos before coming to class and some students may not have access to the required technology. Cargile (2015) states, "as teachers and school leaders devise plans for incorporating computer based learning into instruction, accommodations will be needed to provide access for all students so as to not increase existing achievement gaps between socio-economic groups" (p. 26). Bergmann (2015) states, there are four main obstacles when flipping a classroom: "flipping your thinking, technological barriers, finding the time, and training yourself, students, and parents" (p. 10). Flipping your thinking can be challenging for teachers who are used to doing the same routine. Technology can also often be challenging to master and it is up to each teacher to learn what works best for students in their classrooms. Bergmann (2015) presented that it is highly beneficial for teachers to create their own videos when using the flipped classroom because teachers are familiar to their students. Yet, it can be challenging to do this when first implementing flipped classroom instructional practices.

Another implication can be finding time to “create videos” and “recreate your classroom activities” (Bergmann, 2015, p. 20). According to Kirvan (2015), there needs to be much more planning when it comes to implementing a flipped classroom. One of the challenges of the flipped classroom is there is a lack of research done on the best ways to implement a flipped classroom.

For educators who seek to incorporate the flipped classroom, it is essential to know of the platforms that are available to support the implementation. One platform that has proven to be beneficial is Edpuzzle. Edpuzzle is a free online platform that allows teachers to upload videos for students. Edpuzzle allows teachers to search videos from many popular video channels including Khan Academy, Youtube, and TEDTalk. Designed specifically for mathematics, Eddie Woo - Youtube (with 894,000 subscribers) provides many videos. Edpuzzle also allows teachers to personalize the videos by adding quizzes throughout the video. Another useful aspect of Edpuzzle is that it blocks ads on videos that are uploaded directly from sites like Youtube. “After analyzing the student scores on quizzes from any particular video, the educator can easily see which topics were understood and which topics need more reinforcement” (Mischel, 2019, p. 287). While there are other platforms for developing a flipped classroom, the main platform used throughout this project is Edpuzzle.

Remote Instruction Exemplar

Tips for Starting a Flipped Classroom

The curriculum is focused on an Algebra I classroom for a unit on slope and includes helpful tools designed to guide teachers to successfully implemented flipped classrooms. Every student is unique and each classroom might require a different approach. The successful flipped classroom starts by getting to know students and making sure that a flipped classroom is able to

reach all students in the class. Not all students will have access to technology and will need to be adjusted accordingly.

This method for implementing a flipped classroom is great because students can access the content through any device. By using Edpuzzle, students are able to access the content through any device at home or at school. Many students are even able to use their phones to access the content. It is important to note that this is based on a classroom where students have one-to-one technology. This means that all students have their own chrome books that they get to take home with them. This helps make a flipped classroom run smoothly but is not required. Technology is the basis of how a flipped classroom works.

Planning and preparation

Teachers must know how students will meet the learning objectives and how students will use the materials that the teachers have provided. Educators have to create or find videos that align with the curriculum. When implementing a flipped classroom it is important to get students used to this type of learning style. It can take time to get students learning this way. *Remember, an efficient routine makes it easier for students to learn*. Therefore, teachers must establish structure and a certain set of procedures that students will follow on a daily basis. When implementing a flipped classroom it is good to layout the unit to students and make them aware of what is expected. In a flipped classroom model, it is important that students are learning new material before coming to class. It can be helpful to give students a calendar that requires them and the teacher to check off once the student has completed the video. This method can vary depending on teaching styles. This type of learning can often require students to become more independent learners. *Encourage students to become independent learners and hold them*

accountable for watching the videos. Students must be held accountable for watching the videos assigned each night. This will vary from student to student.

Edpuzzle

While getting to know students and setting the guidelines of what a flipped classroom entails in the classroom, it is important to set up a platform for online learning. There are many platforms out there that teachers use for a flipped classroom. Edpuzzle is a platform that meets the needs of all students. Edpuzzle is a free platform that allows teachers to upload videos and track student progress along the way. In this curriculum, readers will understand how to use Edpuzzle and see the benefits of using it. The first thing needed is to create a free Edpuzzle teacher account. This is very easy to do and will ask at what school you teach. This is helpful because it allows teachers to share content. Not all questions will be answered about Edpuzzle so here is the link for the Edpuzzle *Help Center:*

https://support.Edpuzzle.com/hc/en-us/categories/360000701132-For-Teachers

As seen below, Figure 1 presents a snapshot of the home page of the Edpuzzle to show how Edpuzzle allows users to search for specific videos. The content page can be seen when logged in as a teacher and this is also the homepage when logged in to Edpuzzle. This is a very helpful page because it allows teachers to see videos that might be of interest and has links to popular channels such as Youtube and Khan Academy on the left hand side. On the Edpuzzle homepage there is a search bar that allows teachers to search for specific topics. Figure 1 also shows the search was Algebra 1 slope and as a result videos related to the search appear. This can be helpful for teachers when trying to find videos relevant to the curriculum being taught.

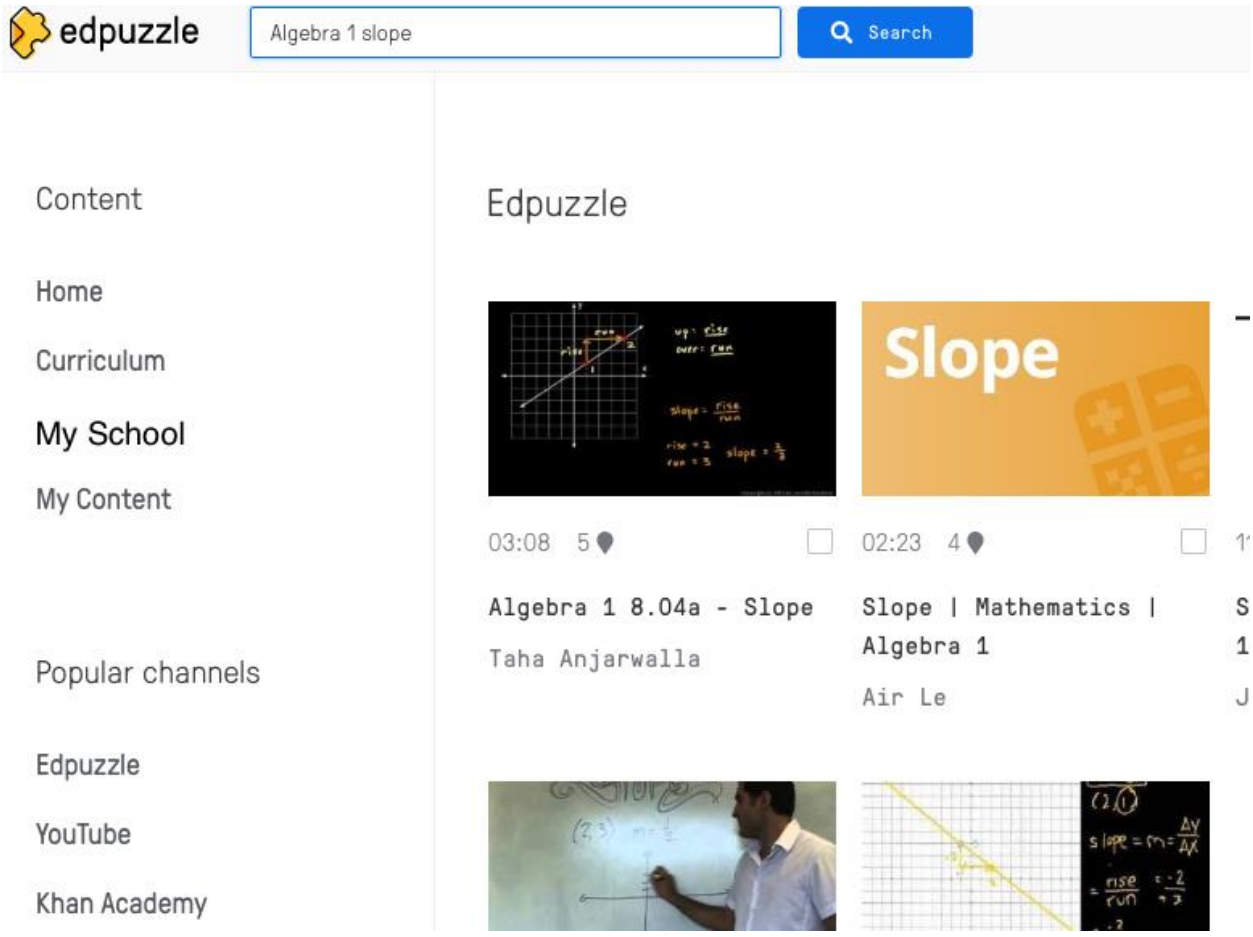

Figure 1. Edpuzzle Homepage (https://Edpuzzle.com/home)

This page is also known as the content page. On the homepage there is also a tab for Curriculum, My School, and My Content. The My Content brings up personal videos and allows users to add videos under this tab. The My School tab is good because users can collaborate with other teachers at the school to make videos and share content. The curriculum tab is a great tool because specific curriculums can be found.

Figure 2, below displays specific curriculum videos based on the subject being taught. The curriculum tab allows users to narrow down the search to a specific curriculum and here Algebra I topics are illustrated. Once a topic is clicked on it breaks it down even further until finally it gives the videos out there based on what is being taught. This can be useful in this unit

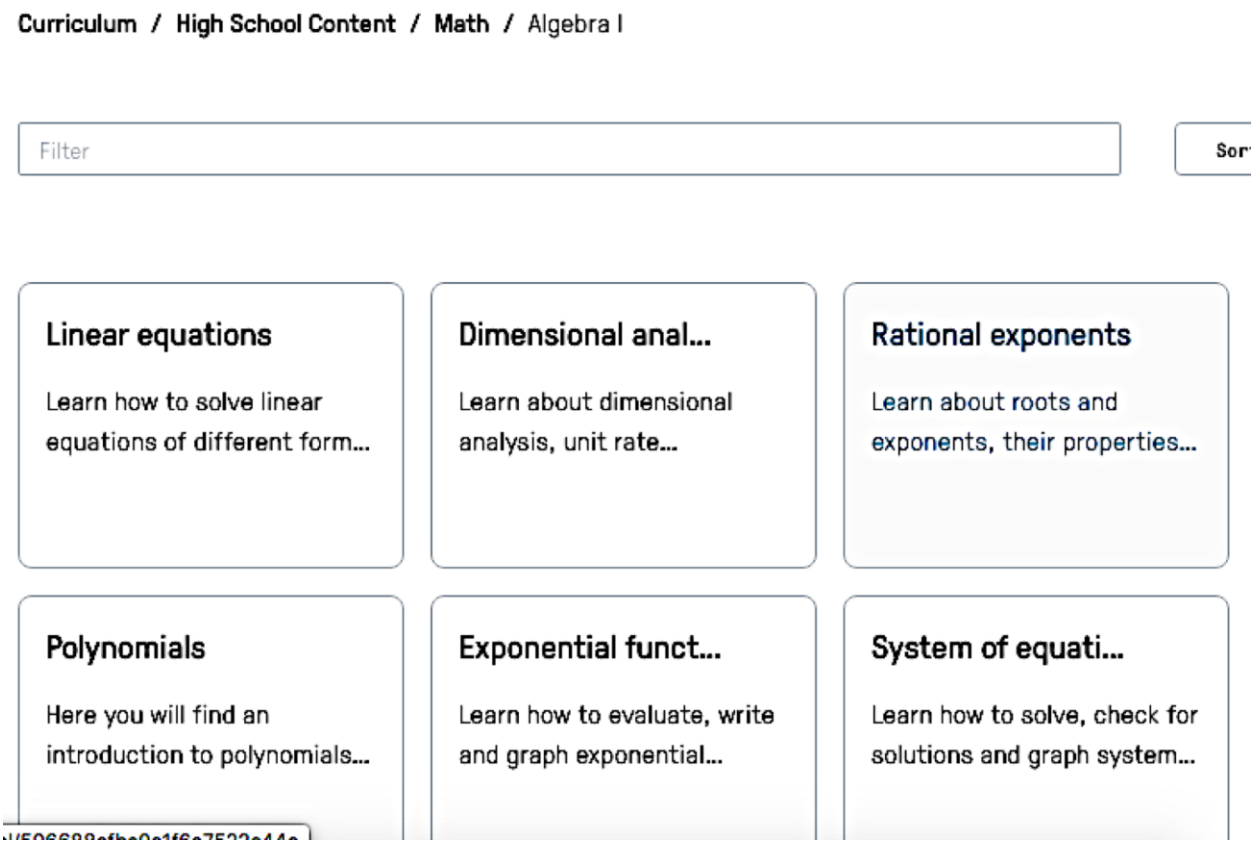

Figure 2. Edpuzzle Curriculum tab (*https://Edpuzzle.com/content/curriculum/high-school)*

on slope because it allows teachers to navigate into the unit they are searching for. Likewise, this can be used for any subject or curriculum.

In Figure 3, as shown below, an example of a class gradebook from a unit on rate of change is presented. This is a screenshot of just 5 of the students' grades with no student identifiers. This is one of the most useful features of the platform because it allows the students, teachers, and parents to see progress and grades on the video quizzes. It also allows access to see how much of the videos were watched or not watched at all. This is a great tool for assessing students. From Figure 3 below, the color coding stands out very well and allows teachers to see exactly who needs help on certain topics. Additionally, it shows how much time students spend watching the videos. The amount of time students spends watching the videos is directly correlated with other grades in the class such as test scores.

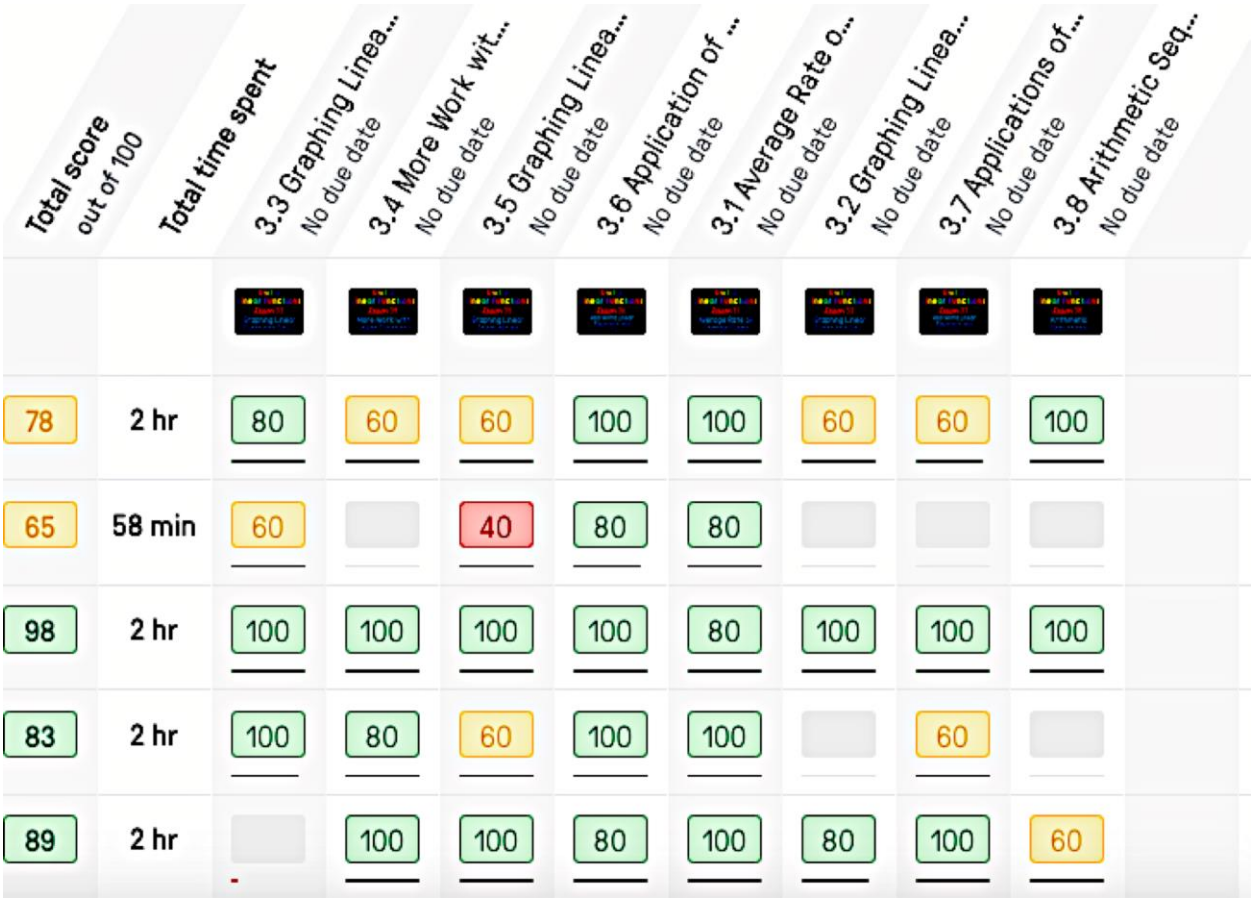

Figure 3. Edpuzzle Gradebook. (*https://Edpuzzle.com/gradebook*)

Figure 3 also shows the gradebook for a specific range of dates. Teachers are even able to see a breakdown of student grades and questions that they missed by clicking on students or the specific grades.

Figure 4 shows a snapshot of videos assigned during the unit and how many of the My Classes tab is shown. It also gives teachers a good overview for the whole class. When in Edpuzzle, if you click on one of the videos it will break it down further showing which students have or have not watched the video. This is a place for the teacher to organize their classes as it provides an overview of the videos assigned and how many have turned in assignments for each

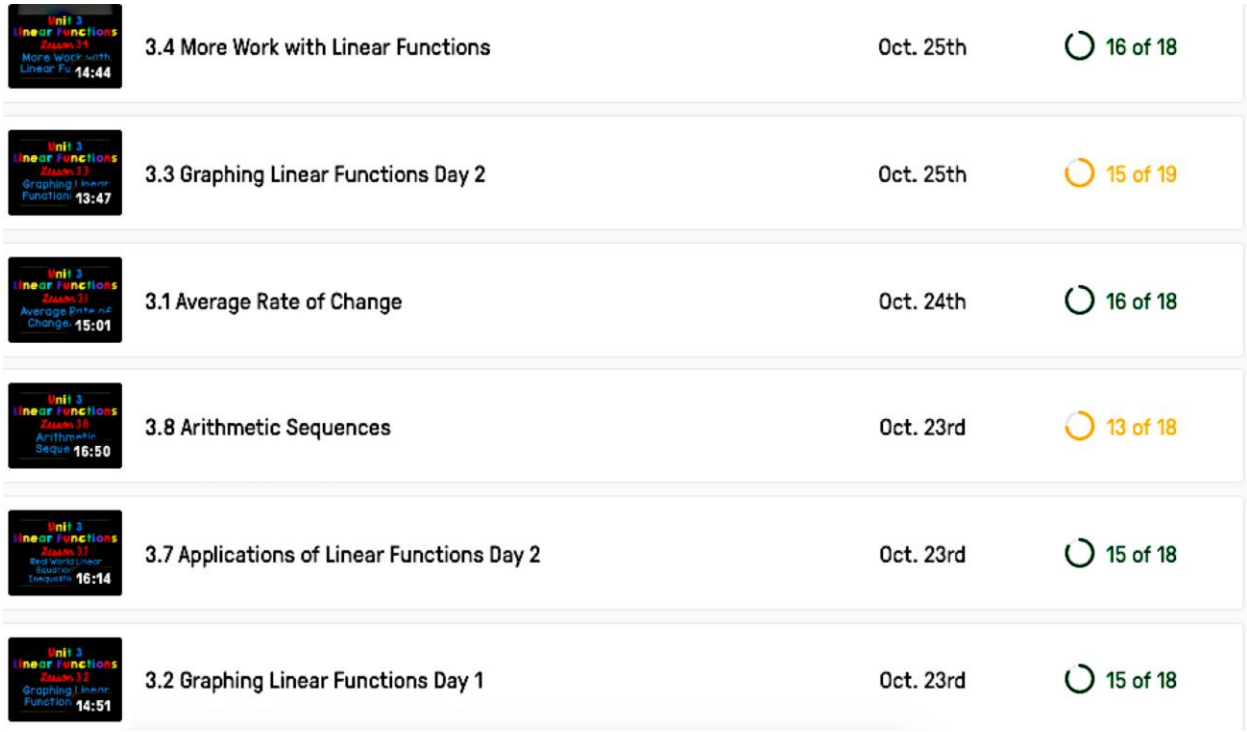

Figure 4. My Classes Tab. (https://Edpuzzle.com/classes)

video. It also has a student tab to see the gradebook and a place where students can be invited to the class. This is also the place where classes are added to the Edpuzzle account and where students watched and turned in the video.

As seen below, Figure 5 shows the feature of how Edpuzzle allows questions to be added to the videos. This is a useful tool that is essential to creating quality videos. Edpuzzle allows the option to embed questions throughout videos. It will allow the addition of multiple-choice questions, open ended questions, and even notes along the way. Questions can be added at any time throughout the video and it is a very easy task. Not only is this beneficial to see the progress of students but it also makes the videos more engaging. By adding questions throughout the video students are able to be assessed and held accountable for watching the whole video. Edpuzzle also adds a nice feature that does not allow students to skip to the end of a video. Instead, students are required to watch the entire video. Many students like these videos

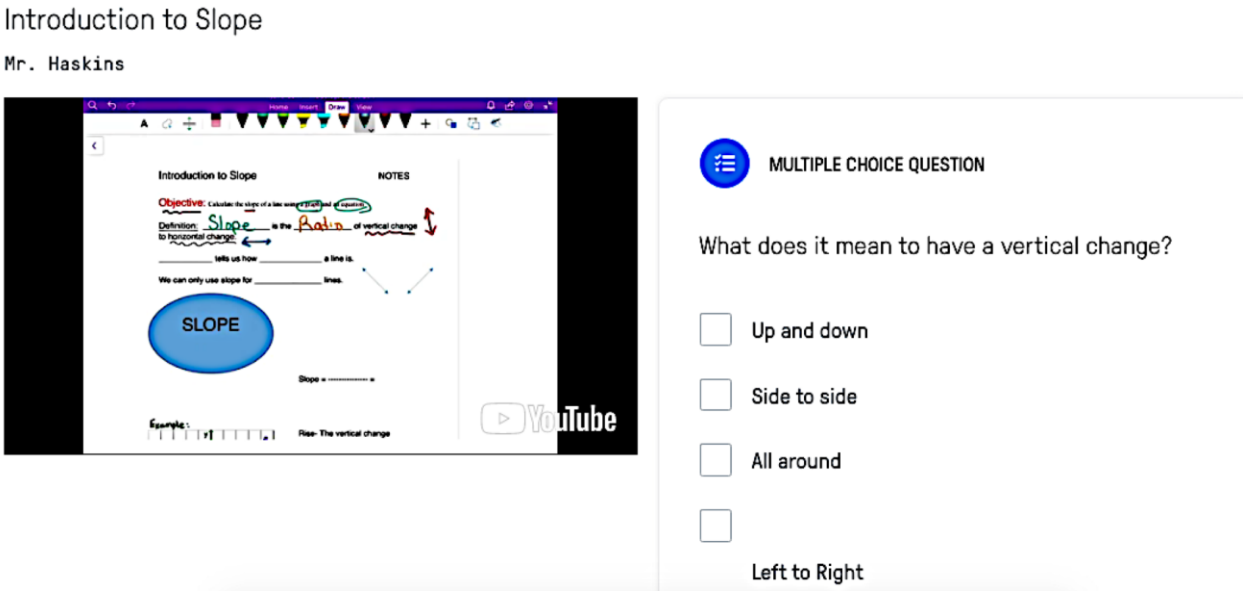

Figure 5. Edpuzzle Inserting Questions. (https://edpuzzle.com/content)

because it gives them a chance to pause and take notes along with the video. Many students will also re-watch the video or parts of the video when they don't understand something. Edpuzzle also gives the option to reset progress on the teacher's end so that students can go back and watch video and re-do questions to get a better understanding. In order to add questions to a video:

- Upload the video.
- Click on the Content tab then the My Content tab.
- Click on the video to assign.
- Then hit questions.
- Scroll to the time in the video where the question will go.
- Then choose Multiple-choice or Open-ended questions. (It also has the option to add notes for the students)
- Type the question and hit save.

Repeat these steps until all the questions are made throughout the video. The video will then be ready to assign to students.

Creating Materials. Creating videos is one of the most important parts when it comes to implementing a flipped classroom. Although there are many videos online that may pertain to student objectives or standards, there is nothing more personal than a video that is created by their own teacher. Students are used to specific teaching styles and learn well from their own teacher. It is important to create videos that pertain and are of interest to students. When it comes to making videos it can often be difficult to know where to start. Some useful tools and tips will be highlighted that can make implementing a flipped classroom easier. Not all of these may work, so take the ideas that will work best based on the class. When it comes to implementing a flipped classroom it's all about meeting the needs of the students.

YouTube. YouTube is an essential tool when it comes to starting a flipped classroom. In Figure 6 below there is an example of a YouTube channel. One of the first steps to take when implementing a flipped classroom is creating a YouTube account and making a channel for students. This is also known as 'your video' section. This is where videos are uploaded.

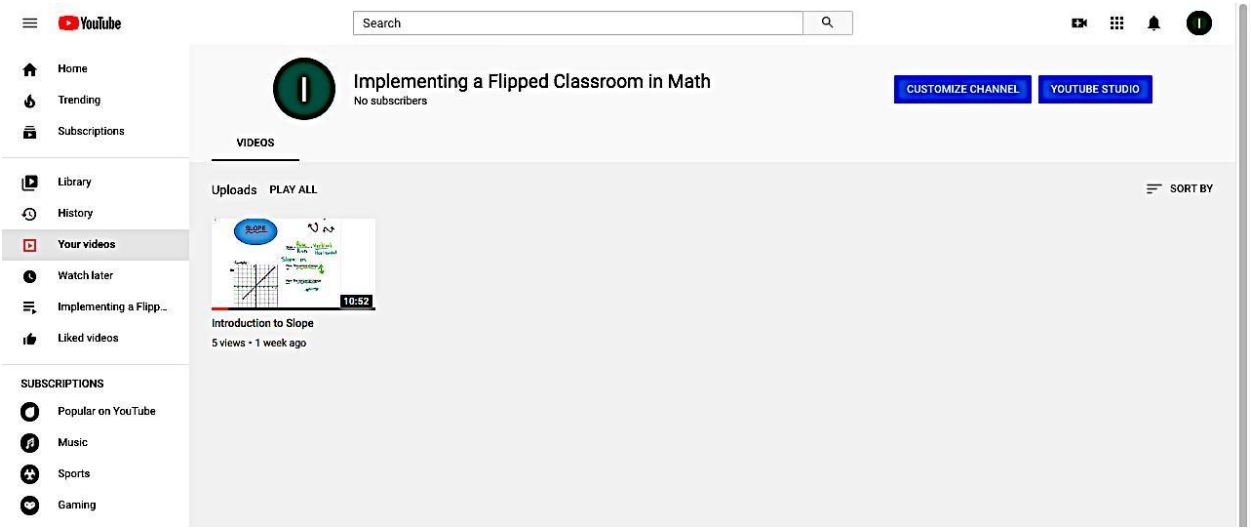

Figure 6. YouTube Your Video section. (https://www.youtube.com/feed/my_videos)

After creating a YouTube account the next step is creating a channel for students on which to find videos. YouTube is user friendly and it allows content created to be uploaded. This is a useful and almost necessary step because Edpuzzle links up with a YouTube account. Created videos can be found in Edpuzzle by simply copying and pasting the URL from YouTube. The URL can be found by going to the video and hitting share. YouTube is all around a great resource and there are many videos out there to share with students. In the next steps, details on how to create videos are described.

Creating Videos. When it comes to making videos it is important to be prepared and make videos ahead of time. Videos should be around 10 minutes because students start to become less focused when videos go beyond that 10 minute mark. When making videos remember to stay targeted on the learning goals. This also allows the insertion of questions throughout the videos for students to answer. When creating videos you can also ask students questions and pause to get them thinking about things deeper. When teaching through a video, give students direction and keep them focused on the material like in a normal classroom setting. Students prefer the shorter videos and they are able to retain more of the information. The best way to create videos is by making notes for students to follow along with. Limit notes to one or two pages because that usually comes out to be a 10 minute video. Below are example notes created to go along with a video. Figure 7 and 8 provide an example of what notes should look like that go along with a video. Typically, the notes are about a page and a half, which allows the video to be around 10 minutes that the students follow along with. The video to go along with these notes can be found here:(https://youtu.be/WRhtkGftTus). This video was uploaded to Edpuzzle to add questions for the students. These structured notes are great for students because they do not have to fill them in but can instead watch and listen to the videos while viewing the notes.

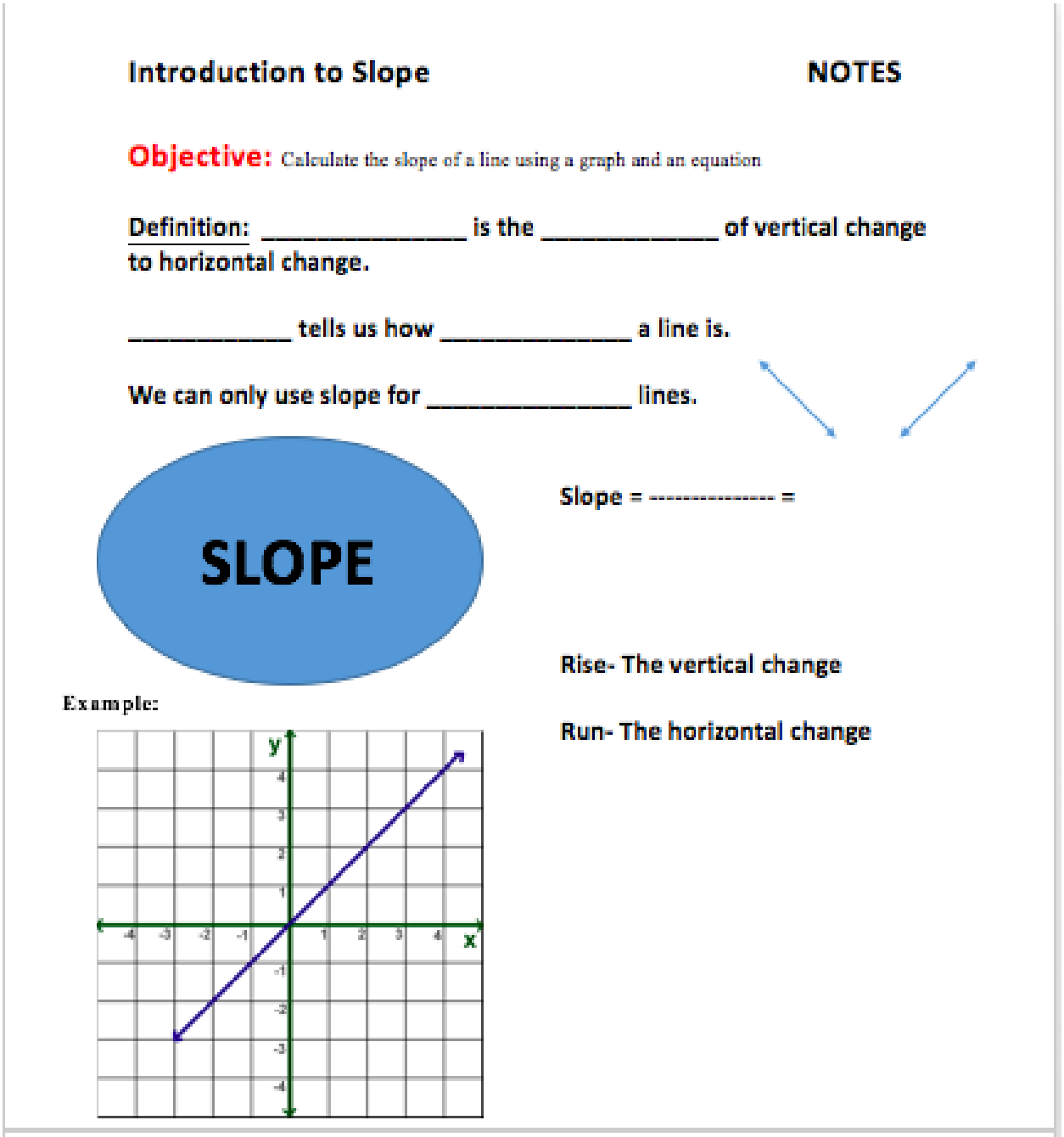

Figure 7. Notes to go along with video.

SLOPE-INTERCEPT FORM

y = m x + b

b =

m =

Example:

y = 2 x + 1

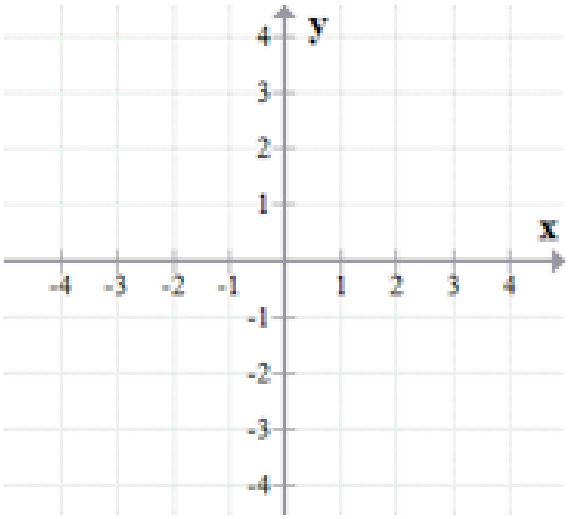

Figure 8. Notes for video (continued).

If notes should be filled in by the students then class time should include a check in with students' notebooks to make sure notes are completed. It is important to hold students accountable for their work.

After creating the notes, make a video explaining the notes. Discuss and move through the notes a couple times to know what needs to be said and jot down notes that need to be said to students. Edpuzzle, has a great tool that allows notes to be added to videos when uploading them to Edpuzzle. This is a good tool in case material is forgotten. More information can be found about this in Figure 5 (page 13).

Once prepared to create the video, there are many useful tools available. For example, one option teachers may be using are Apple but there are other products such as Microsoft as

well. One important tool needed for this is a device that can be used to write on. One option is an Ipad that is paired with an Apple Pencil. Different styluses or even fingers can be used when writing on devices. However, if creating many videos it is recommended to upgrade to an Apple Pencil. This allows neater writing and it also opens up many cool features when it comes to writing on an Ipad. The Ipad also works great for creating videos because of the touch screen capabilities. There are also many great apps that can be helpful when teaching and creating videos for students. When teaching, it is possible to work with other touch screen computers and tablets that work great for creating videos. No matter what device, there are a lot of great applications that can be used to help create videos for students.

Figure 9 shows *Microsoft* Onenote, which is an application that can be used for writing notes on. This is a great application that can be used on all devices and useful when

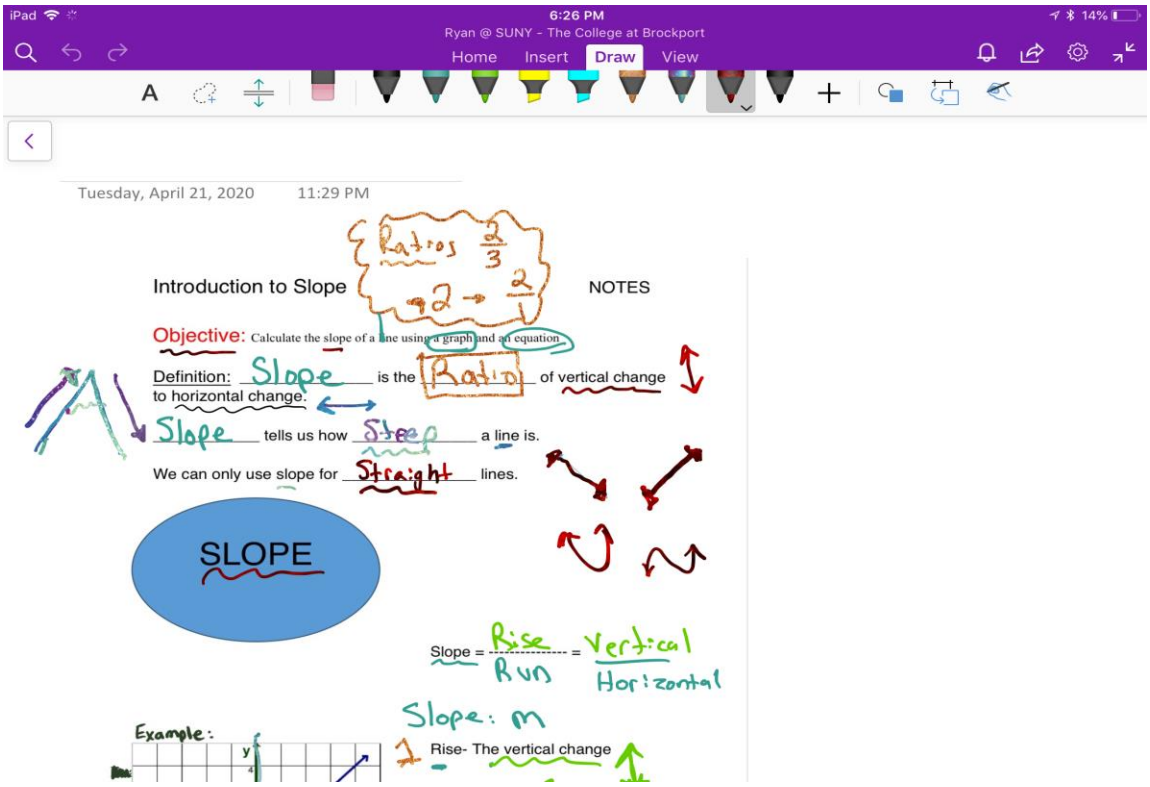

Figure 9. Microsoft OneNote. (https://www.onenote.com/)

implementing a flipped classroom. This application allows drawing and writing, making notes interactive. Figure 9 shows some of the many colors and things that Microsoft OneNote can do. It allows notes to be shared with students easily. This is also helpful for teaching students in class because notes can be uploaded online in real time for those students that may have missed them. It also allows uploading to sites like Google Classroom for students to view. While taking notes in this app it is a good idea to use a screen recording software to make videos.

One great tool that will help when creating videos is Screencastify, as seen in Figure 10. This app allows users to record the screen while adding video and/or audio commentary and is a good tool for creating quality videos. This app is an add on feature that can be used through google chrome. So, this would be a great tool if using a desktop or tablet computer. It allows viewing of different sites and notes while recording. It is a good tool for pulling up things like desmos.com or the graphing calculator to show students examples. It is great to demonstrate different things while screen recording because it allows students to see the exact steps to follow to use certain programs. Screen recording eases a lot of the struggles when it comes to students using new technology.

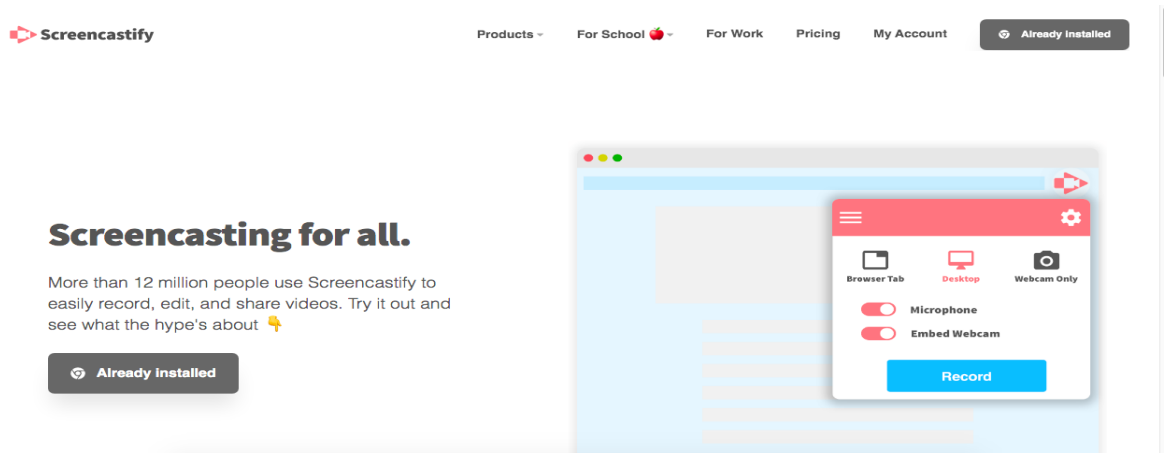

Figure 10. Screencastify. *(*https://www.screencastify.com)

Figure 11, a clipping from a video commentary edit done on the Record it! App, shows how it is possible to add video commentary to notes created. This is another application that assists in screen recording on an iPad. This application is used for the iPad and can be helpful to create more engaging videos. An example of the audio commentary used by this app can be found in this video (https://youtu.be/WRhtkGftTus). It is very similar to Screen Castify but it is for iPad. It allows recording of the screen while adding video or audio commentary. It can help to be able to see the teacher when students are watching the video. It is a free app that teachers can use when recording videos. Record it! Allows videos to be enhanced after creating it or while

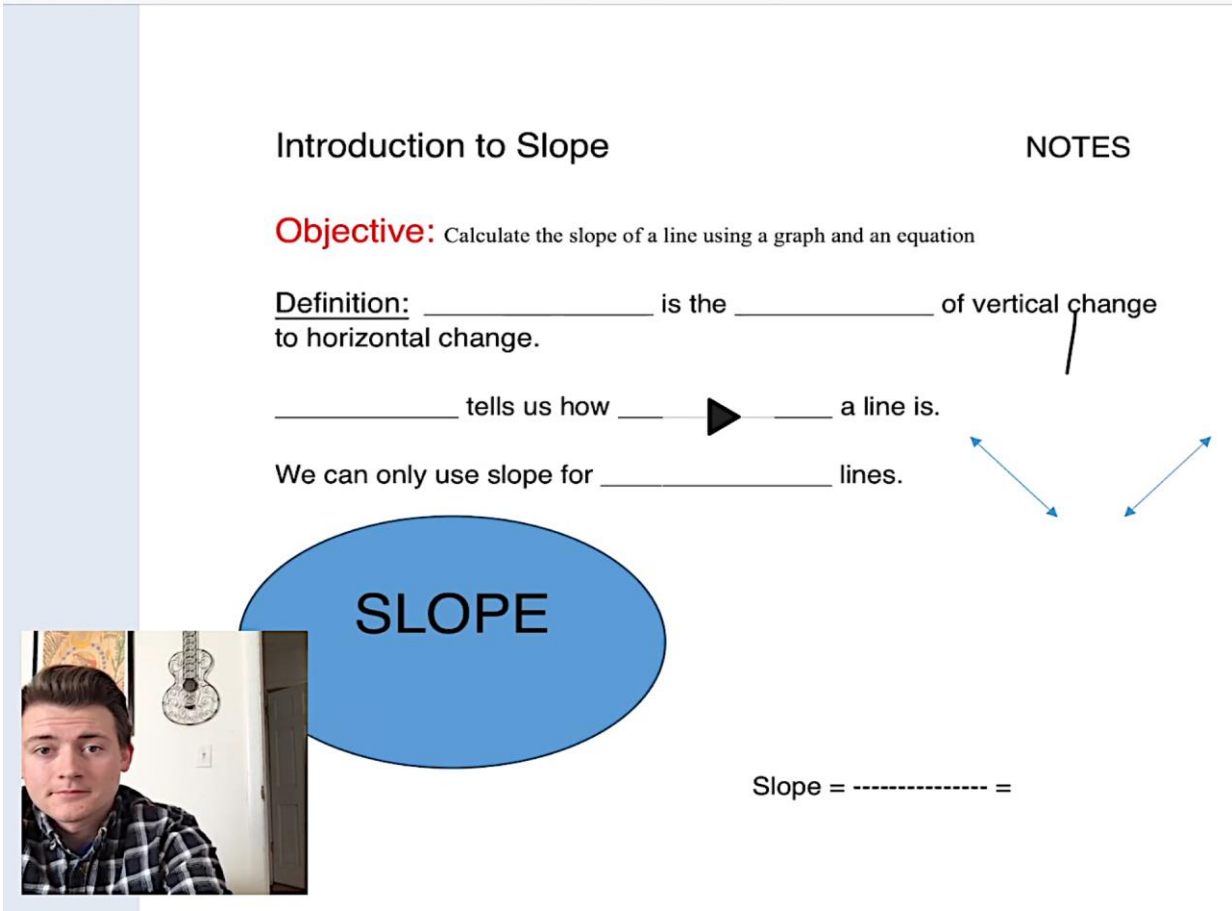

Figure 11. Record it!: Screen Recorder Application. (https://digiset.me/recordit/)

making the videos. There are many applications that do similar things to this.

Creating videos can be a very complex task and can be very time consuming. Some of the resources provided above can help implement a flipped classroom in the classroom. Start with some of these resources and create a model that works best. When implementing a flipped classroom, it is important to remember that each class is different and that some students might require additional resources. The technological world is on a constant rise and teachers have access to new technology every day. Educators need to change with the times and keep up to date on all there is to offer.

Other Useful Content

Educators have access to so much content. It is not always necessary to create new content. Depending on the content there is some type of video out there that could be used to help students master the objectives being taught. Many great educators around the world are implementing a flipped classroom or using technology to help educate. Many of these educators provide content that they have created for free online. Eddie Woo's site can be seen in Figure 12.

Eddie Woo is a mathematics teacher from Australia who has been uploading videos of his teachings since 2012. Mathematics topics of all content can be found from his videos. He has a YouTube channel called Wootube. He also provides things like worksheets and other resources on his website. All that he has to offer is free to use. His videos provide students with a new and engaging personality that could get anyone to learn. He has so much to offer to educators. His videos can be used as supplements to any lesson and teachers can learn ways to teach new content to students. It is always a good idea to learn how to teach topics from other teachers. Eddie Woo records all his teachings and uploads them online. There are many teachers who are

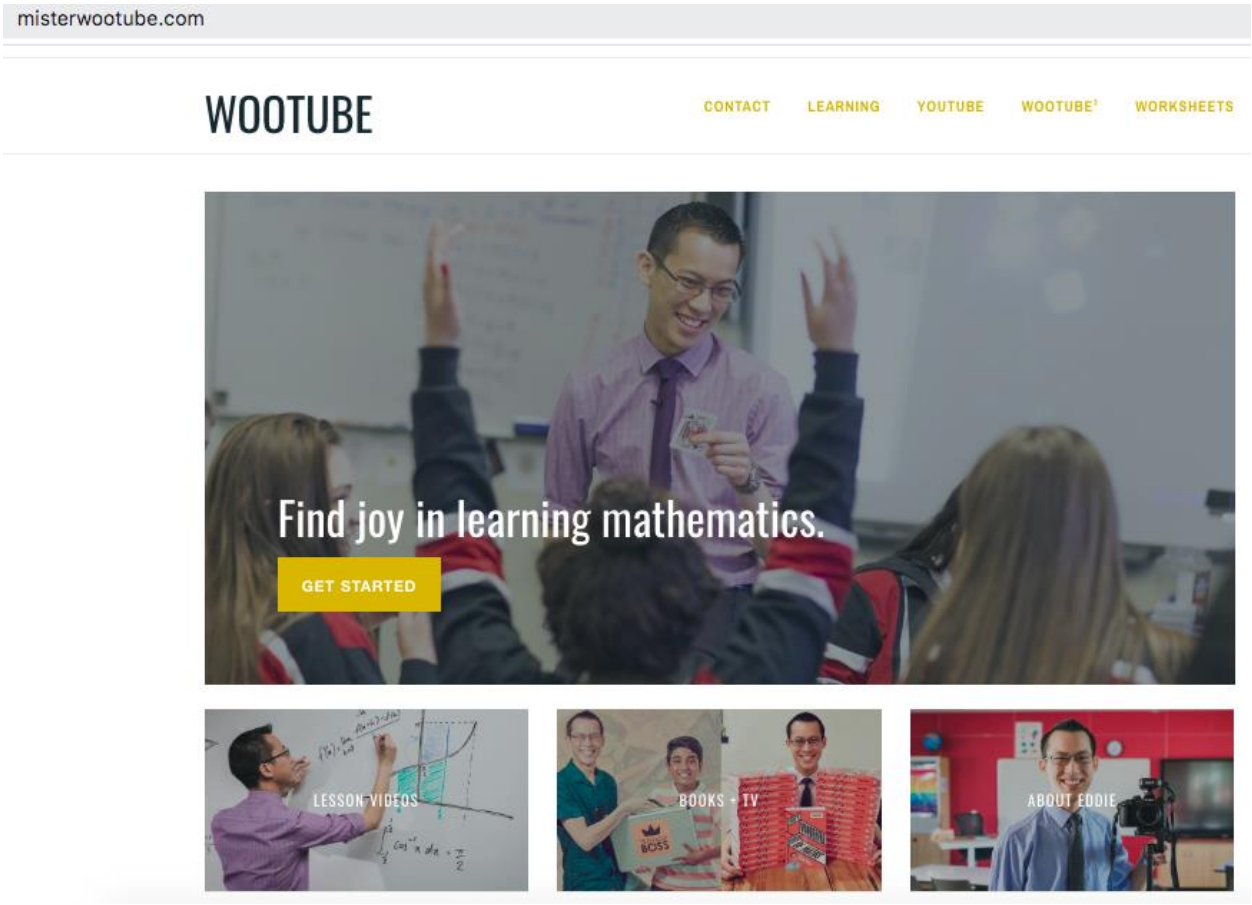

Figure 12. Eddie Woo (Wootube). (https://misterwootube.com/)

doing what Woo does as this is possible to do in any classroom. It is a great idea because it allows students to catch up if they miss class. It is also great for students who need to see a lesson twice. Allowing students to go back and watch the material on their own time can benefit learning. It is also very easy to upload his content to Edpuzzle. Just copy the shared link from his YouTube video and insert it in the search bar on Edpuzzle.

Figure 13 shows another great source to finding videos and worksheets for students from the well-known website Khan Academy. Kahn Academy also has an app version where almost any math topic can be found. This website is completely free and can be

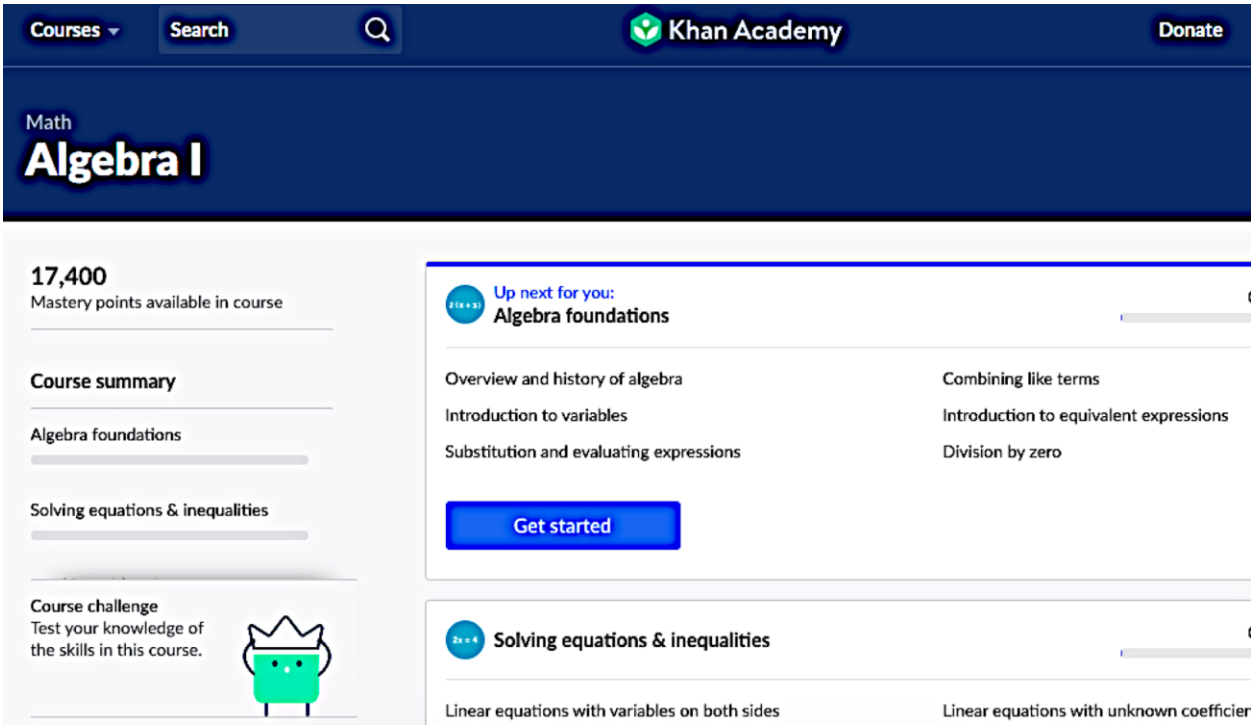

Figure 13. Khan Academy. (https://www.khanacademy.org/math/algebra)

accessed by anyone, anywhere. Also important, this site is free from ads for students that can add distraction and controversial ideas to the videos. There are many benefits that Khan Academy can offer to students and it really goes along with the ideas of a flipped classroom. This can be used as a supplement to teaching. This site provides endless lessons and videos that can really help students become better in mathematics. Find ways to use Khan Academy in ways that benefit all students. Khan Academy isn't catered to every student's needs and teachers must be able to create lesson plans that are differentiated for all students. Khan Academy once again links right up to Edpuzzle. Edpuzzle even has a special Khan Academy link on the left-hand side of the content page.

Figure 14 shows another resource for teachers to use to find videos and worksheets for a flipped Mashup Math is another great resource for mathematics teachers. This site allows access

to free videos, worksheets, puzzles, and workbooks for students. Many of the videos can also be found on YouTube making this platform compatible with this design of a flipped classroom. This site creates engaging videos for students that can really be of interest to the students. Mashup Math uses many real-world examples that are relatable to the students. If looking for a fun video for students that uses real world examples look at these videos. Topics of all math curriculum can be found on this site making it great for a flipped classroom. Students really like the animations in these videos.

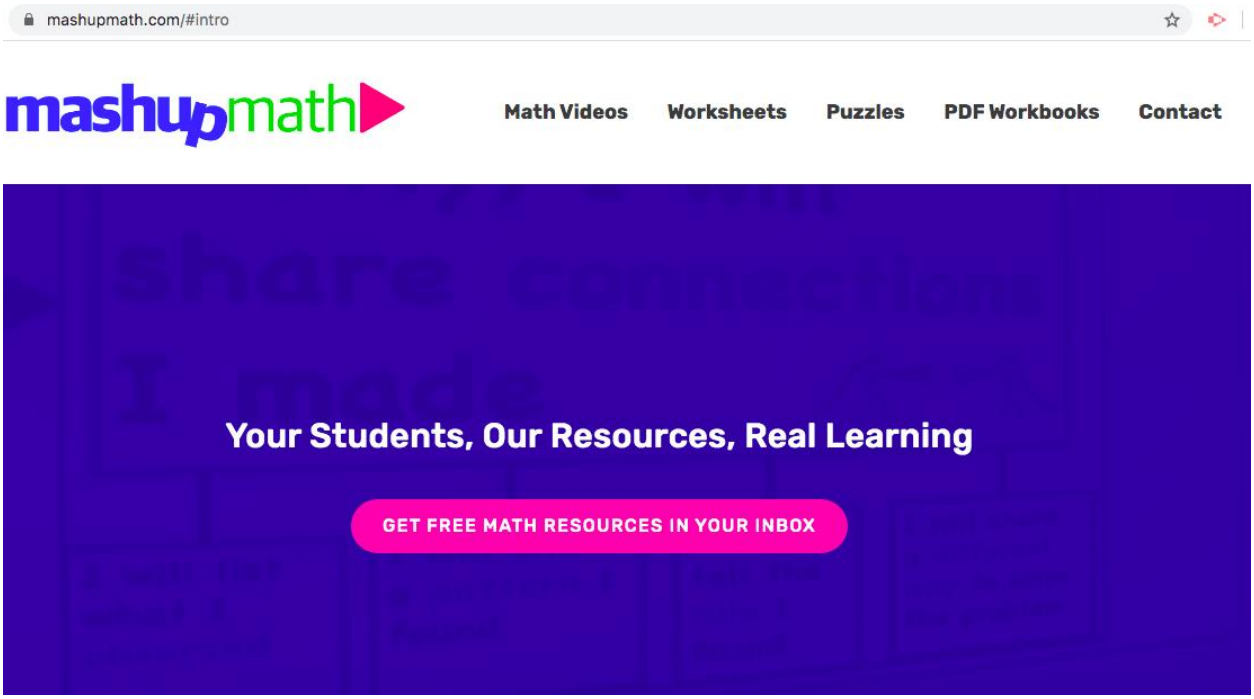

Figure 14. Mashup Math. (https://mashupmath.com/#intro)

How this Works in the Classroom

As technology continues to expand teachers are presented with so many tools to use in the classroom. Education is all about teaching to the needs of students and finding ways to improve their education. The best way to see if methods are working for students is to get student feedback and look at assessments. While implementing these methods in my classroom a

majority of my students were very pleased with the flipped classroom model. Many students were hesitant at first because this was a new way of learning for them. When I taught using the flipped classroom my students loved how they were not working through the hard problems at home. Instead they were working on practice problems in class with other students. I found when students were given videos longer than 10-15 minutes they were not as engaged in the content and didn't like the videos. I think it is best to keep videos around 10 minutes. Students said that they liked how the videos were made by their teacher because it is what they are used to. Some struggling students also said they liked how they could pause the videos and take notes or re-watch the videos. Many students also stated that the videos are much more fun and engaging than regular homework and that they are actually learning something new. This was great to hear because that is exactly what a flipped classroom should feel like for students.

After getting over the learning curve of a flipped classroom my students found much success in this method. My student test scores showed much improvement when students actually watched the videos. I compared test scores based on the time students spent watching videos and there was a direct correlation between them. Many students' quiz scores were also directly correlated with time spent watching the videos. It is important when using the flipped classroom that all students are able to watch the videos. It is also important that they are watching the whole video and understanding them. One thing I added more as time went on was check in with students to see their understanding and progress. I also added more times for questions and added a spot to ask questions online as they were watching the videos. I had some students whose chrome books weren't working and instead of asking for help they were just not doing their online homework. This is an example of things to look for when using the flipped classroom approach.

Conclusion

Implementing a flipped classroom can have many approaches and there are many tools out there that help make the class run smoothly. These research methods and practices are a few of the many that can help teachers make the transition from traditional learning to a flipped classroom model. It is important to remember that the reason for flipping a classroom is to benefit students. Although flipping a class can be very time consuming and hard, there is so much to offer by doing it. Therefore, educators may need to modify their approach based on the students they are teaching. Teachers must differentiate to help all students master the objectives.

Living in such a technological era can often be overwhelming especially for teachers. In order to be a good teacher one must adapt to the new technological advances that the future has to offer. The global pandemic that people are facing today could have been a wake up call for many reasons. Many educators and students were not ready to go into full online learning. This has been very hard for many students and teachers to make this transition. The flipped classroom approach is the middle ground between in-class and online learning. Teachers who have adapted to the flipped classroom model have had a much smoother transition during this crisis. There is a lack of research on implementing a flipped classroom in mathematics. This information will help guide teachers to promote more individual learning within students because this is a time when the flipped classroom is essential.

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