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Videos Production for Flipped Classroom

A Guide for Teachers

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Flipped classroom model is a new teaching technique which allows students to take the lectures at home by watching the videos recorded by their teachers. The videos can also be recorded by other experts in the field. Since the lectures are watched outside the class, other activities are done in the classroom.

Although Flipped classroom is a new model, it is gaining popularity rapidly. Students, teachers, parents, schools, colleges all are attracted towards it because the method allows teachers and students have more time in class to discuss and try out the things to be learned rather than just sitting and listening to the lectures from the teachers. Flipped classroom is also popular because it uses a lot of technology. Almost every student has a Smartphone and a in their use. When teachers record their lessons and share them with students, it gives the students an intensified feeling of learning and participating.

Recording videos can be a problem for some teachers if they are not used to technology. However, the videos do not have to be perfect in the first time; they will eventually get better with practice. This thesis tries to help those teachers who wish to flip their classes but do not know how to do it because of their lack of knowledge in video recording.

| Keywords | Flipped classroom, Video production |

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Abbreviations

FLN: Flipped learning network

OBS: Open broadcaster software

LMS: Learning management systems

SBG: Standards based grading

FPS: Frames per Second

1   Introduction

The flipped classroom, which is also known as inverted classroom, is a teaching method that reverses the timing of class lectures and homework. This is a model where students are provided all the lecture materials in the form of video and graphics and asked to go through them at home. All the tasks and exercises are allotted the class time. All the projects, interaction and discussions are done in the classroom. The purpose of flipping a classroom is to interact and inquire about the content of the lecture one to one with the teacher or in a group of students. This gives more time for students to implement their knowledge acquired from the lectures. This in long run enhances the skills of students. Video materials are one of the main ingredient to the flipped classroom. These videos are created or borrowed by teachers. These videos could be previously recorded lectures or separately created videos for individual topics. These videos are delivered either online or in a recording device like DVDs, memory cards or USB sticks.

The flipped classroom breaks the tradition of the teachers standing in the front and students sitting in the row and listening to him/her. It also breaks the traditional one size fits all style of teaching. The students can study on the pace and time they wish. Students who learn fast can fast forward the lecture content provided by the teachers while others can rewind or slow the studying when needed. Moreover, flipping of classrooms also offers flexibility of time. Students who go to work or have something else to do can study at the suitable time. Hence, the students do not have to miss the lectures in any situation. In short, flipped classroom is a perfect blend of education and technology which offers appealing studying experience for each student with any form and skill sets.

Furthermore, flipped classrooms offer the students first-hand experience in implementing knowledge into skills. The teachers can guide the students through the problems by giving them real-time feedback. In traditional classrooms, students are taught the lessons and courses but with the inverted classrooms, students gain the skills as they get more time to implement and practice in classroom the theory they learn at home. The best thing about flipped classroom is that students can familiarize themselves with the lecture materials beforehand so that they already know the problems they have and make their questions ready when they come to the classroom. Hence flipped class-

room is the method of inverting classroom experience by replacing the lectures in the classroom by in-class activity and hone students' skills for better.

2   Flipped Classroom Model

There are many factors that influence the learning environment in a flipped classroom but there are two key components without which it is impossible to flip a classroom. One of them is the educational technology and the other is classroom activities and learning. [1]
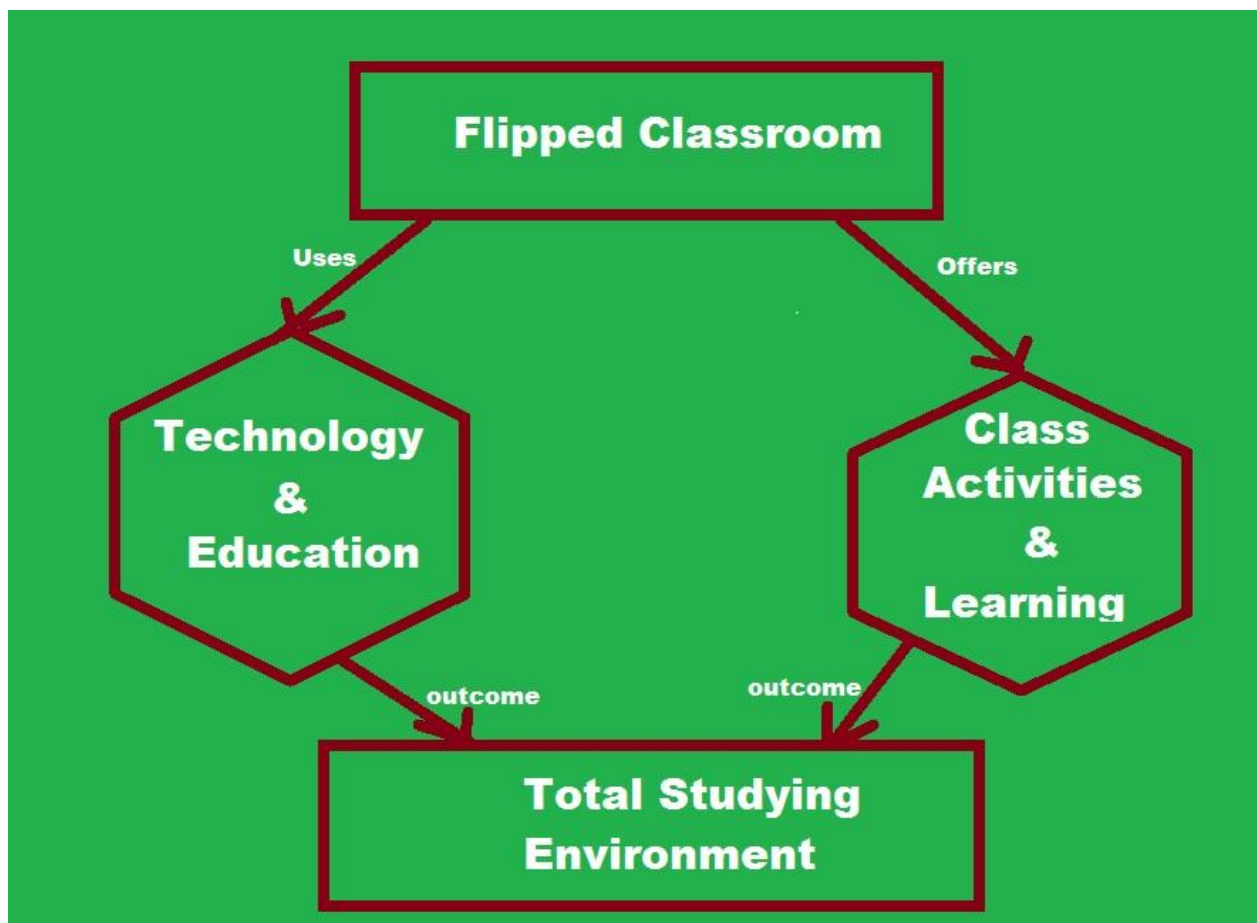

Figure 1. Flipped classroom model. Modified [1]

This flipped classroom model illustrates that with the use of technology and videos at home and activities in the classroom, an enhanced learning environment can be acquired.

3   History

There are a few different theories on how the flipping of classroom started. However, Alison King is considered and credited for theoretical introduction of flipping of classroom. In her article "From Sage on the Stage to Guide on the side", she concentrates on the significance of dedicating the class hour on skill honing rather than just delivering the theoretical lectures [2]. Then a professor of Harvard University, Eric Mazur introduced a concept called "peer instruction" which also was an influencing factor for the flipped teaching. In his classes, students absorbed the information and practiced them which were transferred to them outside the classes. This gave Mr. Mazur ample time to guide his students personally. [3]

Moreover, the implementation of flipped teaching was started by two chemistry teachers Jonathan Bergmann and Aaron Sams at Woodland Park high school in Colorado, USA. In order to cover the studies that missed the class lectures, they recorded the lectures and posted them online. The students who otherwise would have missed the classes benefitted from it. [4] However, Sams and Bergmann do not claim that they invented the inverted class. They acknowledge Maureen Lage, Michael Treglia, and Glen plant's journal "Inverting the classroom: A gateway to creating an inclusive learning environment", which was published in 2000. They also guessed it did not reach popularity since YouTube was not that popular by then. [5]

In 2003, Salman Khan, the founder of Khan Academy, was instructing his cousin remotely. He recorded the chapters on the request of his cousin so that she did not have to go through the parts she already understood and work on her own pace. He started publishing his lectures on the YouTube and that was instantly a major hit. His lectures not only helped his cousin but also millions of other viewers. Mr. Khan already has more than half a billion viewers on his videos. [5]

Moreover, Aaron Sams found out there are software available which could record PowerPoint presentation along with sound. This is when Sams and Bergmann saw some opportunity of recording the lectures missed by students. In the beginning, they did it to reduce the burden of their work. However, this not only reduced their work but also helped students who missed the lectures. Also, many other teachers and students benefitted from the videos. The students all over the world started watching the videos and asking questions to them. This is when they started going to different portals and

places and explaining about flipped classrooms. This led to the popularity of inverted classrooms. [6]

4   The Four Pillars of FLIP Learning

There is a common belief that a flipped class can be achieved by just giving student notes to read at home and make them watch the videos related to the course [7]. While these may be a part of the flipped classroom, flipped classes are not limited to that. There are many other things that need to be incorporated in it in order to be a called a complete flipped classroom. A few things that are a must in a flipped classroom are flexibility, mutual understanding between students, teachers and guardians. Moreover, an absolute flipped classroom leads to flipped learning. In order to, establish flipped learning, four pillars must be included: Flexible Environment, Learning Culture, Intentional Content and Professional Educator. [7] This in short is called as FLIP.

Flexible environment

One of the most important building blocks of flipped learning is the flexibility. Flipped classroom offers flexible environment for not just students but also for the teachers. Teachers can change the interior of the classroom in a way that suits the requirements. For instance, if students are supposed to do group tasks, chairs can be arranged in a circle so that everyone can have their bits done. Furthermore, if students are required to do individual tasks chairs can be separately located.

Learning culture

Learning culture is another important part of the flipped learning. The sources of the information vary in flipped learning in contrast to conventional learning where the teacher would only be the source of information. Moreover, students go through different learning experience in this method of learning. Instead of sitting in the class and listening to the teacher, students discover different aspects of the topics by in hand practice and group discussions.

Intentional content

One of the reasons the flipped learning is effective and popular is because of the use of intentional content. Teachers invest their time on finding ways to make students understand the practical concept of the subject rather than just giving the lectures in the

class. They go through the subjects and create the contents that students practice at classroom and make the lectures on the topic available for students to go through at home. The contents are made in a way that suits the necessity of the students and is also easily understandable.

Professional Educator

The role of teacher is essential in flipped learning. In traditional learning, teachers offer lectures in a whole and most probably would not have any idea of which of the students have understood and which have not. However, in flipped learning, instructors go around to the students individually and offer one to one feedback as per need. The class time is mostly dedicated in practical activities, problem solving, and doing the exercises. Hence the teachers are required to be more professional in their approach. [7]

5 Theoretical Framework of Flipped Classroom Model

The figure below is of the theoretical framework which illustrates the time and content distribution for classroom activities and home. The flipped classroom works on the principle of not having lectures in the classroom and spending time in in-class activities [9].

Traditional class   **Flipped Class**

achieved through homeworks — Creating, Evaluating, Analysing, Applying — Achieved in class working with teachers

achieved through lectures in class — Understanding, Remembering — Lecture material outside the class

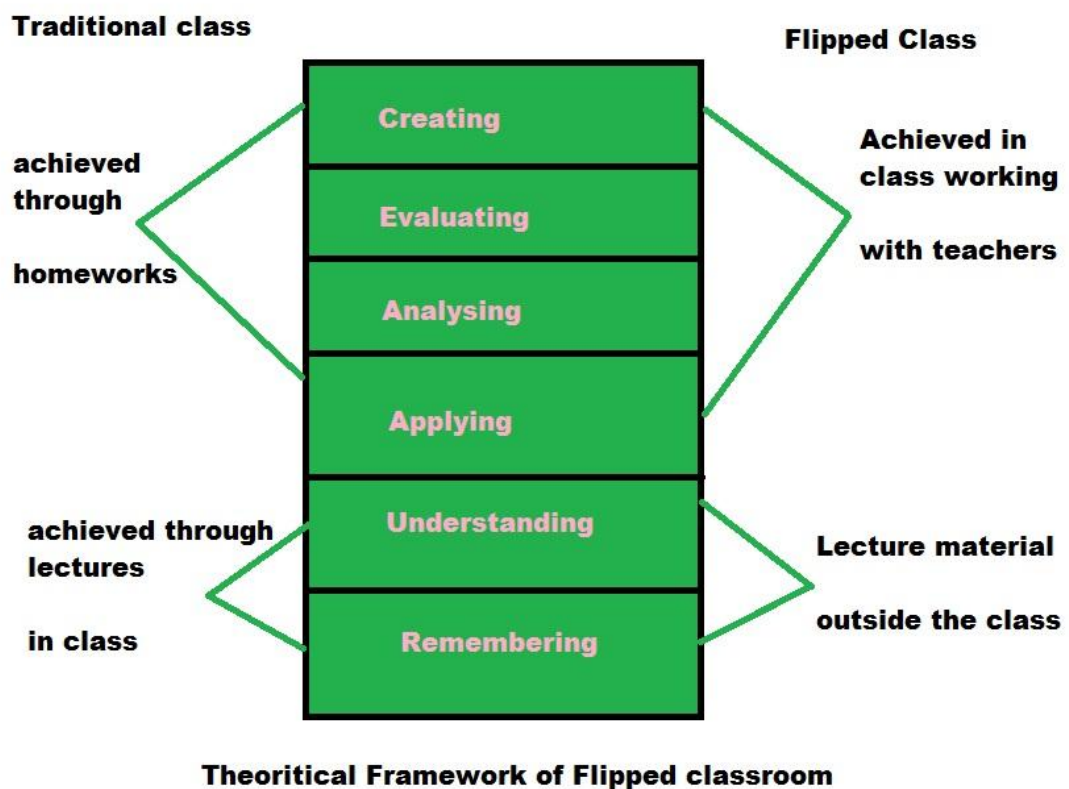**Theoritical Framework of Flipped classroom**

Figure 2. Theoretical frameworks of flipped classrooms. Modified [8]

In the chart above, it shows that in flipped classroom theoretical knowledge is read outside the class and implementation of that knowledge is done in the classroom with the guidance of the teachers. The content is usually created and distributed either online or other form as a pre-learning tool. The connection between home study and classroom activities is accomplished by the interactions between the students or between student and teacher.

6 Advantages of Flipped Classroom

The advantages of flipped classroom are divided in two parts; one for students and other for teachers.

6.1 For students
- Prepares students before coming to class
  The course contents are provided to students prior to class and they go through them in advance at home. Hence, they are better prepared before attending the class.

- Students have more time for collaboration
  Since the lectures are followed outside classes, students have more time for group discussions and collaboration. This enables students to get several prospective of the same topic.

- More time for interaction with teacher
  Students can have one to one interaction with teachers in class as they already go through the topic prior to class. This gives individuals chances to ask questions for teachers separately.

- Can study at the speed they desire
  All the students do not have the same level of capability and skills. Some students understand the content quickly while some may take a bit longer to understand the same content. The students who learn the subject faster can fast-forward the content while others who need more time can reverse or pause if needed.

- Students do not have to miss lectures because of illness or other reason
  The contents are usually provided online so if students are sick or cannot attend the class they do not have to miss the lecture. They can go through them later.

- Time is flexible
  One of the most important advantages of flipped classroom is its flexibility. Students can go through the lectures at the time or place suitable to them.

- More sources for information
  In traditional classroom, the only source of information is the teacher while in flipped classroom they are several sources. They can find sources from several places such as online, books, journals etc.

- Cost effective
  Flipped classes are usually cost effective as student use the computers and other technologies at home. The schools could use the devices and other equipment multiple times.

- Easier for parents to follow their children's academic process
  The contents of flipped classrooms are usually offered as videos so the parents can see the videos and find out what their children are studying. Moreover, they can also be prepared with the subject so that they can guide children.

- Deeper insight of the topic
  Since students have more time for one for one interaction in the classroom, they can ask specific questions and ask for guidance. This makes students more accessible to deeper knowledge of the subject.

6.2   For Teachers

- Teachers have lesser lecture time as students come prepared to classes.
- The contents of the lectures are reusable. The lectures are either recorded or are in the form of videos so they can be used many times for several groups of students.
- The teachers know exactly how much time each student needs.

7 Disadvantages of Flipped Classroom

- Time spent in front of screen:
  Flipped classroom requires more involvement of technology. The contents are in videos and require computers or DVD players to watch them. In each case students are bound to spend more time in front of screen which in long term could be problematic for eyes and overall health of students.

- Online distractions
  Students require internet to watch videos online. Because students spend time online this may lead to regarding social media, YouTube videos, computer games online.

- Student motivation factor
  The whole theory of flipped classroom is based on determination to study and go through the lectures at home. It is important that students watch the videos at home. If they do not, the whole idea of flipping a classroom may be non-functional.

- Decrease in human element
  Students go through the lectures at home online rather than directly with a teacher. Teachers also record the video and publish it online. In a long run teachers may find it difficult to teach in class as they lose practice.

- Lack of technology and internet
  Technology and internet are the major components of flipped classes. There are so many places and schools which do not have access to computers and internet. If they are not available for students, the whole idea of flipping a classroom will be ineffective.

- Difficult to plan the lesson
  Students work on their own pace in flipped classroom. Some students complete the chapter soon while some may take a longer time. In such a situation it is difficult to go to next chapter. So it is important to plan the lessons ahead and make a time frame for a lesson.

- Skills to make videos necessary
  The lectures in flipped classroom are mostly covered through the videos. In order to make those videos teachers are required to have certain skills. If teachers are unable to make videos themselves it would be difficult to maintain the flipped classroom. If other people are asked to make the videos it might be expensive.

8 Cost of Flipped Classroom

There are many teachers and schools who want to implement flipped classroom. One of the reasons many educators want to start flipping the class is because of the belief that they could save costs. However, the question still looms if flipped classroom really is cheaper than the traditional classroom. The answers are varied because it depends on several aspects. Sometimes it depends on the salary of teachers, technologies available in the school and the skills of the teachers [10]. The cost also changes according to the kind of technology used. For instance, a video can be simply recorded by a laptop webcam with a high quality camera. The table listed below shows the approximation of the cost of flipped classrooms for the teachers and the students.

Items	Cost for teachers/schools Approx.	Cost for students Approx.
Computer or a laptop	300-1200€	300-1200€
Content creating tools - Screen recording software - Camera/tripod/memory card etc - Editing software	15 €- 50€ /month 700-2000€ 20€/ month	
Distributing tools e.g. internet, DVDs	10€- 40€	10€
Hosting and delivery Platform e.g. Wistia, Kaltura	99$ -$400/month	
Total	1144€-3710€	310€-1210€

Figure 3. Price table.

The costs shown in the table are approximations of similar items available in Gigantti shop.

9 Creating Flipped Classroom

Different students have different capacity to absorb knowledge and have different skill sets. They take different length of time to understand the topic [11]. They may have dissimilar interests and study time. They all could benefit from creating a flipped classroom. For instance, Ram is a good student. He understands the subjects well. However, he has to work part time to cover the expenses. So he has to miss the last class and go to work. The leads Ram not doing well in the specific subject. He now has options of either coming early to school to go through course material with the teacher or drop out of the course. The first option may not always be viable as the teacher may be busy with other things. Now, this where flipped classroom proves useful. If the teacher has flipped the classroom then students like Ram could immensely benefit from it.

Moreover, in a different situation, Ayesha for example, is a student who is a little slow in catching up with the stuffs in the school. She tries hard but she fails miserably as the teachers are too fast for her. She does not understand the course and she has to do the assignments. She tries hard to do the assignments at home but is not able to. She has choices to meet the teacher outside the class time and ask for help but teacher may not always have time. The option she has is to ask for help from the class mates or copy their homework. This is a bad condition to be in. Then there is the third option to just not do it. So, the solution for students like her could be the flipped classroom. She could slow down the video lectures at home and study at her own pace. She could pause or go back again and again until she understands the topic.

Likewise, there are many other students who face different situations in school. For example some students need to understand how to pass the test and study accordingly and get good grades. However, they do not understand the logic behind it. This is one of the most common problem education system around the world is facing currently. Flipped classroom will not only help students pass the test but also gain the practical knowledge of implementation. Teachers are available during the class time for individual attention to the students who need it. [11,2]

10 Why to and Why Not to Flip Classroom

Why to flip classroom

- To help struggling students
- Flipping offer students capabilities to shine
- To help busy students
- To give students a chance to pause and rewind the chapter
- To increase the communication between students and teachers
- To increase the interaction among students
- To involve parents take part in their children's learning process
- To help absent students and teachers
- To help teachers know their students better

Why not to flip the classroom

- To make teachers job easier. However, it does not necessarily make the job easier.
- To make the classroom pro technology if it does not use the latest technology
- To follow others who have flipped the classroom
- To make you look like a good teacher because just flipping a class will not make anyone a good or a bad teacher. [12]

11 How to Make the Videos Effective

Videos are the most essential tools for flipping classroom. Hence, it is important to make videos in an effective way. The skills for making efficient videos come with time. It needs practice and willingness to improve over the time in order to make better videos. The videos make initially may not look as good as those seen on YouTube. One should not lose hope and keep making them and video making will get better.[11.] There are many ways to make videos and listed below are things to be taken into consideration while making videos.

- Videos must be short and on to the point: The students today are growing amidst technology. They are exposed to technology since the childhood. They also get bored easily. Therefore, the videos must be short and on to the topic. For instance, if the lecture is for Pythagoras theorem, the video should only talk about Pythagoras formula and its implementation. Hence students can go to separate videos for separate formulas and topics. The shorter the video the better it gets. The ideal length of the video would be around 5 minutes. Students might get bored watching long videos. [11, 44]

- Incorporate own voice in the video: Students are used to listening the teacher's voice. If own voice is added while recording the video, students not only find it familiar but also feel the presence.

- Add humor: Adding humor allows students to concentrate on the video and spending time watching it.

- Make students post comments: This is a good way to know if the students have actually watched the videos and listened to it carefully.

- Necessary to set several starting points in the videos: This allows students to find what they wanted easily. If the video does not have a starting point then students have to go through whole video to find some specific things. [13]

- Use of video analytics: This is important to find out
    1. How many students watched the videos?
    2. The time they watched the video.
    3. What part of video is watched to most?

This is helpful for understanding the students and knowing students need more attention and which part of the video should be given more preference during the lectures. [13]

12 Difference between Lecture capture and Flipped class videos

A lecture capture is basically a video recording of everything a teacher does to teach the students. They could be the lectures and presentation of teacher including his or her own voice. However, the videos for flipped classroom are a mix of many things like collection of images, notes, instruction and they are well planned and recorded accordingly. Moreover, lecture captures are usually a recording of whole lectures of class and are usually long while flipped class videos are focused and short. The videos for flipped classroom are focused on a specific topic rather than the whole chapter.

The videos of flipped classes are short and attract the attention of students unlike the lecture captures which are long and monotonous. The ideal length of flipped classroom are somewhere between 3 and 15 minutes while the lecture capture are full class length [14]. The lecture captures are recorded directly during the class session so it would not take much time and effort. However, the flipped classrooms are recorded for specific purpose and require more time for planning. The editing also is well thought out and published in a medium previously decided with students. The publishing medium could be university website, YouTube or any other private distribution site.

13 How I made flipped videos

There are many ways flipped videos can be created. I have made some flipped videos using some of the tools below.

13.1   Using Camtasia

There are many ways of video making for flipped classroom. There are so many tools for making the videos. Some of them are free and some of them are one time purchase while for some monthly payments should be made. Camtasia 9 is one of those many available. Camtasia 9 is created by TechSmith. One month trial version is available online for free. However, the trial version includes the watermark of the company. According to the official TechSmith website, the full version of Camtasia 9 is available after a one time purchase of € 222.80 with estimated vat. Camtasia 9 can be installed in 2 different computers after purchasing once. Camtasia has been my favorite as it allows me to record the screen and bring it to my video and edit it as I wish. I can add all annotations I want. The other reason why I like Camtasia is because quizzes can be incorporated in the videos.

Moreover, videos created using this tool can be shared directly to YouTube or any other cloud drive. The videos can be shared publicly or privately. The videos also can be exported directly as an mp4 file and saved in local drives. This way the videos can be saved in CDs, DVDs, pen drives etc. and distributed to students. There are many other features of Camtasia 9 as we could easily use transitions in the video. Animations, video, audio can be added in the timeline and make a good video overall. I have used the demo version of the application so there is the water mark of the company.
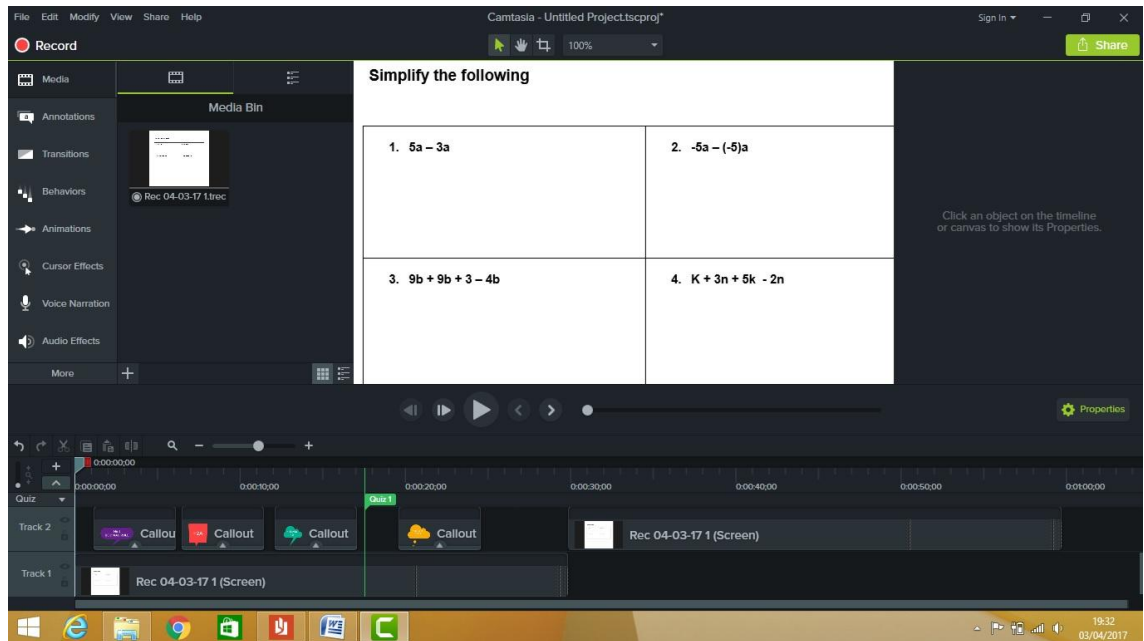
Figure 4. Video Screen.

The stepwise instruction on how I made it is in the appendix.

13.2   Using Ted Ed

There are two ways to create a flipped classroom environment using TEDEd. One way is to use the videos created by other teachers and experts and the other is to record the lecture by the teacher himself. There are plenty of videos for almost all the topics available on YouTube and TeacherTube. Most of the videos are freely available to use for education purpose. However, there are some videos which require permission from the owner to use it. Sometime the permission may be granted only after some monetary deals.

On the other hand the videos can be recorded by the teacher. Many teachers hesitate to record the videos themselves because of technology phobia. They think that they need to be technically very knowledgeable to capture the video which is not true. These videos can be recorded with simple recording cameras, DSLRs, and sometime even with the camera of the phone. The most important thing is to plan the shoot before recording. The videos for flipped classroom should be focused mainly on one topic. There might be some pause or some unintentional disturbance like coughing. This is ok to have those in the videos as they look more natural to students. In short, these videos do not have to be perfect.

This video, I recorded is about grade 3 level simple division. I planned ahead what I will be teaching and speaking and also checked how much time the topic would need to

complete. Then I looked for a place where there are plenty of lights and not much disturbance. This is very important because if there is less light, artificial lighting needs to be done. I did not use any artificial lighting for this video. Here are few things I used to create this video.

- Canon 700D to shoot the video
- Manfrotto Tripod for support
- Whiteboard, Marker for writing
- Windows movie maker for editing and chopping of unnecessary parts in the video.
- YouTube

I shot the video on following camera settings: ISO 1600 f 4.5 30 fps. The unnecessary part in the video can be trimmed by using software like adobe premiere pro, movie maker. I used windows movie maker as this application is free in windows 10.

Figure 5 Lesson screen.

Then I used this video in TEDEd, which is a web tool, to make it useful for flipped classroom. TEDEd allows making the interactivity between students and teachers. Quizzes and tests can be incorporated to videos with this tool. Teachers can send the lecture to students though email and give prompt feedback through this tool. The student and teacher both need to sign up in order to use the functions of TEDEd. The process in creating a lesson in TEDEd is shown in the appendix at the end.

14 What to Do on the First Day of Class

Flipped classroom is relatively a new model of learning. Students do not really know what to expect from the class. They do not understand the process of learning in the flipped classroom. So it is important to tell the students the functionality of flipped classroom. There are a few things students have to go through before going to the chapters.

- Help students with technical difficulties
  In traditional classroom model, teachers offer lectures and give homework at the end of the class and students go home and try to complete the given assignments. They try to do the assignments themselves but if they had not understood the lectures, they try to get help from others or just simply copy the assignment from others. This is not a good way of learning. In flipped classroom, students do assignments at home and go through the lectures at home. In order to watch the lectures they need to know how to watch the video and what to expect from the video. Students need to know how to use of computers and software that is required to follow the lecture at home.

- Tell students to take learning responsibilities
  In this model of learning, students go through the lectures all by themselves at home. In traditional class model, students would attend the class and they would have to listen to the lectures attentively or inattentively. However, in flipped classroom the lectures at taken at home. So, students have to take the responsibility for studying themselves.

- Inform parents about the model
  Parents play an important role in the flipped classroom model. They are the ones who are at home and they need to ask children to study and go through the lectures. So, the teachers have to inform parents about this new model of learning and ask them to help the students in the process.

- Educate students to watch and interact with videos
  In the lecture videos, there could be several points where students need to be more focused and be interactive. [15] Hence it is important for teacher to help them understand how to interact with videos.

- Ask students to make a questionnaire after each video

Students watch the videos at home. There could be some instances where they do not understand something. If they do not understand something they should note down the question and ask it from teachers in the first session of the class. This helps them be clear on the topic before going to other topics.

- Encourage students to attend the classroom
  There is thinking among students that since the lectures can be attended at home in this model of learning, there is no need to go to school. However, it is not correct. It is important that students attend the classes for the flipped classroom to be successful. It is as important for students to attend the class as to watch the videos at home. The group interaction and other class activities is a very important part of flipped model of learning. [15]

15 Implementation of Flipped Classroom

Flipped classroom is a fairly new model of learning so there are not too many recorded ways of implementation. Therefore, it could be a tough task to implement for both teachers and students. Students are usually not used to getting an individual attention in the class. So it will take some time for them to become accustomed to this model of learning. This might even be a new thing to the teachers too. Hence, it is important for teachers to be prepared and explain the students the technical part of it. The teachers have to have a detailed plan in order to start flipping the class. [16.]
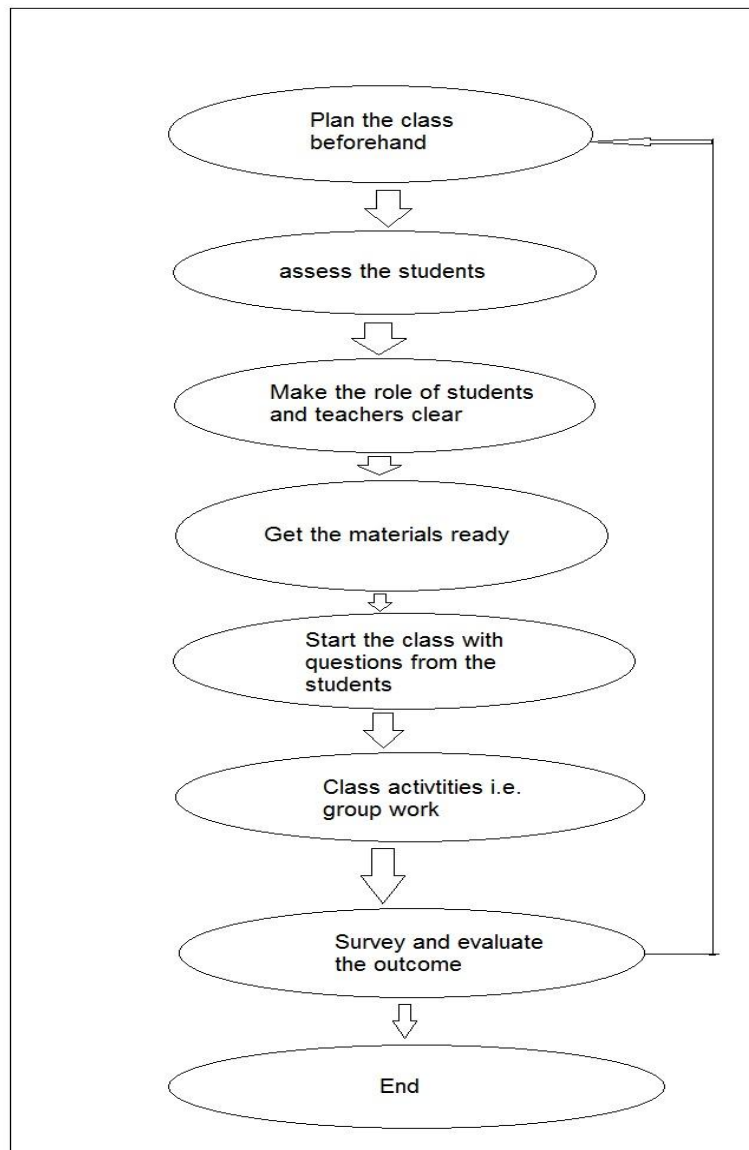
Figure 6. Implementations flow chart. Data gathered [17]

The videos may be the integral part of the flipped classroom but it is essential to re-member that the most advantageous thing in the flipped classroom is not the videos;

the activities in the classroom are most important ones [18]. Listed below are some of the key factors for implementing the flipped classrooms.

Videos as lecture material: Videos are important tools of flipped classroom model of teaching. However, videos only are not the tools for this model of instruction. It is important for teachers to evaluate the importance of videos on certain topic. Videos should be made only if it is important [18].

Making own videos: Video making is another skill needed by the teachers in this model of learning. There are so many tools and technologies used to make videos. So the teachers should invest some time in learning the use of video making tools and editing software. Videos should be made in a way that it does not bore students and is easily understandable to them. Teachers can be creative and flexible if they make their videos themselves.

Using quality videos made by other instructors: There are many teachers who are unable to produce their own educational videos either due to the lack of knowledge or they are camera shy. Many teachers are not comfortable in front of cameras. The remedy for them is to find the quality videos made by other teachers and use them. However, it is important to see the rights to use them. Some of them could be used for free while some videos might need permission to use. [18]

16 Necessary Video and Web Skills

Videos are everywhere. There are found all over social Media like Facebook, Twitter, and YouTube etc. They are recorded in different ways. Some of them are recorded for entertainment, some for long term memory, some for advertisement, and some for educational purposes. The purpose of recording defines the use of technology. High capacity cameras are used for shooting high quality videos like movies, music videos, advertisements etc. The availability of smart phones have made video recording easy. Anyone can record videos easily with smart phones and share them in social media or save them for themselves.

However, videos for flipped classroom are a bit different. They are made differently and for a specific purpose. Hence, one requires different sets of skills to produce these videos. Teachers need to be very careful when making videos. Some teachers may be a little nervous before making videos and that is absolutely normal [19]. The quality of videos may not be the best initially but will eventually get better with time and experience. It is also good to know a thing or two about sound recording because if sound in the video is not good then video will not be good 19].

There are several ways to create a video and teachers can choose whatever way they feel at ease. This also depends upon the skills a teacher possesses.

- ❖ It can be recorded by using a camera and recording a lecture like in the old days.
- ❖ They can also be made by using presentation tools like PowerPoint where teachers voice is use in the background along with the text
- ❖ The other way and the latest way of making video for flipped classroom is by using screen capture software like OBS.[19]

Some basic skills necessary for producing videos for reversed classroom are given below:-

- ❖ Use of technologies for example computers, cameras, Wacom Bamboo
- ❖ Use of screen recorders for example Camcaster, OBS, Camtasia etc.
- ❖ Use of Internet tools for example YouTube
- ❖ Use of sound recorders and sound editing tools
- ❖ Use of Video editing tools like Adobe premiere pro, After Effects
- ❖ Use of presentation tools like PowerPoint

17 Technology Used in Flipped Classroom

Flipped classroom is eventually a technology based approach to learning. There are several technologies used for creating and implementing the flipped classroom which can be divided in four major groups.

17.1 Video creation tools:

There are several video creation tools. Some of them are available online for free while some of them should be purchased. Most of these video creating tools are device specific [20]. Some of the popular tools available in the market are shown below arranged according to the operating system they use.

Windows	Macintosh
Camtasia PC	ScreenFlow
There are several several features of Camtasia PC. One of the most important features of it is green screen support. Other important features include adding picture in picture, zooming, adding speech and text in the video. It also enhances the quality of audio. Callouts and captioning are other notable fetures of Camtasia PC. The cost of this video creating and editing tool is $149.	This is a paid professional screen casting tool. The cost of this video making tool is $99. This is made for Mac but the output of it is mp4 which works in all devices. The main features of this screen casting tools are video editing, zoom and pan, annotations, chroma key, transitions. They have several templates on it. The teachers can choose one of those templates and make a video as they like.
Screen-cast-O-matic	Screen-cast-O-matic
Free and paid version according to requirement. Free version can record for 15 minutes and can export the video directly to YouTube or can be downloaded as mp4. On the other hand, the paid version has some additional features like video	It also has free and paid version. Free version can record video for maximum 15 minutes and can export the video directly to YouTube or can be downloaded as mp4. On the other hand, the paid version has some additional features like video

editing; saving it do Google drive, record in HD, and also can draw and zoom. The price of it is $15 per year.	editing; saving it do Google drive, record in HD, and also can draw and zoom. The price of it is $15 per year. It can record unlimited time of video
TechSmith Relay This video creating tools is sold only as enterprise software. TechSmith Relay is known to be the tool that works on all kinds of mobile phones. This is popular because it is very easy to use. It is also good because it offers option for multiple choice and tracks user data.	**TechSmith Relay** Students can create videos with this tool as it is sold as a site license. This is popular for implementation in whole school. It also works on all mobile devices. Quizzes can be embedded in the video and track the progress of the students.
Adobe Presenter These video creation tools are divided in two parts video creation and analytics which cost $149 in total. Since it supports html5, it works in all devices. Adobe presenter offers functionality like branding, integration with PowerPoint along with screen-casting. Its ability to track student responses makes it another important tools.	**Adobe Presenter** Adobe presenter for Macintosh cost $99 for video creation and analytics tool. The Mac features are quite similar to that of Adobe presenter for widows.

IOS	Android
Explain everything This video creation tool for IOS costs $2.99. It allows creators to add videos and export it to YouTube, Google drive, drop box etc. The other function it offers is that things can be imported for several formats like .doc, .pdf, .ppt etc.	Explain everything This video creation tool for Android costs $2.99. It offers makers to import in different formats like .doc, .pdf, .ppt and export the videos directly to YouTube and other cloud storage like drop box, Google drive.
Doceri Doceri is free if used as an app but costs 30$ if it is connected to computers. Free version of Doceri has many qualities like creating a presentation on an iOS device and exporting directly to YouTube. However, to connect it to computer, creators need to pay.	Air Server This video creation tool allows video makers to connect Android to a computer and it costs $14.99.

Figure 7. Content creating tools. Modiefied [21]

17.2 Video Hosting Tools

There are several sites to store video online. YouTube is considered to be the most popular one to host videos [22]. It is widely used around the world by teachers, students and other professionals. However, YouTube is blocked in some schools and other options should be looked upon. Some of the popular hosting tools are listed below.

- ❖ YouTube
- ❖ Google drive
- ❖ TeacherTube
- ❖ Learning management systems (LMS)
- ❖ Acclaim [22]

17.3   Video Interaction Tools

There are several video interaction tools available in the market. It is wise to choose the best one that suits the need of teachers. Some of the popular video interaction tools are listed below.

- ❖ EDpuzzle
- ❖ EduCanon
- ❖ Zaption
- ❖ Verso
- ❖ Office Mix [23]

17.4   Learning Management Tools

Teachers must also master Learning Management Tools. There are many LMTs available. Some of the most popular tools are given below.

- ❖ Moodle
- ❖ Eliademy
- ❖ ATutor
- ❖ Dokeos
- ❖ ILIAS
- ❖ OLAT [24]

18 Assessing the students

One of the toughest parts of flipping the classroom is assessing the students. Assessment of students is an enormous issue. Flipping a classroom changes the way a traditional classroom works in many ways. Thus, evaluation of students also changes accordingly. It is also necessary to integrate the old school way of grading students by A-D, F model along with new ways of evaluation [25]. It is important to structure an apt model of evaluation of students. Another thing teachers have to keep the track of is whether all students are in the class and keep the logistics of each and every student intact. Evaluation of students can be summed up in two major groups: - formative and summative assessment. Both of these ways of assessment require gathering the information regarding the graph of accomplishments [25].

18.1 Formative Assessment

Formative assessment is an instructional process which updates both the parties' i.e. teachers and students about the learning of the students on the certain topic. This means teachers can find out the understanding of each student in real time. This gives the opportunity to teachers to help the students personally in class [25]. The main goal of formative assessment is to keep an eye on the progress of students while they are learning. Formative assessment not only helps teachers but also the faculty about the difficulties the students are facing and how to help them immediately with appropriate solutions. This will also allow students to realize their strengths and weaknesses and work on their flaws. Formative assessment generally means asking students to do something to prove that they have understood the concept of the topic. For instance, teachers ask students to submit an answer in a sentence or two about what they have understood regarding the topic. It usually does not have points at stake.

18.2 Summative Assessment

Summative Assessments are high stake assessments. There are done at the end of a section of a course or after the whole course. This way of assessment determines if student is capable of taking it to next level. This assessment is evaluated by a grade. The grade determines the level of understanding. The grades are usually given as percentage or A-D, F grades. A is the highest grade and F is for fail. The passing grades are A-D. In the percentage grading system, students are graded out of 100. The scores are very important for students as report cards and the accountability of schools also depends on the scoring system. [25.] There are several types of summative assessments. Some of them are given below:

- End of chapter
- End of course
- End of semester
- End of year
- District level exam
- Country level exam

All these assessments may vary according to the geographical locations where the assessment is done. The assessment can be done with different techniques. Some of the most popular one are

- Fill in the blanks
- Definition
- Question answers
- Multiple choice questions
- True or False
- Match the following etc. [26]

19 Working with grading cultures

The grading culture depends on the country. Different countries have different types of grading systems. In many countries like in Finland the grades are given in A-F format while in some countries like Nepal grades are given in percentages. In Nepal where percentage system of grading is practiced, the percentage more than 80 is considered to be a distinction. The grade of 60% and more means the student has passed in first division. The percentage less than 60 and more than 45 is called as second division. The third division percentage is anything more than 32 and less than 45%. The percentage of less than 32 is considered to be failed. In countries like Finland, students obtain credits if they complete the course. The credits are then graded according to the performance of students in the test. Students get grades ranging from 1 to 5 where 5 is the best and 1 is the lowest passing grade. In USA, students get letter grades ranging from A to D where A is the best and D is the lowest passing grade. The failed students get an F.

All around the world, the teachers teach the course and students take an exam which defines the level of student and whether he or she could go further. If the student passes the exam he or she goes to next level and if not, the course or the exam must be taken again. In flipped classroom, the traditional grading system may not work efficiently. The best way to grade in flipped classroom is by giving the grades on the basis of goals achieved in the class. Therefore, standards based grading system works best for flipped classes. However, not all teachers who flip their classrooms use this grading system [4, 92]. The students are given the target beforehand to achieve the required goals. In SBG (Standards based grading), only selected quizzes and tests are used for grading purpose and the most recent result is used for grading instead of taking the average of all previous results [27].

20 Flipping classes in developing nations like Nepal

Flipped classroom can be effective in small developing nations like Nepal, too. In Nepal, normally students are given a lot of homework especially in primary and secondary level. They do not have time to play or do any other things besides homework. If the classes are flipped, the homework load will decrease significantly. This will give ample time for students to do many other things. They can watch the videos provided by teachers. They can watch them as many time as they wish until they understand the topic. They can bring all their questions regarding the topic and discuss it with teachers. This will help students to know where they stand and how they can proceed further.

Furthermore, flipped classes could be very good for students located in remote villages. The schools are located very far away and students have to walk several hours just to reach the school. If the classes are flipped, they can watch videos at home and make a note of things they have not understood. Then they could walk to the school every alternate days and discuss topics with teachers. This would help them immensely. They could download the videos online or get them as CDs, DVDs or even USB sticks. They can watch the videos at a time that is feasible to them. [28.]

However, there are some difficulties to implement the flipped classroom in Nepal. One of the main complexities is that not too many teachers are trained for this model of learning. Most of them are not even updated with latest technologies. In order to put flipped classroom into practice teachers need to know how they can use technologies to benefit the students. The other problem is that Internet is not available everywhere. Even bigger problem is the electricity. Even if there is no Internet student would be able to watch the videos in CDs in their TV but if there is no electricity, it is very difficult. The education system in Nepal is mostly theoretical and hence, teachers often do not how to use internet and download videos. Parents are even more likely to face the problems as many of them have never been to school. [28.]

Moreover, the attendance of students may not be regular. Students and parents might think that why go to school when students can obtain all the lectures at home through videos. It is very important for teachers to make the students and parents understand the importance of attending the class even if the lectures are available online. Students are more attracted towards technology and if they get a class where technology

is available, they may start being less interested in classes and lectures without the use of technology. Teachers must make sure that students understand that not all classes are inverted and attending school and classes is equally important.

21 Challenges

Since the flipped classroom is a relatively new model of learning, there is not much detailed information on how exactly it is done. There are not so many experts who could make people understand the best ways of doing it. There will always be some challenges in doing something not so old. Some of the common challenges in flipping a classroom are listed below:

- Untrained teachers: There are many teachers who lack knowledge about flipping a class. This could be one of the many challenges in flipping a classroom.
- Teachers with fear of camera: Facing a camera could be a new thing for some teachers. Some teachers may even be scared of speaking in front of a camera. If this is the case, then it would be very tough for that teacher to flip a classroom.
- Lack of technology available: Flipped classroom is a learning model which incorporates technology. Many things like a computer, camera, and Internet are required to flip a classroom. Lack of all or some of these things could be challenging.
- No Internet or very weak Internet connection: Internet is not available everywhere. In many remote areas Internet is not a common thing. Lack of Internet could cause another problem in flipping a classroom.
- Lack of trust: Students are used to listening to their teachers in classroom. The students relate to the teachers teaching in some manner. Sometimes teachers use the videos made by other experts which might make it hard for students to relate to their teachers.
- Students missing the classes: Students may think that since they can get all the lecture material online there is no need to attend classes. This may cause students missing the classes.
- Students attending classes without preparation i.e. without watching videos at home: In a classroom there are several types of students. Some like to study

and some do not. In a traditional classroom model there will always be a few students who do not do their homework. Likewise in a flipped classroom model there will be students who do not watch the videos. This could lead to more challenges to the teachers.

- Students not knowing how to watch the videos: Watching the lecture videos of flipped classroom is not similar to watching a movie. There is a certain technique to do it. There will be some students who might not know how to watch and learn properly.

22 Conclusion

To sum it up, flipped classroom is one of the latest learning models which change the traditional style of teaching and learning. In this model, things that students would do as homework are done in class and the lectures are taken at home. The classroom activities include question-answer sessions of lecture videos, group discussions, interaction between students and teachers, in-hand practice and labs. This allows teachers to engage with students in an intense way. This kind of a learning method, I believe, significantly increases the skills of the students because students get an opportunity to practice in class what they have studied at home. The lectures are usually recorded by teachers. However, videos recorded by some other experts are also used.

I believe the videos created by the teachers themselves make more impact than the videos made by other experts. Each teacher has his or her own way of teaching, a certain accent or talking style. The pause between the talks, the hand gestures made are familiar for the students. The students are used to activities a certain teacher gives. This in my opinion keeps students more connected with the teacher. Even if the videos of other experts are better in quality, students may be disinterested because they do not know him or her personally.

Furthermore, video making should not be taken as a daunting task by the teachers as the videos for flipped classroom do not have to be perfect. The pause and certain actions like coughing, sneezing do not have to necessarily be removed from the videos. These things occur even during the classes so this brings ease of classroom environment. Short videos of around 5 minutes or less on each topic would keep the students interested. Long videos may descend the concentration and students might get bored. Teachers could use humor to make the videos more interesting. However, if the teacher is really uncomfortable about facing the camera, he or she should not think that they cannot do flipped classrooms. They could use videos from other experts or get help from other teachers, or professionals to create the videos.

Flipped classes can be helpful in all countries and schools but they might have an even greater impact in a country like Nepal. There is lack of good teachers in remote places in the countries. Technology permitting, videos of experts and good teachers could be distributed to students which would help them to understand things. Moreover, this could also help those students who are forced to work on the fields with their parents during the day. They could follow the lesson when they are free.

In conclusion, I believe, a flipped classroom is worth a try. The whole course does not have to be flipped. It is also possible to flip some topics and see how it goes. This could be beneficial to most students and teachers.

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Content making with Camtasia

The stepwise instruction to create videos with camtasia is given below:-

- A new project can be started by clicking in New Project.
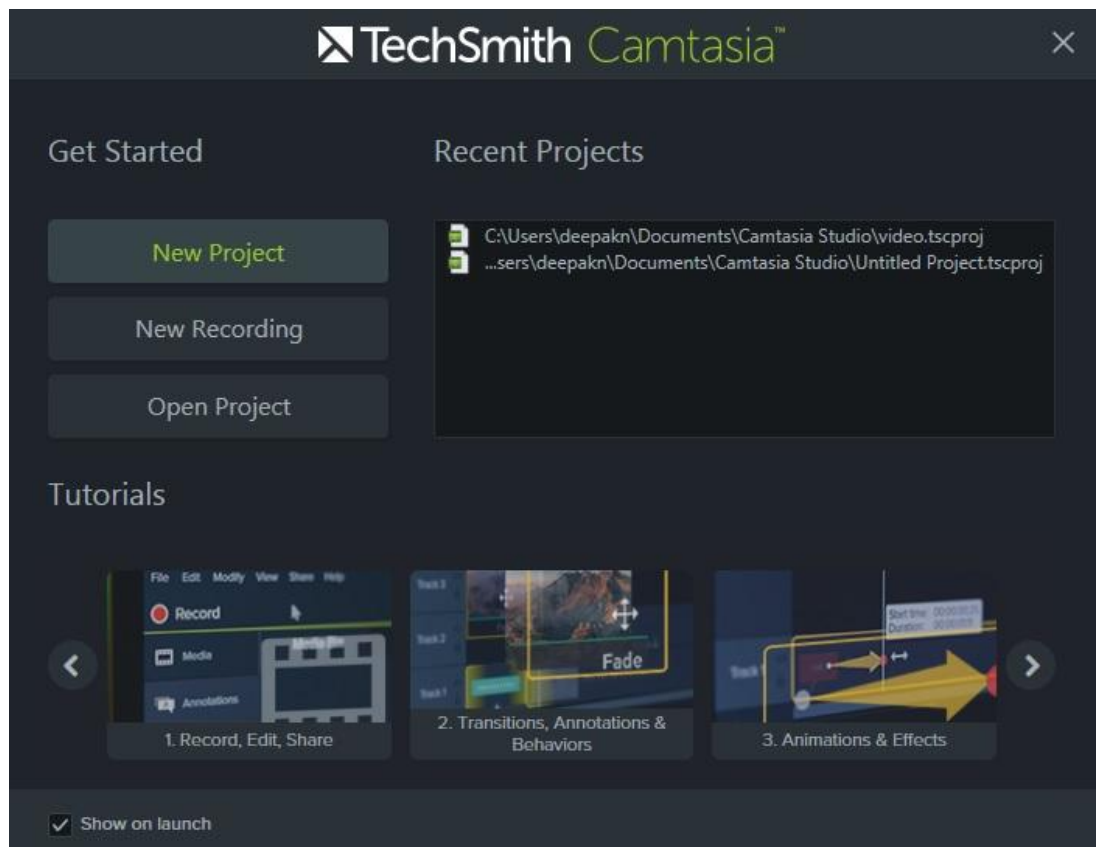
- A new blank project with empty timeline will be opened
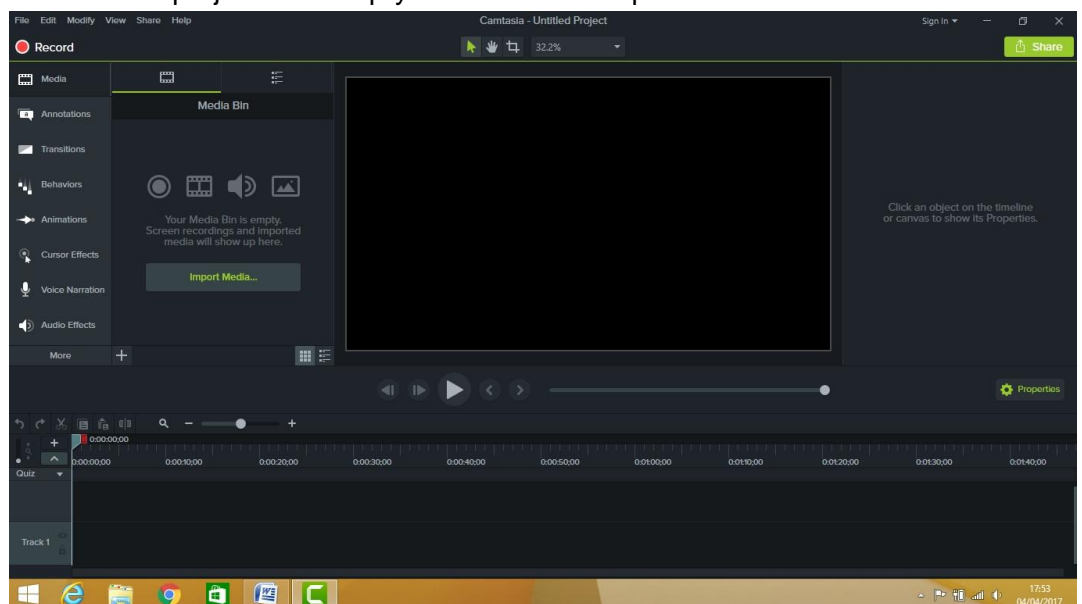
- Video, audio, or images can be imported by clicking in import media. Then it can be dragged back to the empty canvas
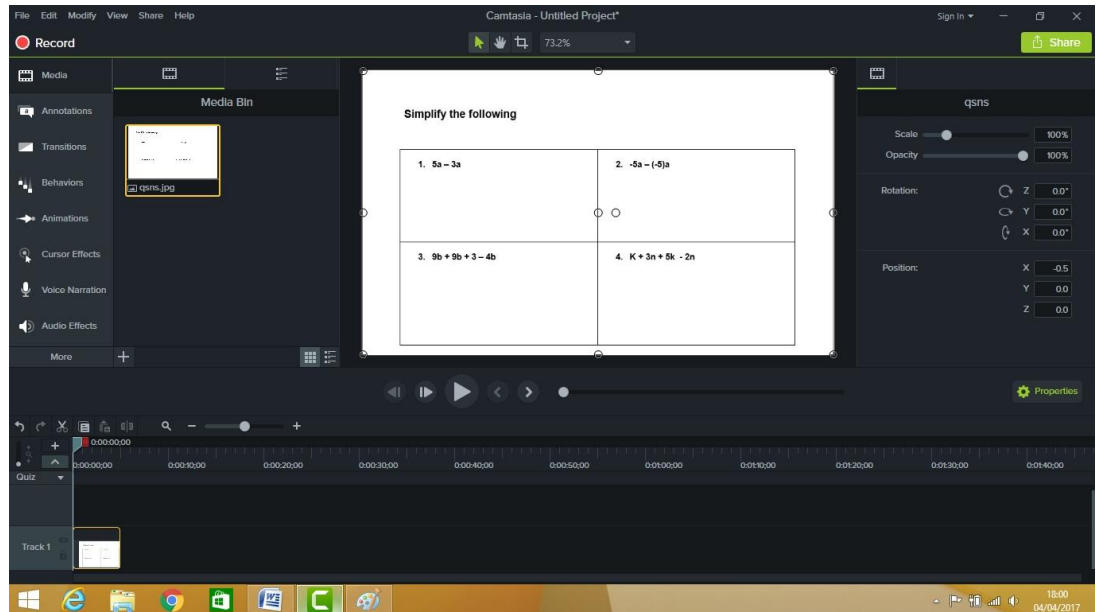
- Video can be recorded by clicking in record button along with screen capture. Video, audio and screen capture can be incorporated at once.
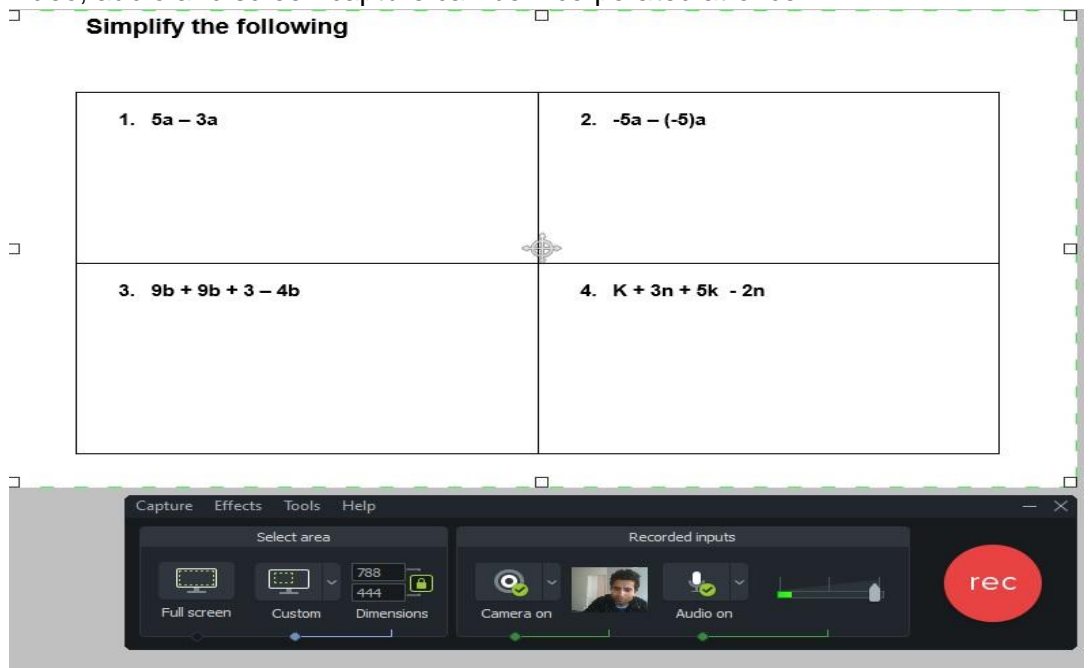
- Annotations can be added along with video and screen capture.
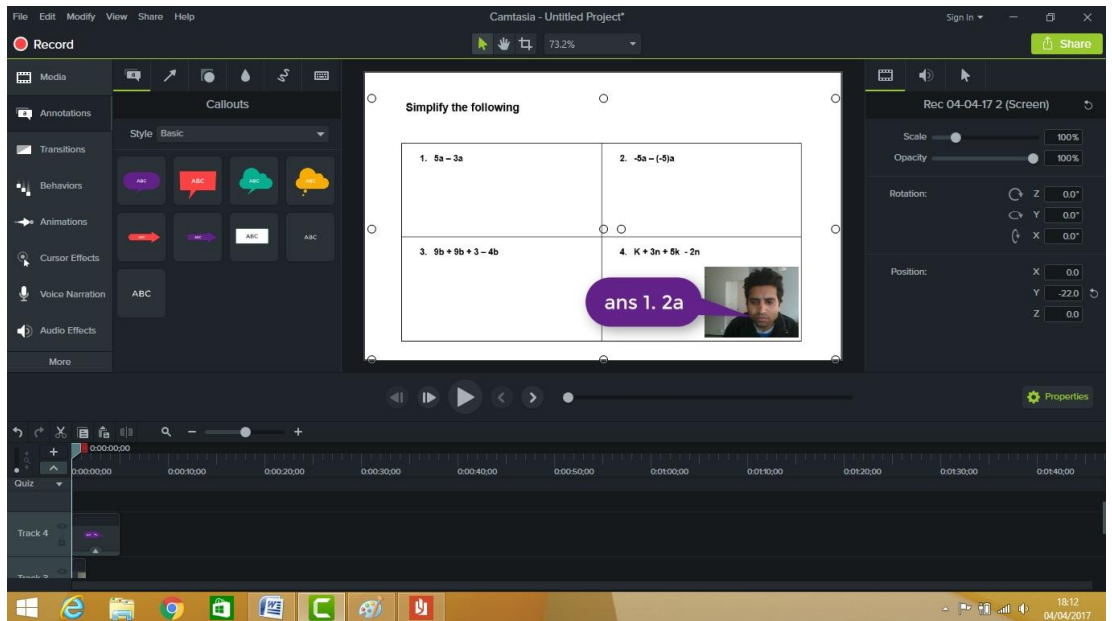
- In order to make the video interactive quizzes can be add in the timeline by clicking interactivity button. Then by clicking Add quiz to timeline button.
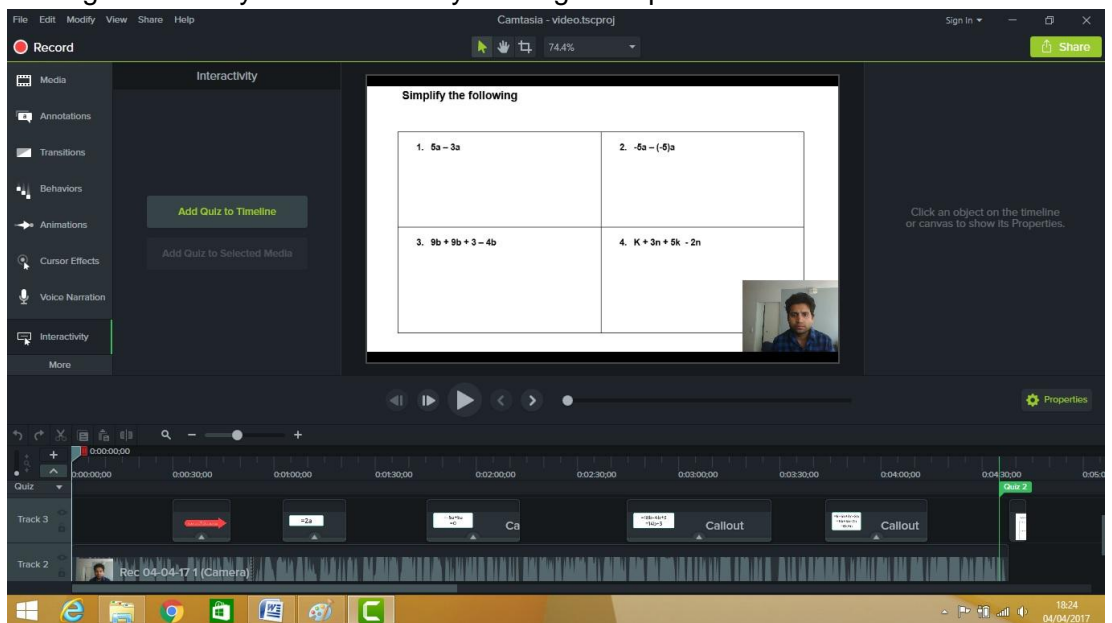
The quizzes can have answers and feedbacks too. If the answers were right the video can continue and if the answer in the quiz is wrong the video can go back to the point you want.
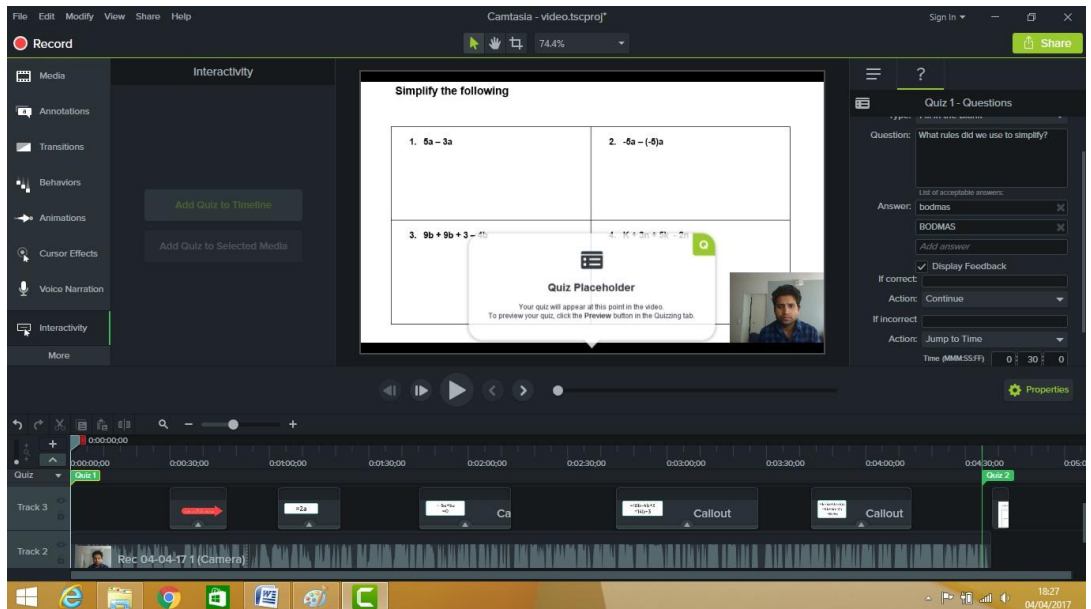
The quiz in the video looks like the following
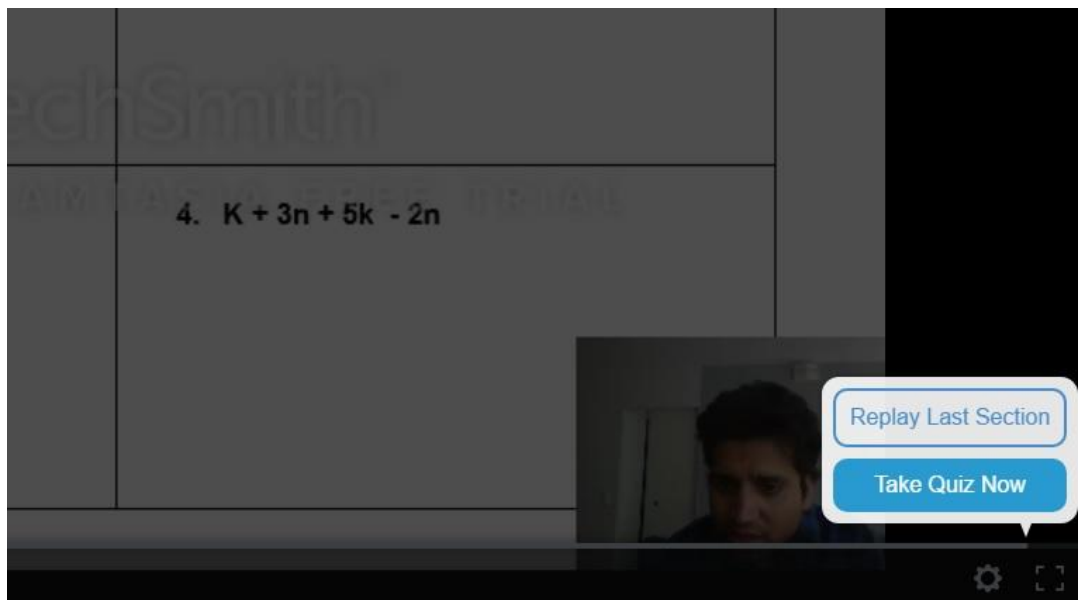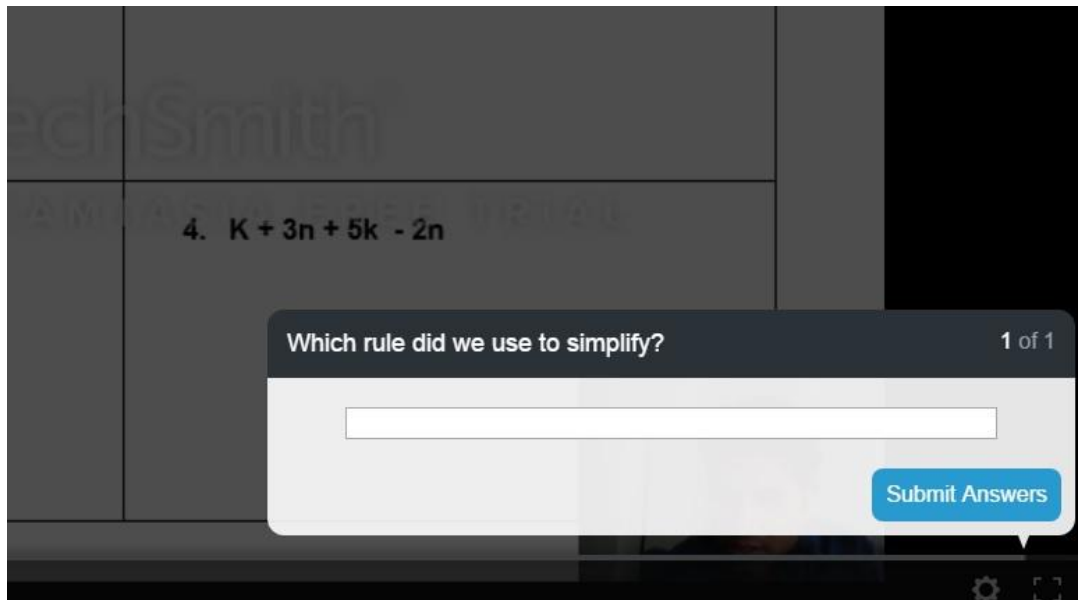
If the answer is wrong then it shows in the video and goes back to time where the right answer in the video is discussed.
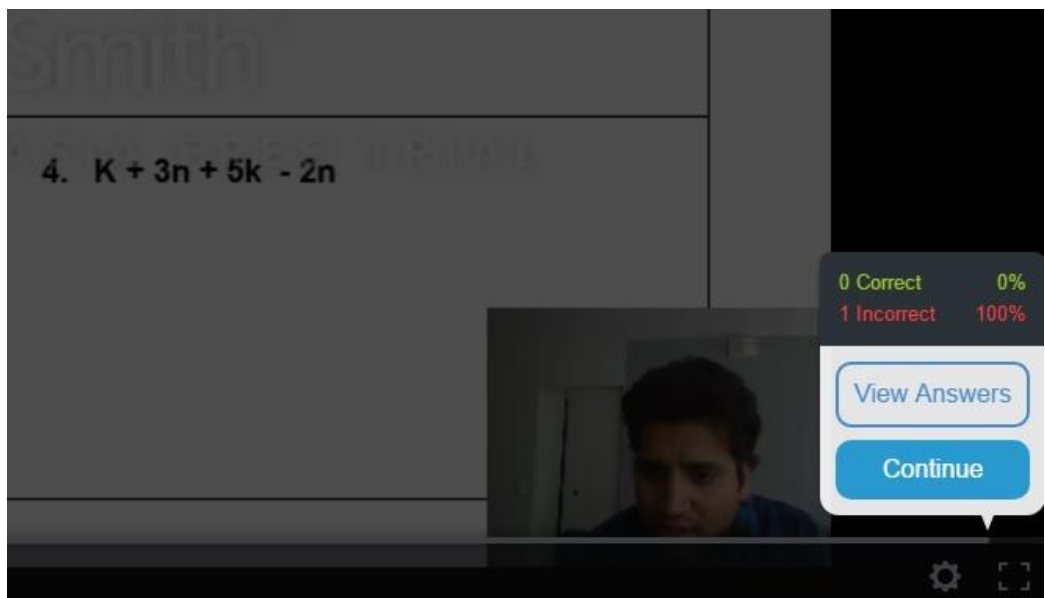
And when the answer is right, it shows in the video and lets you continue
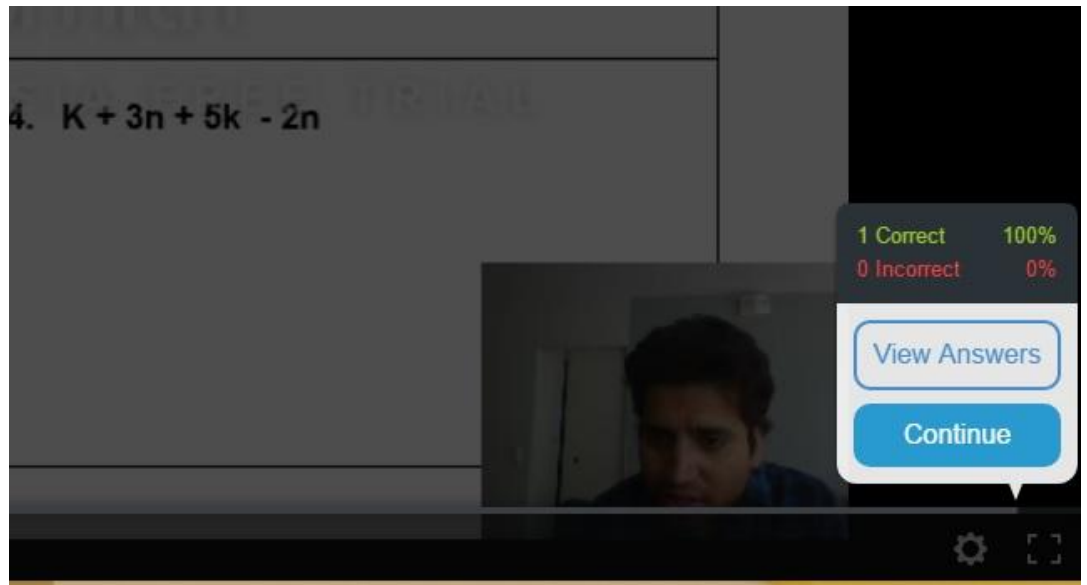
- Then the video can be exported in the mp4 format or directly uploaded in the cloud drives or YouTube.
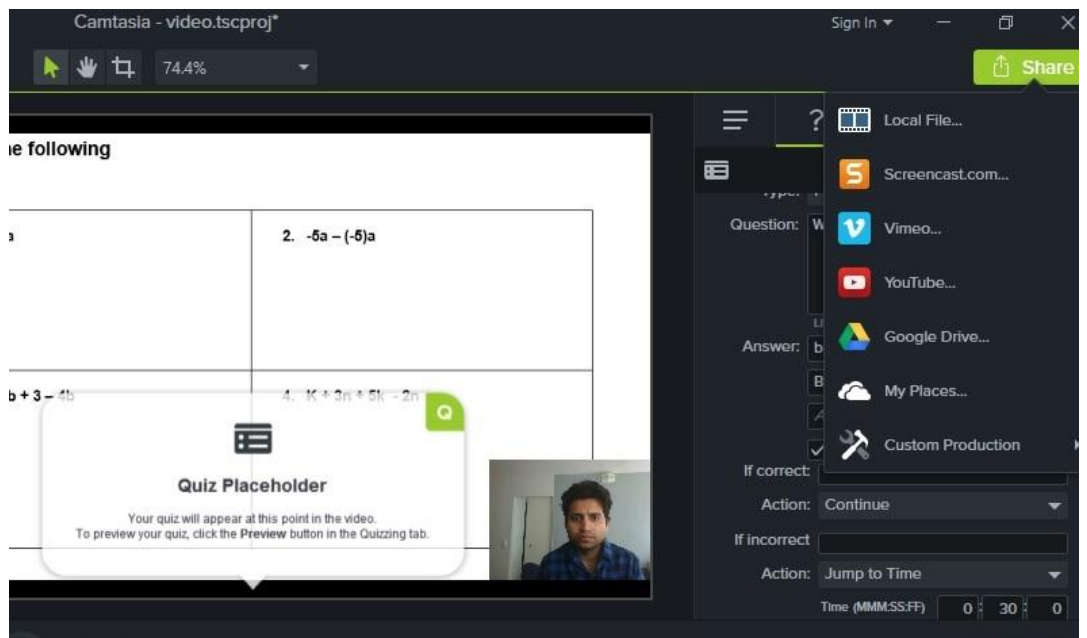
Lesson creating with TEDEd

Here's the process in creating a lesson in TEDEd.

1. Sign in to the TEDEd. Then click on Create a lesson button.

Fig 1.

2. Next step is to search a video created by the teacher or some other experts. Here I have used the video I recorded myself.
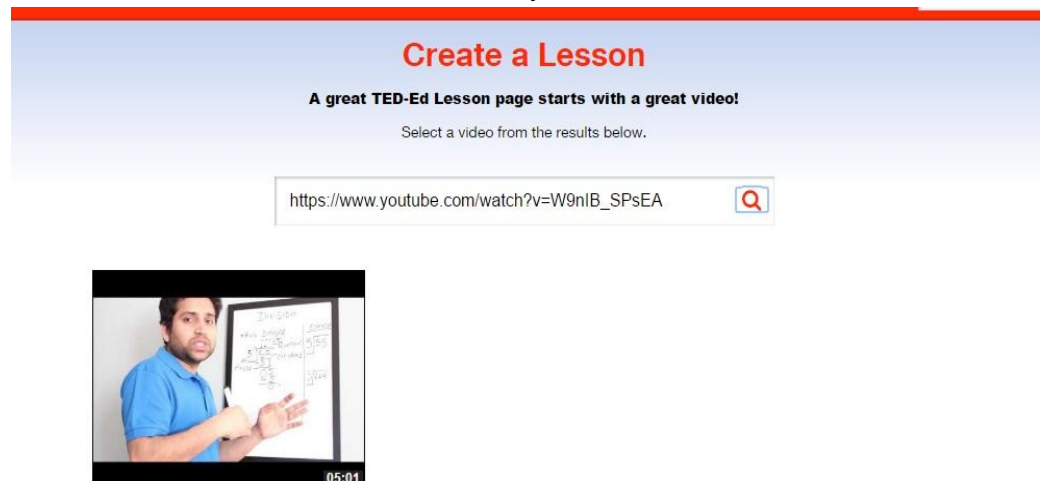
Fig 2.

3. Then click on the video you searched to start building the class.
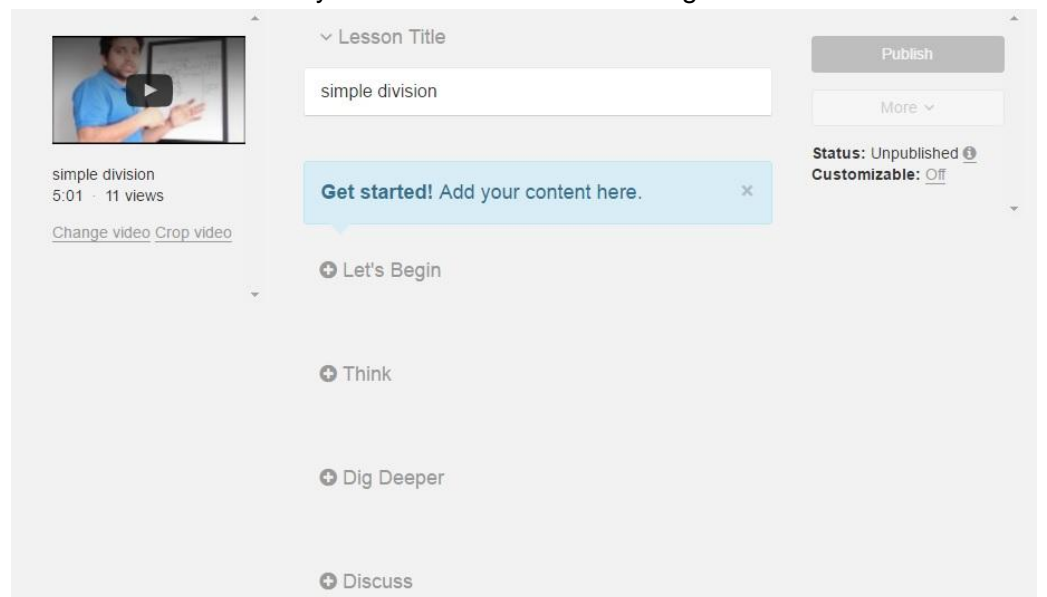
Fig 3.

4. The class can be started with an introduction by clicking on the Let's begin part in the image above. Then by clicking in Think tab quizzes and short open answer tests can be created.
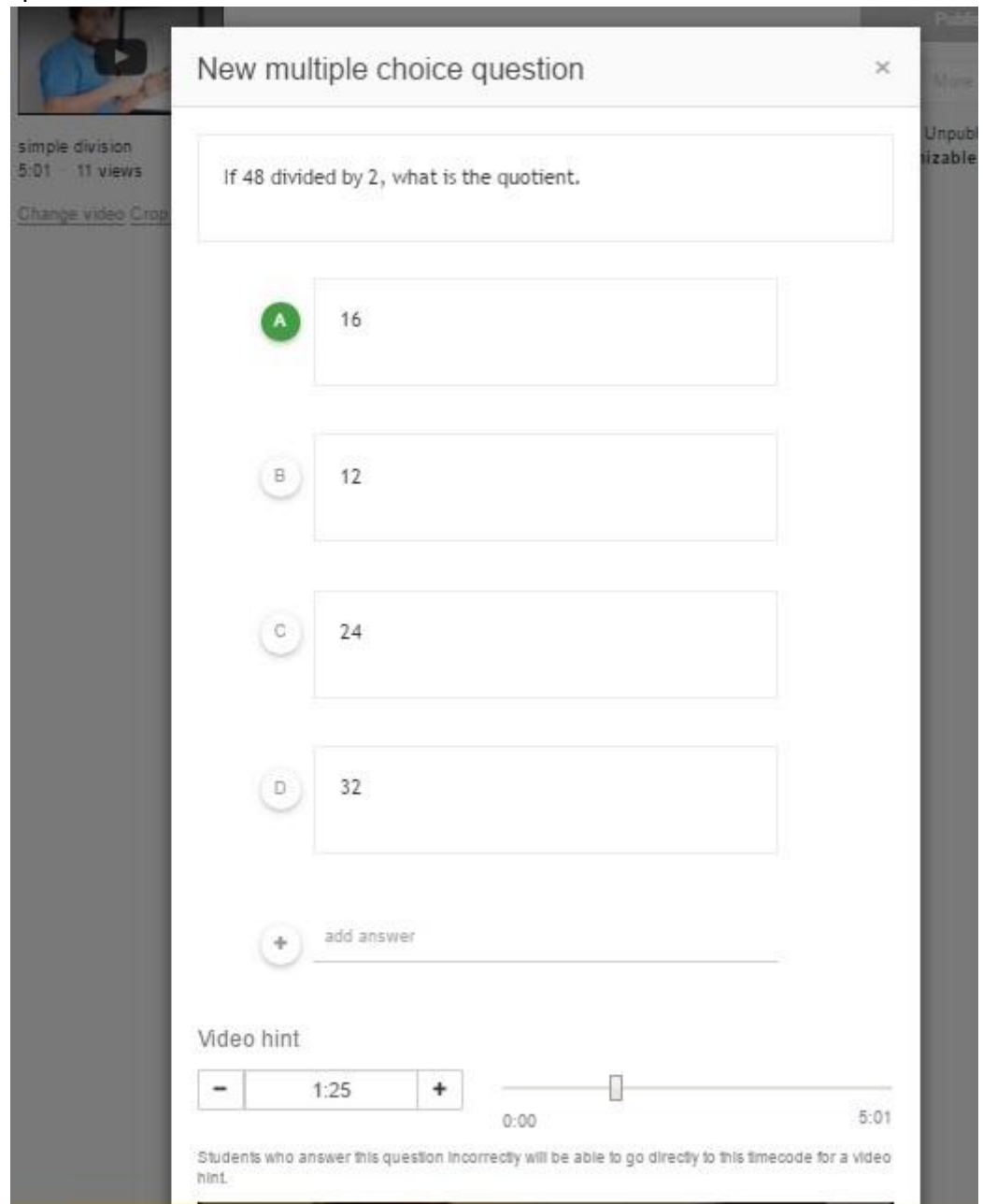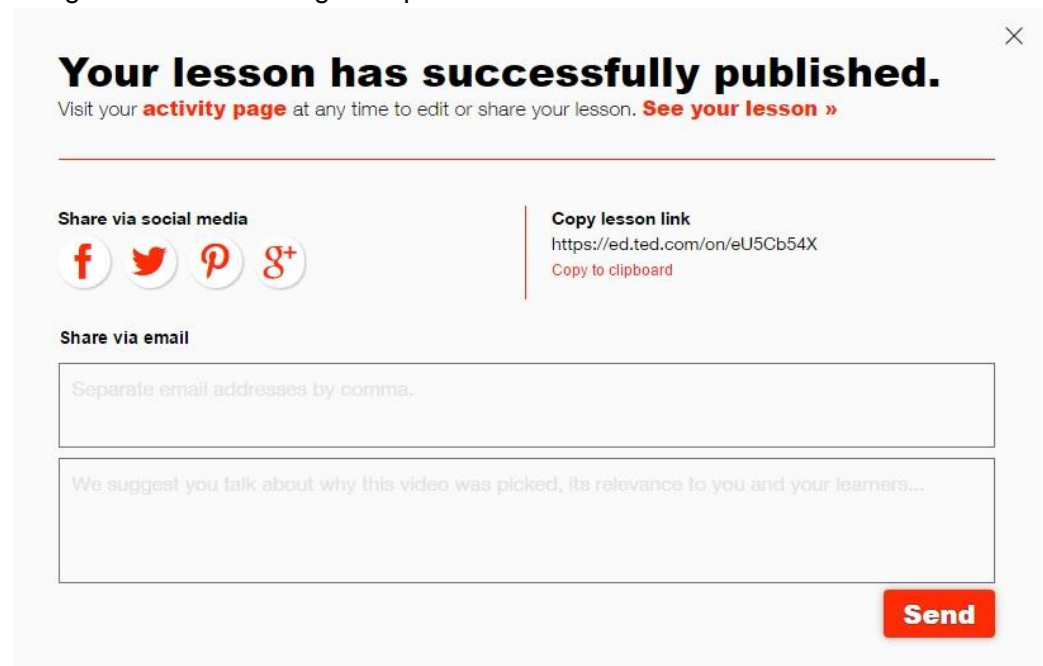
Fig 4.

The video hint can also be given by allocating the exact timer in the video. The students can go that section of the video directly and watch the video from there and do not have to go to the whole part again.

5. Likewise discussions and final summary of the topic also can be added to it.
6. After adding everything wanted, the lesson is then published and shared it with students. Sharing can be done with social sites like Facebook, Twitter, Google+ and also through the private emails.
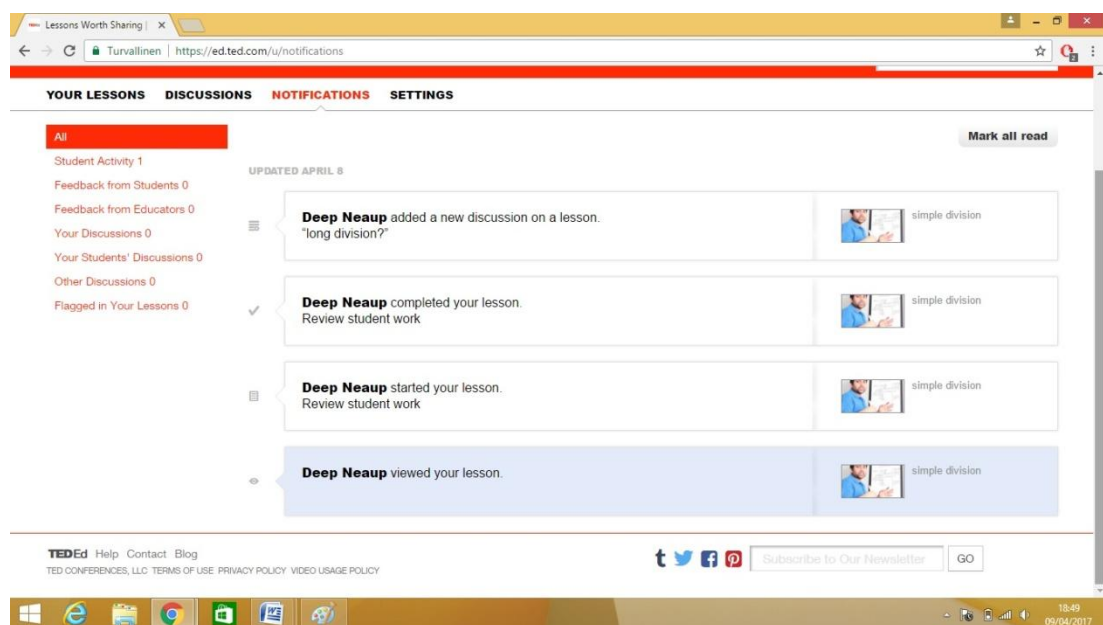
Fig 5.

Once the lesson is sent to the students they get a notification and could go through the lessons and videos. The teachers get the notification of every student who viewed the lesson. When the students do the quizzes the teachers get the notification and go through the answers and give the feedback if required.