

## Creating ACTIVE Learning in an Online Environment

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## Abstract

This evidence-based practice paper describes a method for evaluating video platforms for development of active videos for Generation-Z (Gen-Z). These students represent the majority of students in higher education courses today. They are digital natives who are efficient multi-taskers across multiple devices. Gen-Z's consistent exposure to multiple incoming channels presents new challenges and opportunities for course delivery. Gen-Z students crave various learning opportunities and often turn to outside video resources for education and entertainment. Flipped classrooms and asynchronous learning utilize recorded videos, which are often well-received by Gen-Z. However, previous studies have shown that passive learning videos with stagnant quizzes may not affect learning outcomes or change students' perception of learning [1]. Consequently, we conduct a systematic investigation of video platforms that enable *active learning* interventions with clickable content and exercises to provide real-time feedback to students during virtual *video lectures*. We investigate several platforms to measure their aptitude for offering active learning opportunities. We develop a preference matrix with four main criteria: cost, interactivity, learning management system (LMS) integration, and data analytics. We explore 53 highly ranked and popular video platforms and participate in interactive demos for the top 11 contenders. This paper highlights the pros/cons and capabilities of platforms instructors should consider when developing active learning video lectures as well as how instructors can incorporate these tools into their online video lecture development. This is not a marketing tool for a specific platform but instead a review for how to identify the appropriate tool for a specific instructor's needs. Online material development is more critical than ever as instructors at all levels of education are now creating online material due to the COVID-19 global pandemic.

## Keywords

Generation Z, Online active learning, Video development

## Introduction

Generation Z, the current cohort of college students are the first generation of true digital natives [2]. This means that they are the first generation to grow up with access to digital devices and the internet their entire lives. It makes them incredibly efficient at filtering out information on multiple devices [3]. As instructors we must continuously improve our methods of teaching to match the learning preferences of the generation. As is the case with Gen-Z they often demand personalized learning through video lectures. This has only been heightened during the global pandemic of 2020 and 2021, as instructors are developing video lectures at an extraordinary pace. The question stands are traditional videos enough for Gen-Z?

## Active Learning Framework

Videos are used as teaching tools in many aspects of a course. For example, in a flipped class, where passive learning is done at home and active learning is done in the classroom. However, videos themselves may not be enough to establish meaningful learning. The theoretical frameworks of Behaviorism [4] and Cognitivism [5] support that learning is best achieved when supplemented with an activity. Behaviorism means that when students perform a behavior such as building an online model, they learn the information based on completing the task. Cognitivism

uses more open ended and free thought activities such as group work or essays to demonstrate and achieve the learning process [6]. Both reiterate that to achieve deep learning, students must have the opportunity to control what they learn, be challenged by what they learned, and in turn this will lead to students being committed to the learning process [7-8]. When students are responsible for their own learning through written exercises, problem sets, class discussion, etc. they can achieve higher-order objectives on Bloom's taxonomy (analysis, synthesis, and evaluation) [9]. Therefore, including active exercises for students is essential to the learning process.

### **Active Video Framework**

In a flipped class environment, assigning videos to watch at home has not proven to increase learning gains. Rather implementation of active learning exercises in class following videos is the suggested underlying reason for deeper learning [10]. Therefore, the basis for this research is the theory that including active exercises in typically passive videos could lead to even higher learning gains. To create an *active video*, one needs to include and require students to think about and answer that thought through an activity. In short, the instructor introduces a question or statement which requires students to think and respond.

*Active Video:* Creating an instructor led thought during the video which requires a response from the student.

Active exercises can be brought to videos by providing “guiding questions”, which have shown to increase student performance [11]. Including iterative and repetitive memory and application tests (multiple choice questions) in videos discourages mind wandering and improves learning [12]. Embedding questions into videos can improve the amount of interaction of students as well as the time spent with the learning tools. However, incorporating questions into videos will not ensure an improvement in learning [13]. Students who engage in matching and interactive problem sets with infinite tries have more interactions with videos and have shown to score better on exams [13]. Even simply allowing students to move through the video non-linearly with purpose to review material can achieve better learning outcomes [14]. Follow-up group exercises (typical flipped class method) which encourage rigorous discussion and elicits student involvement promotes deep learning [15].

While student preference can vary between cohort and topic, students often prefer interactive videos to help reduce attention wandering and provide feedback to students on what they learned [1,16]. Generation Z not only prefers interactive videos but expects high quality videos as well. For example, students report that videos need to have smooth transitions, and include problems solved for immediate feedback [17]. Active videos today can easily include embedded questions, hotspots, branching, and data analytics [18], which we discuss in the “Active Video Content” section.

#### *A note from the authors:*

Most instructors are trained in specific fields but rarely are content creators, too. The authors of this paper believe it starts with taking time to identify the right platform for your work. This paper will review the process for identifying active exercises and appropriate platforms. This paper is not sponsored by any specific platform, and the authors are not recommending any specific platform for use. Rather, we describe a process to evaluate platforms and how instructors can

incorporate active learning into video lectures where the key to a successful flipped class is activity and not passivity by the students [17].

### **Traditional Video Content**

In a traditional video, students typically have options to pause, rewind, fast-forward, restart, speed-up, or slow down the video. With accessibility to tools like screen recording in Microsoft PowerPoint, traditional videos have become prevalent in even the most traditional higher education courses [19].

*Traditional Video:* Students watch and engage with the material on their own accord.

From a student's perspective, traditional videos are:

1. Accessible – speed-up, slow down, pause, rewind, or fast-forward
2. Convenient – watch anytime anywhere
3. Passive – low effort to watch video
4. No feedback – students can have misguided confidence of learning the material

From an instructor's perspective, traditional videos are:

1. Accessible – easy to post for students to review
2. Convenient – record and edit in office
3. Passive – instructors are unaware if students are engaging with the material
4. No Feedback – instructors are reactive to students' level of understanding based on performance in a follow up assignments

### **Active Video Content**

To address the concerns of traditional videos, the literature suggests including activities during the video to keep students engaged throughout the video [11, 12, 13, 14, 15]. Programming feedback into the video allows students to measure their understanding and instructors to track student participation and learning gains. An interactive video is characterized by having many different functionalities. The most common features are hotspots, branching, quizzes, camera switching, e-commerce functionality, 360-degree experience, slider views, and more. However, in an educational setting, the most important features identified for this work are hotspots, branching, and quizzes as defined in Figure 1.

**Hotspots:** Hotspots within a video refer to trackable content. These hotspots appear as a clickable “dot” in the progression bar or an object within the video frame itself. For example, students click on an image and it offers additional content related to the topic. Hotspots can also be located in the progression bar to mark an activity or specific information in the video. Hotspots can link to other files or videos, link to a different place within the same video, show a new image, or pause for an activity.

**Branching:** Branching is the ability to accept a viewer response/input and redirect them to a different point based on the viewer response. Therefore, viewers move non-linearly throughout the video based on their responses (forward or backwards). Branching is also referred to as “jumping”. For example, this includes presenting a question to the student during the video and if answered incorrectly, the student's progress “jumps” to a review of material related to the missed question. Branching can also refer to a single video having multiple endings. For example, a

student may be presented with different scenarios and the video diverges to a specific scenario based on the student’s selection.

**Quizzes:** Quiz functionality enables embedding questions into lecture videos to gauge the viewer’s understanding of the content being covered. An ideal platform will offer quiz functionality that supports various quiz question formats, such as multiple-choice, free response, true/false, check box, matching, etc. and records the student’s score for immediate feedback to students and grading for instructors.

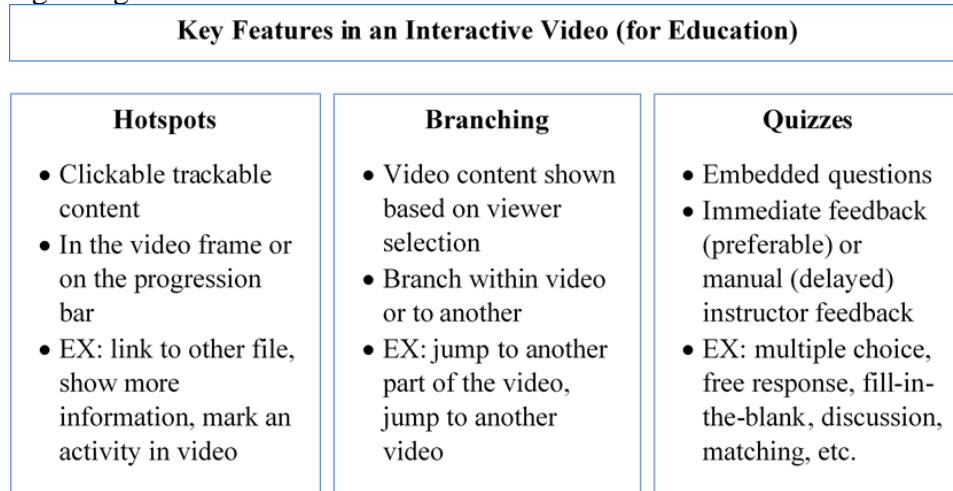


Figure 1: Top platform features for creating active videos.

### Active Video Platform Assessment

The team created a rubric to evaluate platforms on cost, interactivity, learning management system (LMS) integration, and data analytic capabilities as shown in Table 1. Each category was ranked on a scale from 0 – 3 where 0 is the least beneficial and 3 is the most beneficial to the specific needs of the course.

**Cost:** If the cost is greater than \$6,000 a year, it scored 0 points. If the cost was between \$1,000 and \$6,000 it was given 1 point. Anything less than \$1,000 was given 2 points and any free platforms received 3 points.

**Interactivity:** The team divided the interactivity category into the three separate functions; hotspots, branching, and quizzes since these were identified as most important for developing active lecture videos. The platform received a binary score (0 or 1) for each interactive feature, leading to an overall interactivity score between 0-3.

**LMS integration:** Since this platform will be used in an educational setting, it is important to have LMS integration so instructors can easily integrate active videos, provide immediate feedback to the students. Integration allows for seamless video streaming and automatic grade integration for video-embedded quizzes/activities. The authors of this paper use Canvas as the primary e-learning management software. The platform was given 3 points if it integrated with many platforms, 1 point if it only integrated with Canvas, and a 0 if it had no integration. Our research found that platforms without integration would require lectures to be uploaded to Canvas as SCORM packages and in most cases would not automate analytics into Canvas.

**Data Analytic Capabilities:** Automated data analytics allows both instructors and students to evaluate performance (grades) and observe trends overtime. For example, how long do students spend on in video interactions or observe specific topics students are continuously requiring many

attempts to get correct. The platform was given 3 points if it had thorough data analytics capabilities, 1 point if it had some and 0 if it had none.

**Bonus Category:** Additionally, a bonus category was created to reward points to platforms that offered additional features outside of the requirements identified. An example of such a feature is the ability for students to specifically mark points in their video that were confusing. The teacher would receive these marks and could then go back to cover those confusing topics in greater detail.

Platform Features	Ranking System
Cost (per year)	0 - \$6,000(+)
	1 - \$1,001 - \$6,000
	2 - \$1 - \$1,000
	3 - Free
Interactivity	0(no) - 1 - Hotspots
	0(no) - 1 - Branching
	0(no) - 1 - Quizzes
LMS Integration	0 - No integration
	1 - only Canvas
	3 - multiple platforms
Data Analytics	0 - No data analytics
	1 - Some data analytics
	3 - Full data analytics
Bonus	0 - None
	1 - per "bonus" feature

Table 1: Active video capability rank scale.

### Analysis

The team evaluated 53 platforms during a 5-week period in Spring 2020. A platform was considered as a "top contender" if it scored at least 7 points out of a possible 14 in the scoring rubric in Table 2. Initial platform scoring was completed through an investigation of the platform's website and available information. The 53 platforms were divided among three team members who did a preliminary scoring assessment. The platforms strengths, weaknesses, and features were then discussed among the three team members and a consensus score was agreed upon. The team participated in demonstrations of the top contenders with a platform representative to guide us through the features the platform offered. The team also analyzed how those features would help achieve the initial goals for creating interactive lecture videos, such as branching capabilities, data analytics, and LMS integration. These demos were performed via video conferences and recorded to a shared location for other team members to watch and review later. Following the demos, the team discussed pros and cons about each platform, what beneficial features the platform offered, the platform's ease of use, and how well it stood up against other top contenders. In some cases, if the demo meeting led to new information being revealed about the platform, necessary changes were made in the rubric scoring of the platform. For example, some of the cost structures were different for academic units or some platforms were developed for marketing or specialized training videos, thus not fitting the needs of instructors.

Video Platform	Cost	Interactivity			LMS Integration	Data Analytics	Bonus	Total	Notes
		Branching	Hotspots	Quizzes					
PlayPosit	1	1	1	1	3	3	0	10	
Panopto	2	0	0	1	3	3	1*	10	Discussions in the video
HapYak	1	1	1	1	3	3	0	10	
Cinema8	1	1	1	1	1	3	1*	9	*Simulation
Edpuzzle	2	0	0	1	3	3	0	9	
VideoTier	2	1	1	1	0	3	0	8	In development
Vidzor	3	0	1	1	0	3	0	8	
Youtube	3	1	1	0	0	3	0	8	Branching opens new links
Viddler	1	0	0	1	3	3	0	8	
Koantic	2	1	0	1	0	3	1*	8	*Clickable through in video
Exaltive	3	1	1	0	0	3	0	8	
Engajer	2.5*	1	0	1	0	3	0	7.5	*Cheaper option with less features
H5P	3	0	0	1	3	0	0	7	
Dot	1	1	0	1	1	3	0	7	

Table 2: Top 14 platforms assessed.

After finalizing the initial ranking cycle, we examined the updated rankings and continued with a more in-depth comparison between our top 6 finalists. Of the six platforms, three were ruled out due to lack of required interactivity features and other functionalities discovered through platform demos, usage trials, and Q&A sessions with the platform's sales representatives. We will refer to the three used in the final evaluation as Platform 1, Platform 2, and Platform 3. All three of these do have the necessary interactivity capabilities to create active learning videos.

Platform 1 was specifically created for education and can-do progression bar hotspots, branching (in-video), and multiple quiz formats. However, Platform 1's use and campus integration is structured for entire departments/institutions, and is only able to offer a cost estimate for the entire department, rather than on a course-by-course basis. The department proposal was too expensive to justify for piloting for one class. After explaining this to Platform 1's team, they were able to offer a pilot run which was more affordable, but still out of our budget, and so we removed Platform 1 from our list of options.

Platform 2 offered powerful and widespread functionalities and included significant support provided by Platform 2 that would make integration and training for instructors easier. Platform 2 provided a free trial to experiment with the user interface and features. Platform 2 required SCORM usage for Canvas integration, which would require additional training and back end work for instructors to automate data collection and reporting.

Lastly, Platform 3 was still in its developmental stage when demonstrated, however, the price was better than Platforms 2 and 3. Furthermore, the sales team was very helpful and offered the opportunity to work together to create features that were not currently offered. This could have resulted in a customizable experience for the specific use cases of the instructors. However, this opportunity was not within the scope of the instructor's research. Furthermore, Platform 3 did not yet have features allowing LMS integration.

Platform 1 was more suited to the needs identified by the instructors, as it was created for education, but eventually was ruled out due to the high price point. The team was moving forward with Platform 2 despite the need to learn and integrate SCORM packages into Canvas. However, just before financially committing to Platform 2, the instructors institution partnered with Platform 1 to provide instructors with new tools for teaching. Due to the partnership, Platform 1 was free to use and was chosen for the pilot study.

## **Conclusion**

There are a multitude of video recording and editing platforms with features to make active videos. However, the first step in identifying the right platform is to first identify the features necessary to create videos with active content for specific instruction. The features assessed for this work were cost, interactivity (hotspot, branching, quizzes), LMS integration, data analytics and bonus features. Creating a ranking scale allowed for multiple people to research each platform and provide a non-biased comparison. Using the priority matrix for evaluation created opportunity for two undergraduate students to participate in the research, demos, and creating reports for each platform.

Selection criteria may change between instructors as some may need or want specific features not included in this priority matrix. The authors conducted several pilot semesters using Media Site to record and edit traditional videos. This platform does allow for multiple choice questions embedded in the videos. However, the authors found no evidence of correlation for passive end of video quizzes, [1]. These findings sparked the need to research how to create active exercises throughout the video to retain student engagement and increase learning gains. After completing the analysis of 53 platforms the top 6 were PlayPosit, Panopto, HapYak, Cinema8, EdPuzzle, and VideoTier. Most platforms are receptive to instructor inquiry and will provide demonstrations and



working sessions. However, the instructor must have a clear and specific idea of the required features of a platform, as it is easy to get distracted by the “Bonus” features.

The team chose to use PlayPosit for the pilot study of Fall 2020. We do recognize that if the university ever discontinues this license, we will need to complete a new analysis of active-learning video development software and re-evaluate the platforms used to make active lecture videos. Although the authors are not promoting or discounting any specific platform, we recognize that PlayPosit has been an almost seamless transition to active videos. We have included exercises such as multiple choice, discussion, free response, pauses, file download, check your work, and more. This platform allows for seamless integration of existing recorded videos with the addition of active exercises built in the platform.

This assessment was completed in Spring 2020. However, platforms change overtime with new features being added. Therefore, modern assessments should be made for individual instructor use. For example, in 2019 PlayPosit added one of our favorite features that allows instructors to view the video in “learner mode”. For instructors interested in incorporating active exercises into lecture videos:

1. Familiarize yourself with the terminology used in video platforms (such as branching, jumping, hotspot, etc.)
2. Evaluate each feature for its necessity to the material you are teaching and determine the required features.
3. Assess the top platforms that fit your criteria in an analytical non-bias manner, ex. priority matrix.
4. Investigate the “top” contenders through individual demonstrations and meetings with platform representatives. (Note: most platforms are very interested in meeting with instructors who are considering their product.)
5. Contact people within your institution about platform availability. This removes the barrier to entry for an individual instructor. (Note: you will most likely need to reach beyond your department/college for access to some resources.)

Although instructors are not “content creators”, if we want to ensure the highest learning gains for students, it is imperative that video development keep up with the Generation. Developing videos for Gen-Z preferences can maintain engagement and interaction with the material and with the addition of active exercises increase student interaction and possible learning gains.

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