An Analysis of Video Lecture in MOOC

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Abstract. Video is a content delivery form used for delivering lecture content in Massive Open Online Course (MOOC). While institutions plan to launch MOOC on their own platform or adapt an existing one, there is a need to specify the features required for video lecture in MOOC. In this paper, we present a checklist of features for video lecture incorporated in MOOC from the learner's perspective. The use case based approach has been followed for identifying the features of video lecture in MOOC. The checklist helps during requirement specification of video in MOOC as the provider select the desired features from the checklist.

Keywords. Video Lecture, Video Analysis, MOOC, Online Education, Feature Checklist

KeyTerms. ICT Component, Characteristic, Academia, Environment, Management

1 Introduction

Online learning uses technology and electronic media for delivering and receiving courses. It is considered as most promising development in education that provides education with technology. With technology globalization, the concept and methodology of learning, and teaching has undergone a change. The technology usage in education provides global learning environment that allows accessing the course material anytime, anywhere, connect other students, and get access to the content without considering any geographical boundary. The significant changes in technology usage in online education has seen emergence of MOOC in 2008. It is a popular way to offer online courses globally by the universities and education providers.

MOOC uses web-based tools and environments to deliver education [1]. It provides online courses aimed at unlimited participation and open access via the web [2]. It is being used across the globe for offering online courses. Some of the popular MOOC providers are - Coursera[1], edX[2] and Udacity[3] in United States, FutureLearn[4] in

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[1] https://www.coursera.org

[2] https://www.edx.org/

[3] www.udacity.com

[4] www.futurelearn.com

United Kingdom, iversity[5] in Germany, FUN[6] in France and MiríadaX[7] in Spain [3]. The course lectures in MOOC are delivered in different formats, like, text books, lecture slides, academic papers, tutorial notes, video lectures, blog posts, article links, quizzes and assignments.

In MOOC, video is a primary delivery mechanism to publish the recorded lecture content. It consists of audio (voice of instructor), visual (video of lecture) and text (caption/transcript/subtitles) in one package. The study of edX [4, 5] analyzed that students spend most of their time on video lectures. With the increasing popularity of the video lecture, MOOC providers are continuously improving video lecture content delivery as well as its production.

A video lecture in MOOC is a combination of several elements like, lecture by the teacher, quiz, and lecture slides. For viewing the video lecture, MOOC provides an interface to the student. The video interface has several controls, using which the student can perform settings for the view of the video lecture. The content in video lecture is delivered in different types and formats. The accessing of the content is possible with video lecture options.

For offering MOOC, interested institutions have an option to go for self-hosted platforms or use proprietary platform. When using self-hosted platform, the providers have a choice to 1) develop their own MOOC platform, or 2) use open source platform. Generally, the open source platform is a preferred choice, which may require modification and customization as per the user needs. When developing a new MOOC platform, there is a need to specify the features that has to be provided to the video lectures presented here. Although video lecture are being delivered by MOOC providers, there is no mention of its feature specifications.

In this paper, we focus on creation of the requirement checklist for the video in MOOC. It helps during the development, in selecting and specifying the requirements for video lecture to be included in MOOC.

Here, we present the feature requirement of video lecture that facilitates selecting requirements for functionalities of video in MOOC. The functionality of MOOC video is classified in two components, namely, 1) *Video Interface*, and 2) *Video Lecture Content*. It aids the MOOC platform developer during requirement specification phase. The features required for MOOC video can be selected from checklist.

For formulating the feature checklist of video lecture in MOOC, a study of MOOC platforms was conducted. We chose popular MOOC providers that provide different functionalities for delivered video lecture. We studied Coursera, edX, and Udacity. "Coursera is by far the largest MOOC provider" [6] reported by Class Central. The most popular MOOC providers as reports by [7] [8] [9] are Coursera, edX, and Udacity. Since these are using different platforms, covers diversity in terms of functionalities provided and mechanism used to deliver video content, our analysis can be applied to any video lecture in a MOOC.

The video feature requirement presented has been used to a few open source platforms to identify the functionality provided by them. The checklist of feature has been applied for the functionality visible to student.

In this paper, Section 2 is a survey of related work. Section 3 provides an overview of the video lectures in MOOC. Section 4 explains the methodology used for our study. Section 5 discusses the controls of video interface. Section 6 explains the video lecture

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[5] https://iversity.org/

[6] https://www.france-universite-numerique-mooc.fr/

[7] https://www.miriadax.net/

content. Section 7 describes the analysis of video lecture feature in detail. Section 8 illustrates some examples on which our analyzed features have been applied. Section 9 lists the benefits. Section 10 enumerates the limitation. Section 11 states the conclusion.

2   Related Work

For video in MOOC, much work has been done related to understanding student behavior. In [4] [10] [11] [12] [13], student behavior is studied in quantitative way. The analysis using edX [4] and Coursera course [10] focus on student engagement using action time of students. Student engagement studies using different methods, for example, using clickstream metrics [11], navigation study [12] and use of framework [13]. The qualitative findings of clickstream are combined with cognitive science [11] and student's goals [10]. These studies have not focused on video lecture particularly.

Some authors [14] [15] [16] focuses on different aspects of videos, like, the video interface, its features and properties. Guo et al. [14] studies the student behavioral on edX platform using different properties of videos like, length, speaking rate, video type, and production type. Guidelines for the video lecture are presented by Chorianopoulos et al. [15] with the focus on video style, editing, sharing, controlling and analytics. In [16] Kim et al. define design implication guidelines for video interfaces based on the student engagement, like, providing shorter videos and navigation links.

Ortega et al. [17] perform a study based on different ECO MOOC platforms OpenMOOC, Open EdX, iMOOC etc. and external MOOC platforms - Coursera, Udacity, MiriadaX, OpenCourseWare-MIT, Futurelearn, and iversity. Their focus is to study "accessibility" of MOOC platform including the video lecture. The recommendations are about subtitles (vocal or non-vocal sounds), secondary screen integration, downloadable text, possibility of text reader processing, interface navigation by keyboard. However, this study is based on the published literature only and does not cover the different aspects of video lecture.

3   Video Lectures in MOOC

Video lectures are the pre-recorded learning material that acts as a medium of communication between the student and lecture. In MOOC, the video lectures are primarily used to deliver lecture content. MOOC video lectures are considered as central to the student learning experience [14]. The courses are structured as list of video lectures consisting of activities and contents, like, walkthroughs, assessment problems, quizzes etc. Students need to watch the video lectures of the courses for learning. Video provides self-regulated and independent learning. It has transformed the traditional classrooms by replacing "one-size-fits-all" approach with self-paced learning, and from curriculum/teacher centric to student centric learning.

Video in MOOC provides an interface to the students for managing the delivered lecture. The interface provides different kinds of controls to the students. These controls help to, navigate and view the content by play, pause, stop, increase/decrease speed, volume and toggling to full screen mode etc. It also allows the student to

download the video in different formats and view it offline. The video lectures may also be made available to students who are not enrolled in the course, via YouTube[8] and other video sharing websites.

The video lecture content is the lecture delivered by the teacher which may contain caption and in-video activity like, quiz. The lecture material provided with a video lecture may be presentation slides, transcript of video, related document etc. The lecture material is provided in different formats. According to Clark and Mayer [18], the transcript helps in understanding the complex domain-specific video lecture content. Sometimes the text content of video is presented in different languages. Different MOOC providers use different types of video presentation styles, lecture material, video interfaces and activities for the video lecture.

4   Methodology

MOOC providers use diverse mechanisms to deliver their video lecture. Videos are different in terms of the available features, delivered content and formats and interface used to display the lecture video. The features not only vary with the provider but even with change in MOOC with the same provider. We gathered the information about video by viewing the video lectures by different MOOC providers.

For our study, we selected three most popular MOOC providers - Coursera, edX and Udacity. For our sample data set, we identified courses provided by various universities in different areas, for diversity. The courses provided by universities, like, Stanford, Duke and Harvard; in subjects like, medical chemistry, biology and computer science, were selected. We watched more than two thousand videos across the three different providers and manually analyzed them. Our sample set includes videos of short and long duration, interactive and non-interactive with different presentation styles. Table 1 shows MOOC providers, courses offered, university offering the course and number of videos viewed, from the selected sample.

Our experience and observation while watching the video lecture act as the baseline for the extraction of features and their segregation into different categories.

The long duration videos are time consuming to watch. So it is required to skip some portions of video but not to miss any important feature. For this reason, the frame of the video must be seen at any instant of time to check the relevance of that frame. This kind of provision is provided by the feature named as *Poster Frame*. But it is not provided by all platforms. As a result, the video need to be watched either by simply *play* or by fast forwarding the video using *speed +*. During playing a video lecture in edX, it showed an error once. Since edX provides *help support* we reported the problem and got it resolved. The reason behind this kind of problem is, at times the video player is not supported by the all browser. Therefore, we may need to change the player which is possible using *change player* feature as provided by Coursera. The language barrier is also a problem noticed in a few courses. According to nationality of different instructors, accent and vocalization of the lecture instruction varies. So the availability of *caption* on the video interface panel is very helpful for better understanding of the content. Also, the caption provides *multilingual support*.

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8 www.youtube.com

Table 1. Video selection for our study.

MOOC Providers	Course	University	Video Watched
Coursera	Compilers	Stanford University	96
	Machine Learning	Stanford University	113
	Introduction to Mathematical Thinking	Stanford University	76
	Child Nutrition and Cooking 2.0	Stanford University	46
	Medical Neuroscience	Duke University	199
	Cryptography I	Stanford University	66
edX	Introduction to Computer science	Harvard University	200
	United States Health Policy	Harvard University	119
	Data Analysis For Genomics	Harvard University	141
	The Chemistry of Life	KyotoUx	120
	Biomedical Imaging	Udx	51
Udacity	Artificial Intelligence In Robotics	Georgia Tech	208
	Exploratory Data Analysis	Facebook	180
	Intro to Computer Science	Univ. of Virginia	312
	Mobile Web Development	Google	176

The availability of *downloading* feature which is provided for offline learning support makes it possible to watch the lecture without dependency on the network connection. Accessibility of *different quality of the video* lecture and *High Definition* (*HD*) *support* allowed us to watch the video on larger screen with better quality. After watching the video, attempting the quiz and assignment of the course, the student may require to track the progress, like, how many quizzes are there in a lecture, how many them have not been visited yet. But for doing so, the student needs to go back to the lecture and check each lecture separately. The options available are also not easily navigable. Currently the *progress bar* feature is not being provided even by several popular providers like, Coursera. One of the new features noticed in this analysis process is *embedded quiz*. It allows attempting the quiz while watching the video lecture and interacts with the video interface. It helps to check grasping of the learner from the watched video lecture. This experience helped to identify and categorize the features that were analyzed during the video watching sessions.

We analyzed video lecture by the sample data set from perspective of student. It helps to categorize the video lecture into different component and to segregate the features provided by them.

5   Video Interface

MOOC provides video interface to the student for viewing the lecture videos. The interface has several controls that allow students to make settings for the display of the video lecture. We categorize the controls on the video interface into four categories – (1) Display time, (2) View setting, (3) Advance setting, and (4) Help support.

1) *Display time* shows the current time during video watching and total duration of the video.
2) *View setting* is related to playing the video, like, play/pause, change volume or speed of video. By default, the video is displayed in normal mode which can be toggle to full screen mode. View settings allow the student to control the setting for play (►), pause (▪▪), speed (+/-), volume (+/-), full screen mode (⬛), navigate to previous/next videos (◉,◉) etc. It also allows setting for rewind and replay (◎) video.
3) *Advance setting* include are additional controls provided on the video interface. It allows the student to switch to *HD* mode to watch video lecture with better quality. The *poster frame*s of the video on time bar seen at any time without playing it are part of advance setting. The settings also provide multiple *video player* facility which allows changing the player. The video text is provided in different languages that can be chosen from the *caption option*. The format of the caption can also be changed like, font and background color, opacity of window. The controls for advance setting may or may not be provided in all video interfaces.
4) *Help Support* allows reporting of problem faced during the watching of video lecture. *Discussion forums* are provided for problem reporting. Help for shortcut keys allow interface navigation using the keyboard.
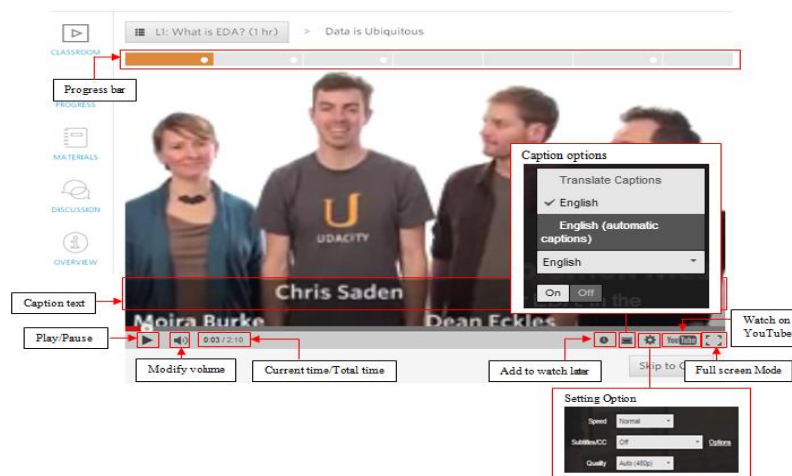

Fig. 1. Video interface controls for video lecture in Udacity.

Different MOOC providers provide different kinds of controls on their video interface. Display setting and view settings are among the common controls provided on video interface. Fig. 1 shows different controls available in the video interface of a video lecture in Udacity - progress bar, caption text, play/pause, volume slider, current time/total time of video, full screen mode, add to watch later, watch on YouTube, caption on/off and language selection, and setting for selecting speed, video quality, and subtitle options.

6   Video Lecture Content

The video lecture content is the lecture delivered by the teacher which may contain caption and in-video activity like, quiz. The support material provided with a video lecture may be presentation slides, transcript of video, related document etc. The support material of the lecture is provided in different formats. The transcript helps in understanding as it provides text of the instruction given by video lecture instructor. Sometimes the text content of video is presented in different languages. Different MOOC providers use different types of video presentation styles, support material, video interfaces and activities for the video lecture.

The lecture content of the video has some activities embedded in it for better explanation and interaction with the students. The video lectures also have accompanying material that helps in better understanding of the lecture. We categorize the content of video lecture into two parts- 1) Lecture Material and 2) Embedded Quiz.

1) *Lecture Material-* The video lecture content is provided in the form of slides, video of the lecture, transcript of the video etc. The content is available in different formats, for example, *mp3/mp4, ppt* and *pdf*. The lecture material can be downloaded to support offline learning which may also be available in different qualities.

2) *Embedded Quiz* is the in-video activity that is incorporated to make video lecture session more interactive. Students can attempt the quiz while watching the video lecture. The quiz has several options and parameters, like, question type that may be Multiple Choice Question (MCQ), true-false or descriptive.

Different types of video lecture content are delivered by the MOOC providers which have diverse features and controls.

7   Video Lecture Feature Checklist

The features provided by each MOOC platform vary. Therefore to understand the features of the video lecture in MOOC, the analysis has been performed on video lecture of three popular MOOC providers - *Coursera*, *edX* and *Udacity*. In our study the main focus is to identify the features of the video lecture in MOOC. The video lecture in MOOC consists of two components - *Video interface* and *Video Lecture Content*. We arrive at the detailed feature checklist by identifying the features provided by each component of video lecture. We analyzed the features for video lecture components including their *presentation style*.

Video Interface provides controls to the student for viewing the video lecture in MOOC. The features provided by video interface are mainly controls that provide control of the interface to a student. A video lecture also provided different types of content to their student. *Video lecture content* provided several options for accessing the lecture material. The categorization of video interface and video lecture content helps to segregate the provided controls, features and presentation style, from student's perspective.

For arriving at the feature checklist, the features provided by the component and control identified in previous sections are applied on the chosen MOOC providers of our study. From our analysis we find some of the features are provided by each of the MOOC providers, like, current/total time, play/pause, and video mp4 format support. It suggest that these are the basic features need to be made available for student. The inclusion of some feature provides better functioning but does not affect the basic functioning of the video lecture. For example, availability of HD support, multiple languages for caption, availability of different quality video named as optional or advance features etc. These are named as optional or advanced features.

The different levels of availability of feature or control from student's perspective, are classified into three catagories-

- *Basic* – are the most important features that are available in all platforms. It is denoted by weight '3'.
- *Optional* – are the features that are not necessary but may be helpful. The feature supported by any of the two platforms is an optional feature. It is denoted by weight '2'.
- *Advanced* – are the features that are required for specific purpose. Feature available only by single platform is an advanced feature. It is denoted by weight '1'.

On the basis of availibility of a feature, weights are assighned to each identified feature. The weighted feature checklist of features helps to select the features and options that need to be made available to a student in video lecture of MOOC. Table 2 lists the weighted feature checklist of video lecture in MOOC. Each feature is presented in different way by the MOOC providers.

The *Video Interface* and its options are provided in diverse styles. It is displayed either as a separate pop-up window or incorporated in the lecture page. Each provider use different presentation style for *viewing controls*, like, video speed is displayed in terms of range of pixels from .50x to 2.0x. Navigation of the video lecture is control using previous/next control, selecting from the video lecture list or from the progress bar that displays the video lectures. An advance setting control, to change format of the caption allow changing font (family, color, size), background (color, opacity), window (color, opacity), character (edge, style) and text opacity. Help support controls are provided as help, discussion forum, mail etc.

Video lecture Content is presented in different presentation styles. The activities are displayed in the progress bar. For example, color variation is used to differentiate, in-video activity inclusion, visited, playing video etc. Embedded quiz in the video are incorporated at different places either in between or at the end of video. Quiz further has various parameters that need to be considered. The quizzes differ in types, options available, question types etc. For example, quiz may be graded or non-graded; different controls in quiz; type of questions in quiz - MCQ, descriptive and true/false; correct answer response for the attempted question, and many more. The presentation style of the video interface and video lecture content are summarized in Table 3.

Table 2. The weighted feature checklist of video lecture of some MOOC providers.

Feature	Control		Coursera	edX	Udacity	Weight
Video Interface	Display Time	Cuirrent Time	✓	✓	✓	3
		Total time	✓	✓	✓	3
	View Setting	Play/Pause	✓	✓	✓	3
		Volume Slider	✓	✓	✓	3
		Full screen mode	✓	✓	✓	3
		Modify Speed	✓	✓	✓	3
		Caption On/Off	✓	✓	✓	3
		Navigation	✓	✓	✓	3
	Advance Setting	HD support	X	✓	✓	2
		Poster Frame	X	X	✓	1
		Change video player	✓	X	X	1
		Caption multilingual support	✓	X	✓	2
		Change Caption format	X	X	✓	1
	Help Support	Report problem	✓	✓	✓	3
		Go to Discussion Forum	✓	✓	✓	3
		Keyboard Shortcut Help	✓	X	X	1
Video Lecture Content	Lecture Material	Download — Transcript — Srt	✓	✓	✓	3
		Pdf	X	X	✓	1
		Text	✓	✓	X	2
		Slides — Ppt	✓	X	X	1
		pdf	✓	✓	X	2
		Video (mp3/mp4)	✓	✓	✓	3
		Video quality	X	✓	✓	2
		Progress bar	X	X	✓	1
	Embedded Quiz	Availability	✓	X	✓	1
		Grading	✓	–	✓	2
		Control — Submit	✓	–	✓	2
		Skip	✓	–	X	1
		Continue	✓	–	✓	2
		Re-watch Instr.	X	–	✓	1
		Type — MCQ	✓	–	X	1
		Descriptive	X	–	✓	1
		Display Response	✓	–	✓	2
		Allowed attempts >1	✓	–	X	1
		Show Quiz presence	✓	–	X	1

Table 3. Presentation style of video lecture of some MOOC providers.

	Feature	Option	Coursera	edX	Udacity
Video Interface	View Setting	Speed Navigation	.75x-2.0x Prev./Next	.50x-2.0x List	.25x-2.0x Prev./Next, Prog. Bar
	Advance Setting	Player Option	Flash, Html5	−	−
		Caption Lang. (#)	9	1	More than 60
		Caption Format	−	−	Font, Window, Background
	Help Support	Report problem	Help	Discussion Forum	Discussion Forum
		Discussion Link on	Video Interface	Lecture Page	Lecture page
	Lecture Material	Progress	−	−	Progress Bar
Video Lecture Content	Quiz	Display Response	Cor./Incor	−	No
		Correct Answer	Attempt> max	−	In Transcript
		Attempt Allowed	3	−	1
		Show Quiz presence	Color	−	No
		Location	Anywhere	−	At end

8 Case Study

The features of the MOOC video has been applied to three open source MOOC platforms. *Sakai*[9], *Open edX*[10], *CourseBuilder*[11] are MOOC platforms of Sakai foundation, edX and Google respectively, whose video interface have been chosen for our study. Study is focused on the two components of video lecture named, Video Interface and Video Lecture Content, and features provided to a MOOC student.

Sakai is an educational software platform developed for higher education by University of Michigan. Since its release in 2005, being used by more than 350 world's great colleges and universities organizations of diverse profiles list; over 4 million students worldwide [19]. It uses video lecture mechanism to offer lecture content.

Open edX is an open source release of edX platform in 2013. It is founded by Harvard university and Massachusetts Institute of Technology (MIT) [20]. Universities and educational providers are using it freely to offer their own MOOCs. Many

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[9] https://sakaiproject.org

[10] http://code.edx.org/

[11] https://code.google.com/p/course-builder/

websites and MOOCs are launched on Open edX, listed at [21]. For our study we analyzed the Stanford OpenEdX [22] which is running on Open edX platform.

CourseBuilder is a software used to offer online courses. It provides an opportunity to universities and educational to offer their own MOOCs. It runs on google infrastructure[23] and is used world wide for offering MOOCs. We studied University of Auckland, New Zealand [24] that is running on CourseBuilder platform. Evaluation has been performed by student and guest account on their demo site.

Table 4. The feature checklist of video lecture for open source MOOC platforms.

Feature Level	Control			Sakai	Stanford OpenEdX	Univ. of Auckland CourseBuilder
Video Interface	Basic	Cuirrent Time		✓	✓	✓
		Total time		X	✓	✓
		Play/Pause		✓	✓	✓
		Volume Slider		✓	✓	✓
		Full screem mode		✓	✓	✓
		Modify Speed		X	✓	X
		Caption On/Off		X	✓	✓
		Navigation		X	✓	X
		Report problem		✓	✓	✓
		Go to Discussion Forum		✓	✓	✓
	Advance	HD support		X	✓	X
		Caption multilingual support		−	X	X
	Optional	Poster Frame		X	✓	X
		Change video player		X	X	X
		Change Caption format		−	X	✓
		Keyboard Shortcut Help		X	X	X
Video Lecture Content	Basic	Download	Transcript Srt	−	X	X
			Video mp3/mp4	✓	✓	✓
		Progress bar		X	X	X
	Advance	Download	Transcript Text	−	✓	X
			Slides Pdf	✓	X	✓
			Video Quality	X	X	X
	Optional	Download	Transcript pdf	−	X	X
			Slides ppt	✓	X	✓
		Progress bar		X	X	X
		Embedded Quiz	L2 Grading	−	−	✓
			Controls	−	−	X
			Display reponse	−	−	✓
			L1 Allowed attempts >1	−	−	X
			Show Quiz presence	−	−	X

	Feature	Control	Sakai	Stanford OpenEdX	Univ. of Auckland CourseBuilder
Video Interface	View Setting	Speed	–	.50x-2.0x	–
		Navigation	Prev./Next	Using List	–
	Advance Setting	Player option	–	–	–
		Caption Lang. (#)	–	1	1
		Caption Format	–	–	–
	Help Support	Report problem	Mail	Problem	Mailing list
		Discussion Link on	Discussion Forum	Lecture page	Mailing list
Video Lecture Content	Lecture	Progress	–	–	–
		Display Response	–	–	Cort./Incor
		Correct Answer	–	–	Instant/End
	Quiz	Attempts Allowed	–	–	1
		Show Quiz presence	–	–	No
		Location	–	–	Anywhere

Our weighted feature checklist is applied to video lecture components for different levels features provided by some open source MOOC platforms. In our case study, we applied our analysis for *Video Interface* and *Video Lecture Content,* and their *presentation style* on three MOOC platforms.

Table 4 and 5 displays a comparative feature checklist for each video lecture component and their presentation styles.

Some of the key findings are discussed here. *Display time*, one of the very common options is not provided by Sakai. *Caption* is also not present in *Sakai. Stanford OpenEdx* and *University of Auckland CourseBuilder* provide *advance settings* to better control of the video lecture interface while *Sakai* do not provide this facility. All platforms allow help support control for reporting the problem but in different ways. Downloading of the *downloadable transcript* is available only in *Stanford OpenEdX* but limited to text format; While *University of Auckland CourseBuilder* allows only viewing the *transcript. Different quality* of the video and *progress bar* is not supported by any provider studied. CourseBuilder is the only one providing embedded quiz.

Table 6 shows University of Auckland CourseBuilder provide most of the features for MOOC videos to their students for video interface as well as content. Also, the presentation style used for video lecture content that is very limited for platforms other than the University of Auckland CourseBuilder. Table 6 and Table 7 list the percentage of features supported and their level respectively, by the open source platforms mentioned in our study..

Fig. 2 displays coverage of *Video Interface* and *Video Lecture Content* components of video lecture in MOOC in our case study. Some of the key findings are as follows:

- The maximum controls are provided by CourseBuilder.
- All view setting options are available in Open edX.
- Advance settings are not present in Sakai.

- Each MOOC provider uses a similar number of controls for help support.
- Embedded quiz are only present in CourseBuilder video lecture.

Fig. 3 shows the provided features by some the providers in different levels. Some of the key observations about these are:

- The maximum basic features are provided by Stanford OpenEdX.
- Stanford OpenEdX is the only one that provided advance features or video interface.
- Optional features for video interface are not available in Sakai.
- The basic and advance features of video lecture content are equally supported by all the platforms, in our case study.
- The number of optional features available in University of Auckland CourseBuilder is double, in comparison to the other providers in our study.

Table 6. Percentage of features supported by some open source MOOC platforms.

Component	Controls	Sakai	Stanford OpenEdX	Univ. of Auckland CourseBuilder
Video Interface	Display Time	50%	100%	100%
	View Setting	50%	100%	66%
	Advanced Setting	0%	40%	20%
	Help Support	66%	66%	66%
Video Lecture Content	Lecture	38%	25%	37%
	Embedded Quiz	0%	0%	50%

Table 7. Percentage of feature level by some open source MOOC platforms.

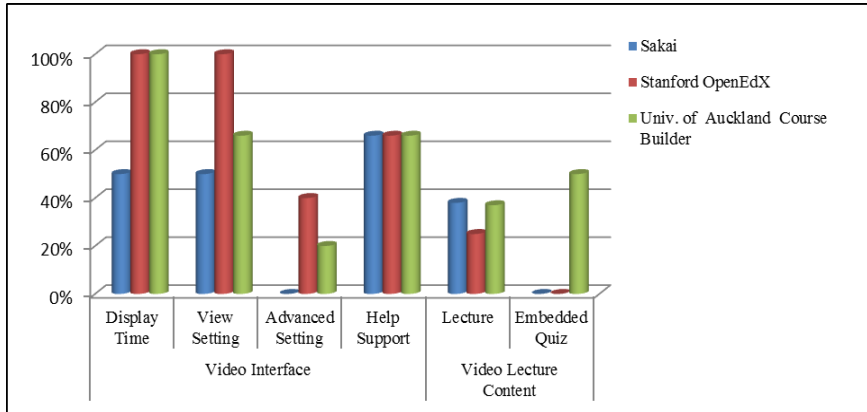| Component	Level of Feature	Sakai	Stanford OpenEdX	Univ. of Auckland CourseBuilder
Video Interface	Basic	60%	100%	80%
	Advance	0%	50%	0%
	Optional	0%	25%	25%
Video Lecture Content	Basic	50%	50%	50%
	Advance	33%	33%	33%
	Optional	12%	12%	24%

Fig. 2. Graph showing percentage features used by some open source MOOC platforms.
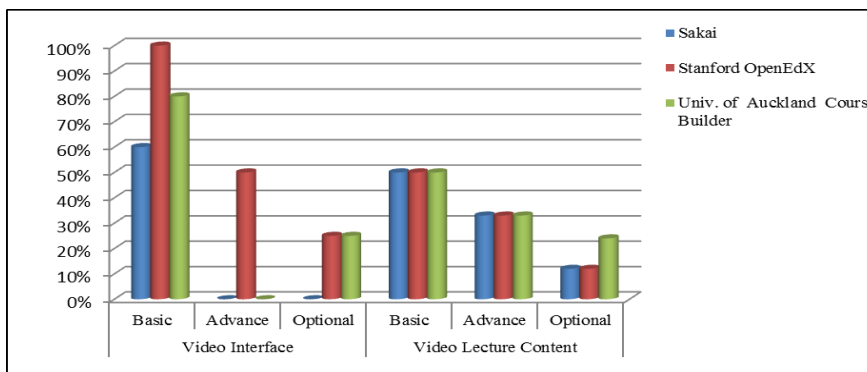

Fig. 3. Graph showing percentage of feature level used by some open source MOOC platforms.

9   Benefits

The features we presented provide aid for including videos in MOOC. For deriving our list, most popular MOOC platforms has been studied. Our list of features benefits the developers of MOOC for incorporating lecture video in their platform. We see that neither of the platforms provides all the features of video to their students.

Mostly, ad-hoc approach is used for providing video lecture to their students. Either the existing open source platforms are used which have their own mechanism for video lecture that needs to be extended sometimes or developing a new platform that needs identification of features that need to incorporated in video lecture. In both the cases, there is high probability of generating basic requirements of features. Developer of MOOC may not be able to elicit the options for video lecture.

The feature checklist presented here can be used by MOOC developers. It lists the features available in MOOC videos that need to be available for the student. During the feature elicitation, the developer can use the checklist to choose the desired options, with less effort. It facilitates the developer to include more options for videos. The video lecture mechanism developed using our checklist provides more interactivity to the interface and make it student oriented.

10 Limitations

For our analysis, we studied the most popular MOOC platforms. There may be some options that are provided by other MOOC providers that have not been studied. However the new options can be easily included in the checklist. Also the derived analysis is for video in MOOC. It is insufficient for standalone video interface creation. It may require some for options and features for standalone video interfaces, which are out of scope of this paper.

11 Conclusion

In this paper, we present a weighted checklist of features for the videos in MOOC. The checklist covers the features including different presentation styles of components of video lecture that are video interface and video lecture content. The requirement checklist is useful during incorporating videos features in MOOC. It eases the task of requirement specification for video software in MOOC by selecting and choosing the desired requirements of features from the checklist. The checklist presented here is extensible in nature and can be updated easily to add any new feature and option.

References

1. Voss, B.D.: Massive Open Online Courses (MOOCs): A Primer for University and College, Board Members, http://agb.org/sites/agb.org/files/report_2013_MOOCs.pdf (2013)
2. Wikipedia, http://en.wikipedia.org/wiki/Massive_open_online_course (2014)
3. Alario-Hoyos, C., Sanagustin, M.P., Kloss, C.D., Rojas, I.G., Leony, D.: Designing Your First MOOC from Scratch: Recommendations After Teaching "Digital Education of the Future", www.openeducationeuropa.eu/en/elearning_papers (2014)
4. Breslow, L.B, Pritchard, D.E., DeBoer, J., Stump, G.S., Ho, A.D., Seaton, D.T.: Studying learning in the worldwide classroom: Research into edX's first MOOC. In: Research & Practice in Assessment 8(1), pp. 13-25 (2013)
5. Seaton, D.T., Bergner, Y., Chuang, I., Mitros, P., Pritchard, D.E.: Who does what in a massive open online course?. 57, pp. 58-65 (2013)
6. Shah, D.: Class central report, https://www.class-central.com/report/coursera-10-million-students/ (2014)
7. Smith, L.: EducationDIVE, 5 education providers offering MOOCs now or in the future, http://www.educationdive.com/news/5-mooc-providers/44506/ (2012)

8. The New York Times, Article: The Year of the MOOC, http://www.nytimes.com/2012/11/04/education/edlife/massive-open-online-courses-are-multiplying-at-a-rapid-pace.html?pagewanted=all&_r=0 (2012)

9. The New York Times, Article: the Big three at a glance, http://www.nytimes.com/2012/11/04/education/edlife/the-big-three-mooc-providers.html?_r=0 (2012)

10. Kizilcec, R.F., Piech, C., Schneider, E.: Deconstructing disengagement: analyzing learner subpopulations in massive open online courses. In: Third International Conference on Learning Analytics and Knowledge, pp. 170–179. ACM, New York, USA (2013)

11. Sinha, T., Jermann, P., Li, N., Dillenbourg, P.: Your click decides your fate: Inferring Information Processing and Attrition Behavior from MOOC Video Clickstream Interactions. In: Proceedings of the 2014 Empirical Methods in Natural Language Processing Workshop on Modeling Large Scale Social Interaction in Massively Open Online Courses (October 2014)

12. Guo, P.J., Reinecke, K.: Demographic Differences in How Students Navigate Through MOOCs. In: First ACM conference on Learning@ scale conference, pp. 21-30. ACM, USA (2014)

13. Anderson, A., Huttenlocher, D., Kleinberg, J., Leskovec, J.: Engaging with Massive Online Courses. In: 23rd international conference on World wide web International World, pp. 687-698, Wide Web Conferences Steering Committee, Seoul, Korea (2014)

14. Guo, P. J., Kim, J., Rubin, R.: How Video Production Affects Student Engagement: An empirical study of MOOC videos. In: First ACM conference on Learning@ scale conference, pp. 41-50. ACM, USA (2014)

15. Chorianopoulos, K., Giannakos, M.N.: Usability design for video lectures. In: 11th European conference on Interactive tv and video, pp. 163-164. ACM Press, New York, USA (2013)

16. Kim, J., Guo, P.J., Seaton, D. T., Mitros, P., Gajos, K.Z., Miller, R.C.: Understanding In-Video Dropouts and Interaction Peaks in Online Lecture Videos. In: first ACM conference on Learning@ scale conference, pp. 31-40. ACM, USA (2014)

17. Ortega, Sergio, Francis, Brouns, F., Gutiérrez, A.F., Fano, S., Tomasini, A., Silva, A., Rocio, V. et al.: D2. 1 Analysis of existing MOOC platforms and services (2014)

18. Clark, R.C., Mayer, R.E.: E-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning. John Wiley & Sons, San Francisco (2011)

19. Sakai overview, https://sakaiproject.org/overview (2014)

20. Open edX, http://code.edx.org/

21. GitHub, https://github.com/edx/edx-platform/wiki/Sites-powered-by-Open-edX

22. Stanford online, http://online.stanford.edu/openedx

23. Course-builder checklist, https://code.google.com/p/course-builder/wiki/CourseBuilderChecklist

24. The University of Auckland[NZ], https://www.coursebuilder.cad.auckland.ac.nz