

# Couch Learning Mode: Multiple-Video Lecture Playlist Selection out of a Lecture Video Archive for E-learning Students

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## ABSTRACT

During a video recorded university class students have to watch several hours of video content. This can easily add up to several days of video content during a semester. Naturally, not all 90 minutes of a typical lecture are relevant for the exam. When the semester ends with a final exam students have to study more intensively the important parts of all the lectures. To simplify the learning process and design it to be more efficient we have introduced the Couch Learning Mode in our lecture video archive. With this approach students can create custom playlists out of the video lecture archive with a time frame for every selected video. Finally, students can lean back and watch all relevant video parts consecutively for the exam without being interrupted. Additionally, the students can share their playlists with other students or they can use the video search to watch all relevant lecture videos about a topic. This approach uses playlists and HTML5 technologies to realize the consecutive video playback. Furthermore, the powerful Lecture Butler search engine is used to find worthwhile video parts for certain topics. Our approach shows that we have more satisfied students using the manual playlist creation to view reasonable parts for an exam. Finally, students are keen on watching the top search results showing reasonable parts of lectures for a topic of interest. The Couch Learning Mode supports and motivates students to learn with video lectures for an exam and daily life.

## Categories and Subject Descriptors

K.3.1 [Computer Uses in Education]: Distance learning;  
H.5.2 [User Interfaces]: Training, help, and documentation

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## Keywords

Teleteaching; Tele-Lecturing; Distance Learning; E-Learning; Self-Paced Learning; Video Lecture; Video Playlist; Lecture Video Archive

## 1. INTRODUCTION

During a semester several lectures are recorded for a course in a lecture video archive. Every lecture is about 90 minutes long. When you add up two lectures per week for a typical 12 weeks university course, the recordings sum up to 2160 minutes (36 hours) of video content. Students have to know parts of this video content for their final exams. Consequently, students have to watch several hours of lectures and have to search for important lecture parts during the learning process. The idea of the “Couch Learning Mode” is to create playlists with important parts from several lectures during the learning process in the ongoing semester. When students start learning for an exam they can play the created playlist, lean back on the “Couch”, and start watching the exam relevant lecture parts for the whole semester automatically. Furthermore, students can share the best playlists with other students for learning purposes and to improve the playlist quality for fellow students.

While analyzing the tested lecture video archive tele-TASK<sup>1</sup> we investigated lecture recordings from different courses discussing similar or identical topics with various difficulty levels. This investigation encourages the development of the “Couch Learning Mode”. Now playlists can be created for a specific topic which is discussed in several lectures of the lecture archive. This strategy is obviously aimed at students willing to upgrade their education and not for students learning for a final course exam. Nevertheless, it is a useful tool to enhance the learning experience for students willing to learn.

This paper is structured in five major sections. It starts with the current section “Introduction” to give an overview of the problem and ideas of the paper. The “Introduction” is followed by the sections “Related Work”, “Approach”, “Evaluation” and the final section “Results and Future Work”. During the discussing of “Related Work” this paper gives an insight of further and close research in the e-learning context of video lecture archives. The following section “Approach” describes the actual research idea and realization of

<sup>1</sup><http://www.tele-task.de>

the “Couch Learning Mode”. In the section “Evaluation” we analyze the user acceptance of this approach. Sixty one students who are familiar with our lecture video archive evaluated the impact of this feature for their learning experience. Finally, the “Results and Future Work” section concludes the work of this paper. Additionally, an outlook shows further improvements and ideas in this research area.

## 2. RELATED WORK

An idea in the field of e-learning was proposed in a paper talking about the future of teleteaching [4]. This paper deals with the integration and interaction of classical video archives with upcoming MOOC platforms. One key point of this paper is the interaction between MOOC platforms and a video lecture archive platform and vice versa. Using this approach similar content can be connected between MOOCs and video lecture archive platforms. We think this is also interesting when you want to connect videos with similar or deeper content within a lecture video archive.

Another research goal in the area of lecture video archives is to find ways to identify difficult spots of a lecture [1]. The idea behind this topic is to find lecture parts which are hard to understand. Furthermore, the lecturer can use this information as feedback to improve the lecture in the following years by pointing out the problem in more detail. This will contribute to a better lecture and support students’ learning experience. This paper’s approach to use these difficult spots could be used in further versions of the “Couch Learning Mode” to create playlists automatically with the most difficult parts of the lecture. This will work out as a brain teaser for motivated students willing to learn more.

Another research area is semantic web. The semantic web represents a network with different topics which are connected to each other. By use of these connections similar topics can be found automatically [3]. These connections can be used to automatically create connections between videos and highlight relevant similar videos. One major problem of this approach occurs in the context of lecture video archives and keywords for a whole video. Since the videos are about 90 minutes per lecture videos are too long merge them together for a “Couch Learning Mode” session. As example, if only 5 connecting lectures were found which contain maybe 10 minutes of relevant content the student would have to watch 450 minutes of video with the couch learning mode. Therefore, an approach using time-relevant information of the lecture video like OCR [7] is an interesting idea for further research and automated creation of content for the “Couch Learning Mode”. Lecture Butler research [5] will combine the OCR search results with the semantic network by using a powerful search which is able to find relevant parts of a lecture.

The native video support of HTML5 [2] enables browsers to play videos without an additional plug-in. Furthermore, no additional software has to be installed to run videos within the browser (e.g. Flash Media Player<sup>2</sup>) or for development of video players for a website (e.g. Adobe Flash Builder<sup>3</sup>). This evolution leads to faster and simpler HTML websites with custom video players. For example, a dual video player is possible which is able to play two video

<sup>2</sup>[www.adobe.com/products/flashplayer.html](http://www.adobe.com/products/flashplayer.html)

<sup>3</sup><http://www.adobe.com/products/flash-builder-family.html>

streams in sync [6]. This is useful for lecture recording archives. Students have the possibility to watch the lecture slides and the lecturer in an appropriate and readable size. This approach is also going to be used for the “Couch Learning Mode” to show the videos and to be able to customize the player easily for the consecutive playback of several videos. This topic is going to be discussed in more detail in the following section.

## 3. APPROACH

This section describes the idea and implementation of the “Couch Learning Mode” in our prospective lecture video archive tele-TASK. This lecture video archive is based on the Python programming language using the Tornado web framework<sup>4</sup>. Tornado’s strengths are handling thousands of text-based input/output-requests. Furthermore, several Tornado server instances can be started and handled with proxy balancing by a common web server such as nginx<sup>5</sup> which is already used to deliver static non-text content like images since Python with the Tornado web framework is not optimized and rather slow on non-textual data. The video content of our video lecture-archive is delivered with an Adobe Media Server<sup>6</sup> with the ability to stream RTMP and HTTP streams in the FLV and MP4 format. Due to historical reasons of the lecture archive portal we still offer a Flash-based player within the portal. Nevertheless, for new and old converted video content we recommend using the standard HTML5-Player which is based on HTML5 video abilities.

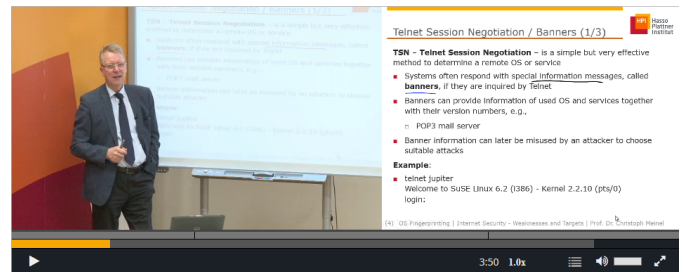


Figure 1: tele-TASK HTML5 Dual Video Player

The challenge for the video player is the synchronized playback of two video streams. Usually, the first stream shows the teacher and the second stream the slides. This dual stream video player is not officially supported by HTML5. Therefore, our player uses two video-tags which are synchronized by JavaScript and a custom user interface to jump within the video streams and to visualize the playback and buffering process. The player design is shown in Figure 1. The following subsections describe the adaptations of the tele-TASK video lecture archive to enable the couch mode within the HTML5Player.

### 3.1 Couch Learning Mode - Playlist

To realize the “Couch Learning Mode” by playing different video parts consecutively we need to define the video parts.

<sup>4</sup><http://www.tornadoweb.org>

<sup>5</sup><http://nginx.org/>

<sup>6</sup><http://www.adobe.com/de/products/adobe-media-server-family.html>

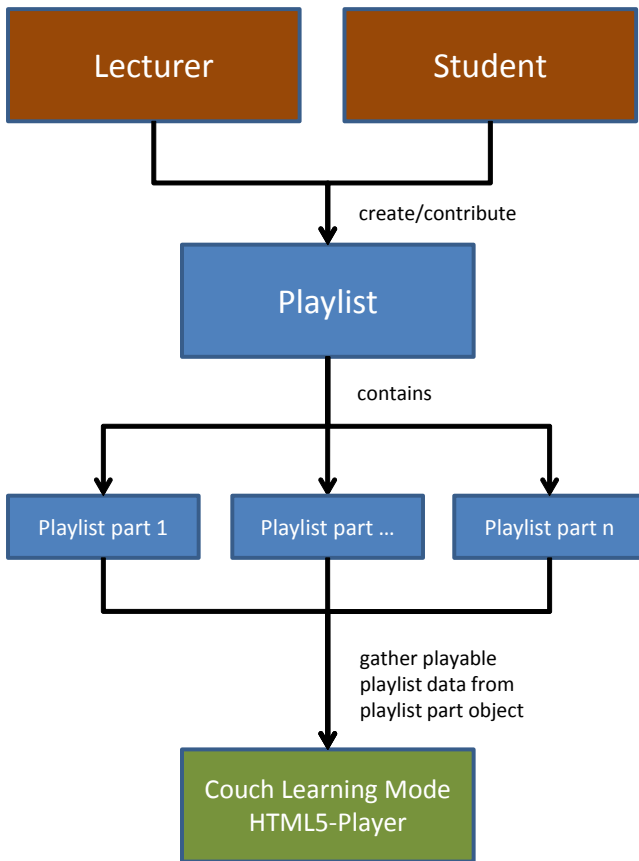


Figure 2: Couch Learning Mode Overview

During the first implementation we decided for the playlist approach. The abstract overview of the playlist approach is visualized in Figure 2. On the top the students and lecturer (emphasized in brown) are highlighted as possible contributors of the “Couch Learning Mode” content. They have the ability to create playlists containing any number of playlist parts. A playlist part can be a mentioned video part of a lecture or a complete lecture. The data structure to store parts is a playlist in our approach and visualized in blue. Finally, the “Couch Learning Mode” HTML5-Player is emphasized in green as point of distribution for the playlist data as a video stream.

The implemented playlist overview in the video lecture archive is shown in Figure 3. When using a playlist a complete lecture, parts of a lecture, or a custom time frame of a lecture can be selected and added to the playlist. How this works in detail is described in Section 3.2. A playlist can contain from one to an arbitrary number of lectures or lecture parts. Furthermore, playlists can be limited to eligible users. These eligible users are selected by the playlist administrator. The playlist administrator can offer a playlist to the public that everyone is allowed to watch. Further details of access rights will be discussed in Section 3.3. Finally, the created playlist can be played in the HTML5-Player with added “Couch Learning Mode” which described in more detail in Section 6.

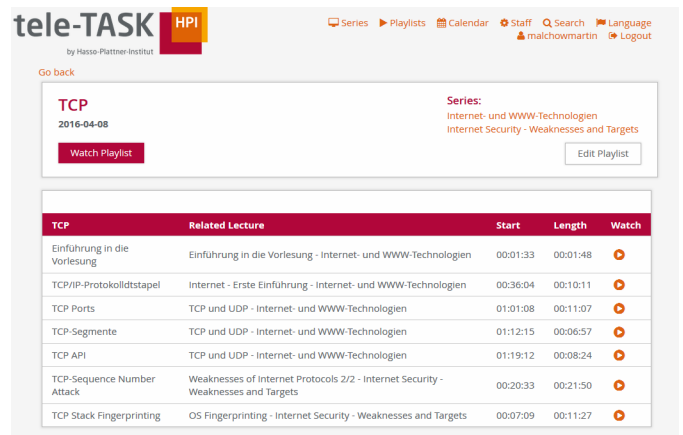


Figure 3: Playlist Overview for Students to Start Playlist

### 3.2 Couch Learning Mode - Playlist Management

A playlist can be created by any registered user on the lecture video archive. When creating a playlist the user is the administrator of the created playlist and has several options to manage the playlist. The user interface of the playlist management is shown in Figure 4. Basic manageable playlist settings are playlist image, playlist title, playlist description, playlist visibility (public/private), and playlist date. The most important parts are the playlist content overview and add lecture or lecture part to the playlist. When a user wants to add a lecture or a lecture part the user selects the appropriate series, which is a synonym for a course in a semester. After the user’s series selection, an available group in this series and finally a lecture of this group within the series can be selected. When a lecture is selected all available lecture sections are shown. At this point the user can add the complete lecture to the playlist or can add parts of this lecture which are shown in the available lecture sections. After adding a lecture or lecture part the selection is added to the playlist, which is visualized in the playlist segments table. Due to hundreds of series and thousands of lectures the selection lists can also add a filter. Possible filters are “Series Type”, “Organization” and “Lecturer”. Filtering eases the process of finding lectures. We have applied the jQuery Chosen<sup>7</sup> plug-in, which enables a text search in HTML select fields.

Within the playlist segments table every segment (shown in every row) can be edited. The administrator of a playlist can change the playlist segment part name, the starting time within the full lecture and the duration of this segment showing in the playlist from the starting point. After a change is done the administrator user saves the changes and they are directly available for the invited users or when the playlist is publicly available for all users.

### 3.3 Couch Learning Mode - Playlist Access Permissions

The already mentioned access rights for the “Couch Learning Mode” is shown in Figure 5.

<sup>7</sup><https://harvesthq.github.io/chosen/>

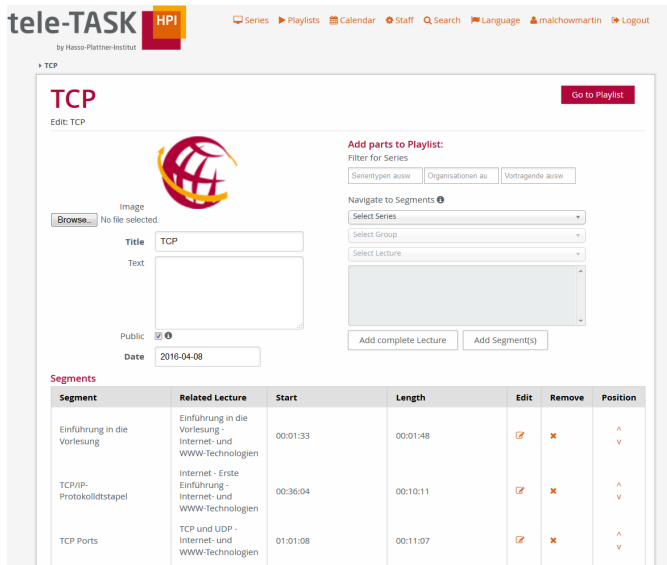


Figure 4: Playlist Management to Edit a Playlist

#### Share this Playlist with other users

Invite user:

**Involved users:**

Email	Administrator	Remove	<input type="button" value="Apply changes"/>	<input type="button" value="Discard changes"/>
malchowmartin@gmail.com	Yes	<input type="checkbox"/>	<input type="button" value="Apply changes"/>	<input type="button" value="Discard changes"/>
matthias.bauer@hpi.de	No	<input type="checkbox"/>	<input type="button" value="Apply changes"/>	<input type="button" value="Discard changes"/>

Figure 5: Access Permissions and Management for Private Playlists

The access permissions can be set for private playlists. Additional users can be invited by email. We use the email identifier in this approach since users are recognized by email and user names are not used in the lecture video archive. The rights of added users can be increased to an administrator level. Administrator users can change the content of the playlist and invite other users to a playlist. Invited users with non-administrator privileges cannot modify a playlist or add users. When a playlist is public only an administrator of the playlist can edit the playlist and change the playlist visibility back to private.

### 3.4 Couch Learning Mode - HTML Video Player

The most important part for the “Couch Learning Mode” is the HTML5 player. It allows to play all videos of the playlist consecutively. For the realization the HTML5 player source code had to be modified to add the specific “Couch Learning Mode” functionality. The final player for this approach is shown in Figure 6.

When playing a playlist the player offers jumps within the available playlist part only. The available playable part is highlighted in the player with an orange bar (see Figure 6). The user can jump within the playlist video part. If the user wants to jump to a position before the playlist part the jump position will be the start of the current playlist part. When a user jumps behind the playlist part the start position is five seconds before the end of the current playlist video part. We

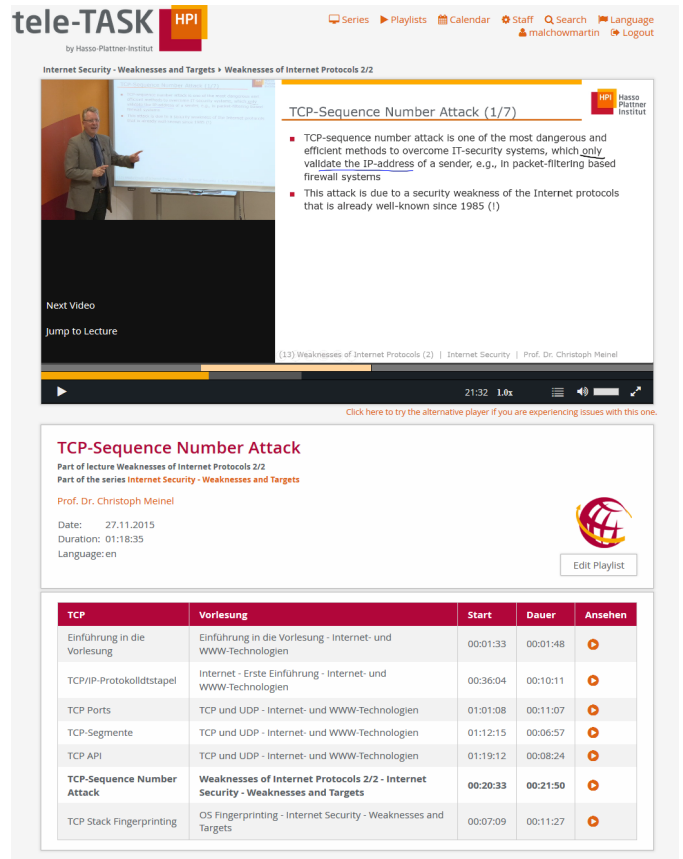


Figure 6: HTML5 Video Player During Couch Mode Playback

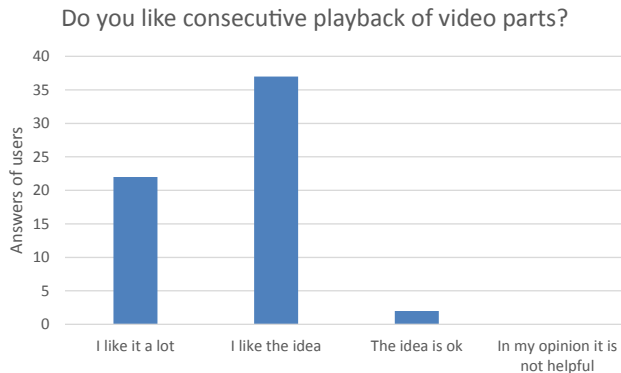
decided on a five seconds delay because the HTML5-Player in “Couch Learning Mode” shows the information, that the following playlist starts in five seconds. This countdown starts at five seconds and counts down to zero. When the countdown reaches zero the next video in the playlist will be started from the adjusted playlist position for the specified duration. In case the playlist reaches the last video the playback will stop after the last video part.

During playback of a playlist all following sections are visible below the player. In this playlist overview it is possible to jump to different parts of the playlist. Inside of the player jumping to the next playlist part and to the full lecture is also possible. When the student decides to go to the full lecture the “Couch Learning Mode” will end and a normal lecture video playback will start at the lecture time position the “Couch Learning Mode” was left.

In circumstances of a full screen playback the HTML5-Player just replaces the videos, playlist part information and start time. Normally, when a playlist part is over the next playlist part will be loaded and started with a redirect and reload of the page. Since this is not possible in full screen mode only parts of the player will be refreshed. When exiting the full screen a video change occurs the page will be loaded again and the player continues playback at the point in time where the full screen mode was ended.

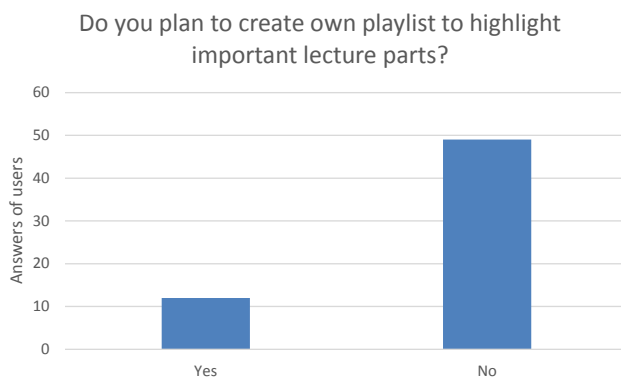
## 4. EVALUATION

For the evaluation of the “Couch Learning Mode” we asked 61 students who are familiar with the video lecture archive to answer four questions about this approach. For the test case we created a playlist containing information about the topic TCP from several lectures and series. The students rated their experience with the “Couch Learning Mode”. They answered questions about the overall experience, usage behavior and further improvement. The results are visualized in Figures 7 to 10.



**Figure 7: Evaluation Question 1: Do you Like Consecutive Playback of Video Parts?**

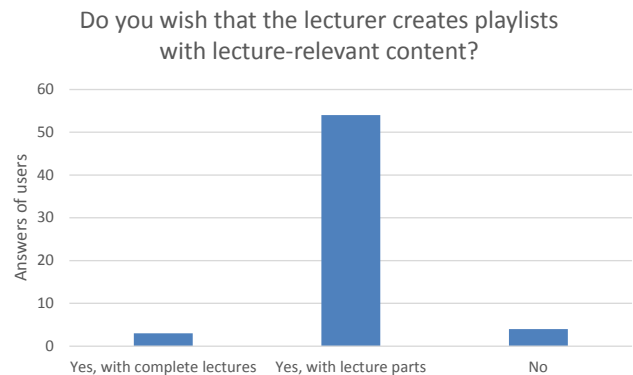
The first survey question about the lecture butler was “Do you like consecutive playback of video parts?”. The answers of the students are visible in Figure 7. Here it is obvious that students like the idea. Nearly 97% of the students say they “like it a lot” or they “like the idea”. Only about 3% of the students said that the “idea was ok”. Finally, 0% of the students think this idea is awful and useless in their opinion. This means the general acceptance of the approach is 100% and implementing this option in a lecture video archive is useful for the learning experience.



**Figure 8: Evaluation Question 2: Do you Plan to Create own Playlists to Highlight Important Lecture Parts?**

The following question two “Do you plan to create own playlists to highlight important lecture parts?” shown in Figure 8, is about user contribution to the lecture video

archive by the use of the self-created playlist for the “Couch Learning Mode”. Unsurprisingly, we found out that our students are more interested in being entertained and getting provided playlists they can use to learn. Only 12 students want to create own playlists to learn with them later for the exam and 49 students do not want to create playlists with valuable content for their fellow students or at least for their own exam preparation. This result shows that it is a good idea to offer students the possibility to create their own playlists. Nevertheless, most of the students will not use this learning possibility.

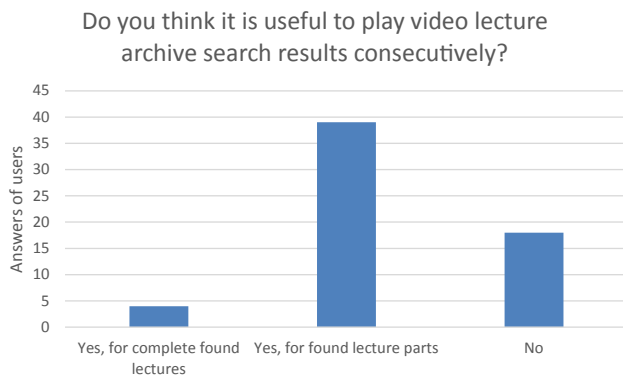


**Figure 9: Evaluation Question 3: Do you Wish that the Lecturer Creates Playlists with Lecture-Relevant Content?**

In question three “Do you wish that the lecturer creates playlists with lecture-relevant content?” plotted in Figure 9 we switch the perspective compared to question two. Now we want to know if students would like to get playlists for the “Couch Learning Mode” with relevant content for the homework and the exams. We expected this behavior, since the students want to have good exam results. Furthermore, it will reduce the the amount of content they have to learn if the lecturers will create playlists with exam-relevant content. This reduction of content is also highlighted, since 54 want to see only relevant lecture parts and only three students are fine with playlists containing the whole lectures. Only four students do not want to have playlist with relevant content created by the lecturer. It is a nice idea for the students to have lecturers creating playlists with major homework or exam topics. Nevertheless, the lecturers have to think about if they want to give so many exam hints and reduce the content students have to learn for the exam. Especially, when important parts for work life will not be learned by the students.

In the final question “Do you think it is useful to play video lecture archive search results consecutively?” shown in Figure 10 we asked students about further development of the “Couch Learning Mode” in the context of the video lecture archive search. About 70% of the students would like to have a “Couch Learning Mode” for the overall video lecture archive search. Thirty nine of the students want to have a consecutively playback for the most important lecture parts and only 4 students want to have a consecutive playback of full lectures. In contrast, nearly 30% of the students do not need the “Couch Learning Mode” approach for the lecture search results. In conclusion of those questions it





**Figure 10: Evaluation Question 4: Do you Think it is Useful to Play Video Lecture Archive Search Results Consecutively?**

seems to be useful to enable the “Couch Learning Mode” for the video lecture archive search in future since more than two-thirds of the students would like to have this functionality. In particular, students want “Couch Learning Mode” for the most relevant lecture parts of the search result.

## 5. RESULTS AND FUTURE WORK

In this paper we described “Couch Learning Mode” in a video lecture archive as a way to ease the learning process by watching reasonable lecture parts for a specific topic or relevant information for a semester course as homework or exam preparation. The functionality of “Couch Learning Mode” is currently very simple. First create a playlist based on lectures or lecture parts. Students can then use this playlist for their studies, invite friends to watch the playlist, or share it with the public. The overall results of the approach evaluation indicate that “Couch Learning Mode” supports the students during the learning process. A major problem for the success of the “Couch Learning Mode” could be the availability of playlists since most of the students are not interested in creating playlists. Actively contributing students have to share their playlists to make them more popular. Nevertheless, even if they decide to keep their created playlists private, they can still enhance their own learning and are also motivated to learn again and use their created content selection for the final exam. Another source for playlist creation could be the lecturer. The lecturers have to think about if they want to offer a complete list which is relevant for the exams and homework or if they just decided to create playlists for difficult topics. A full list of relevant exam content may lead to students learning behavior that other not so important topics are not learned at all. Even when the lecturers have to think about how they want to use the “Couch Learning Mode” in a course the implementation is valuable for students to support learning for a specific topic and motivate the students to decide to take time for learning. “Couch Learning Mode” can be particularly effective in helping students find all the important information on a specific topic.

Even when the “Couch Learning Mode” is useful for students we also have some additional ideas for future research. As already discussed in the evaluation in Section 4, search

results should be playable in the “Couch Learning Mode”. In addition earlier research of the “Lecture Butler” [5] should be considered. Another possibility of improvements could be a playlist containing internal and external video content to emphasize a thesis or deepen the knowledge about a special topic. Attention should be paid to the copyright when embedding external video content in the lecture video archive. Students who are not aware of copyright restrictions could violate copyright laws by embedding external videos. Further future work is an automated playlist creation to improve the available content for the “Couch Learning Mode” and motivate more students to watch specific lecture content. The automated creation can be done by an automated analysis of the most watched parts of a semester course which indicate difficult topics of a lecture [1]. Finally, we can improve the “Couch Learning Mode” with a video export. In this way we could support students that they have the possibility to watch the important parts offline on their computer or on the go with a mobile device.

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