Designing an Interactive Video Editing Tool for Teachers
Abstract
This study aims to find the answers to how an online interactive video editing tool for teachers to use would be designed. To find out the answers to this, students studying to become teachers and experienced teachers were interviewed and used for observations and usability testing of a prototype. In total there were 27 unique data gathering situations with 11 unique participants. The five teacher students who were participating were all teacher students at Linnaeus University in Växjö. The six experienced teachers have been teaching for many years and are currently lecturing teachers about new technology that can be used in the classroom. The result from interviews, observations and literature search contributed to a list of requirements which in turn became a prototype. What has been discovered is that teachers need a tool which is easy to use with interactions and functions such as adding clickable annotations to clips and creating playlists which will help teachers plan ahead and save time during lectures.

Key words
Interactive videos, teachers, interactions, online video editing, and interface design.

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1 Introduction

Video-based learning has been around for more than half a century. For example, soldiers were trained with a combination of audio and film strips during the Second World War (Hovland, Lumsdaine & Sheffield 1949). In the late 1960s, educational television was used as an extra tool in the classrooms. In the 1980s, the VHS video tapes debuted, which made the usage of video in classrooms much easier (Yousef, Chatti & Schroeder 2014). The 1990s provided the teachers with VCDs and DVDs, which made it possible to add multimedia control and the ability to use video on a computer (Yousef, Chatti & Schroeder 2014). In the 2000s, classrooms got connected to the Internet, which made interactive digital videos and video conferences a possibility (Yousef, Chatti & Schroeder 2014). On recent days most Swedish children have access to, or own, a computer, tablet, and smartphone (Statens medieråd 2017), which makes the approachability for educational videos easier than ever before. The Education Administration of Sweden is working for an “en-till-en” environment in schools. “En-till-en” refers to one computer per student. According to Skolverket (n.d.), this makes the education more formative and onward. Interactive videos and interactive videos in education is what the next two sections will about.

1.1 Interactive Videos

A video is an electronic medium for the recording, copying, playback, broadcasting, and display of moving visual and audio media (HiDEF 2015).

The Oxford English Dictionary (2018) gives these definitions of interactive:

“Interactive, adj.

1. Reciprocally active; acting upon or influencing each other.

2. Pertaining to or being a computer or other electronic device that allows a two-way flow of information between it and a user, responding immediately to the latter's input.”

Merriam-Webster (2018) gives these:

“Interactive

1. Mutually or reciprocally active.

2. Involving the actions or input of a user; especially: of, relating to, or being a two-way electronic communication system (such as a telephone, cable television, or a computer) that involves a user's orders (as for information or merchandise) or responses (as to a poll).”

Both definitions are quite alike and they both include the words reciprocally, active, two-way, response, user, computer, and input. The above definitions are for the word interactive and not specifically ‘interactive video’. According to Line Kolås (2015) interactivity within videos can, e.g., be videos with link and or link chains,
videos with interactive 3D-objects, videos with interactive maps, or videos with interactive quizzes. Kolås (2015) describes how interactive videos should be used:

“Interactive videos should be used to engage and activate the learners as they watch the video to enhance the learning process.”

Stephan Schwan & Roland Riempp (2004) argue that interactive videos lead to more efficient forms of learning. They conducted an experiment where participants learned how to tie four nautical knots of different complexity by watching non-interactive or interactive videos. Since the participants who watched interactive videos had the ability to stop, replay, reverse or change speed they could focus on the parts they had trouble with.

Interactive videos have been talked about and researched for many decades and has been used in various different areas such as law (Sharman, Hogan & Cooke 1990), physics (Fuller & Zollman 1994; Escalada & Zollman 1997; Singh 2004), science (Jackson 1997; Kumar 2010), biology (Huang & Aloi 1991; Hall et al. 1989), sports (Hämäläinen 2004; Fadde 2006), advertising (Tomson 2000; Laut 2007), medicine (Shepperd, Coulter & Farmer 1995; Liao 1996) and education (Zhang et al. 2006; Merkt et al. 2011; Kolås 2015). Education specifically is the area that will be discussed in this next section.

1.2 Interactive Videos in Education
The previous section touched upon VBL in school where students watch a video in the classroom, often without any interactions. The usage of interactive videos in many different areas were also mentioned. This section is focused on interactive videos in education. Martin Merkt, Sonja Weigand, Anke Heier and Stephan Schwan (2011) published a paper called ‘Learning with videos vs. learning with print: The role of interactive features’ where they conclude that interactive videos were at least comparable to that of print. Merkt et al. (2011) assumed that the reason for that might have to do with the possibilities provided for self-regulated information processing. The participants in the study were sixty students, were twenty students were randomly assigned to a specific test group (Merkt et al. 2011). The three groups were common video vs. enhanced video vs. illustrated textbook. Zhang et al. (2006) did an empirical study where they examined the effectiveness between different learning environments, three of which were e-learning and the fourth was the traditional classroom. The other three environments were interactive video, non-interactive video and without video. The students in the interactive video environment achieved better learning performance than those in the other settings. They also achieved a higher level of learner satisfaction than the other environments. Zhang et al. (2006) concludes that interactivity is valuable when it comes to learning effectiveness. The participants were 138 undergraduate students from a large university and none of participants had any previous experience with e-learning (Zhang et al. 2006). Interactive videos in education will also be discussed in section 5.1 and throughout.
2 Problem Definition

As of 1 July 2018, teachers in Sweden must implement programming in everyday teaching (Regeringen 2017). First, they need to educate themselves on the subject so that they in turn can educate their students. To make the teachers understand and learn how to program is something that both the Kronoberg Region and Linnaeus University (Smålänningen 2017) wants. Studies show that interactive videos increase the education results in school (Zhang et al. 2006). In the course ‘Introduction to programming for public school’ (Linnaeus University 2018) the teachers must illustrate to the examiner that they are learning how to program. They show this through short self-made videos. The videos are recorded and produced by the teachers themselves.

This study is about finding out if one can enhance an already existing video clip website with the aid of online editing and added interactivity. By providing the teachers with editing possibilities they can create their own videos containing multiple cohesive clips on a subject of their choice. This will eliminate multiple tabs of long video clips where only small portion of each clip is intended to be shown to the class. The interactivity becomes a two-way communication between the teacher and his or her students, for example, the teacher can put out clickable answers for the students to a question that pops up at a specific time (Kolås 2015). This will hopefully yield a better learning performance than the traditional classroom environment (Zhang et al. 2006; Merkt et al. 2011). A free, easy-to-use, and ad-free website providing these features is yet to be found. The interactivity is an important part of e-learning and the most effective way of using e-learning is to use it together with the ordinary classroom according to Alzahrani & Ghinea (2012). The goal is not to compete with the classroom and the physical teacher, but to create something complementary to their teachings. Nowadays, teachers may avoid new technology since it takes time to learn how to use it, time to plan and time to teach their students (Wachira & Keengwe 2010). Therefore, when designing for teachers, it is important to create a product that teachers would want to use and is also easy to use.
3 Research Questions

The question formulation was created from four keywords which all are central for this study. These four keywords are interactive videos, teachers, interface design and, online editing. With these keywords, three research questions were formulated. One broad and general question. From the broad question two sub questions emerged.

The broad question is:

- How can a web-based video editing tool with interactivity opportunities for teachers look like and work?

The two sub questions are:

- What elements are needed in an interface, making teachers able and willing to edit interactive online videos?
- What interaction factors can teachers use and what factors do teachers want to use to present data through online videos?

The first question is about how a service for teachers can be created through graphic design and interface design. The second question is about how teachers can present assignments and tasks through interaction design. Both questions are with regards for the teachers in that teachers are taken into consideration.

4 Limitations

The service could potentially be applied to multiple different usage areas such as medicine, arts, communication, science, and other organizational areas. All the areas mentioned above share similar interests: teach, educate, and learn new technology, new subjects, and so forth. Since the service has the potential to be this extensive, it would require a lot of workforce and time that is not available as of now. Therefore, the service is limited to middle school, intermediate and high school teachers who are interested in new e-learning technologies. The service itself will only be presented as a prototype with no programming involved, the focus in this study is on the design, usability, and potential features towards teachers.
5 Theory

This section presents relevant research that affects the study and compares various video clip websites that offers educational videos.

5.1 Relevant Research
In this subsection relevant research that affects this study will be presented.

5.1.1 Flipped Classroom
The notion of ‘flipped classroom’ is closely related to interactive videos and video editing as the usage of videos in a flipped classroom is a prominent feature. A flipped classroom is when a traditional lecture is moved out of class time and replaced by interactive activities that are intended to entice active learning (Abeysekera & Dawson 2014). The teacher provides the students with a lecture or instructional content in preparation for the class, that the students are required to watch as homework (Roehl et al. 2013). This is accomplished through the use of Internet and computer technology. According to David Raths (2014), when using interactive videos in a flipped classroom, it is important to make them short, divided into sections with a table of contents, and interactive elements.

5.1.2 Interaction Variations
As mentioned earlier in section 1.2, there are many different interaction elements that could be added to a video to make it interactive. Some of the basic interaction elements are play, stop, pause, change of speed and reversing (Schwan & Riempp 2004; Li et al. 2015). As mentioned earlier, more advanced video interactions could be videos with link and or link chains, videos with interactive 3D-objects, videos with interactive maps, or videos with interactive quizzes (Kolås 2015). According to Li et al. (2015), Massive Open Online Courses (MOOC) are classes that are distributed online that features quizzes, video lectures, tutorials, discussion forums etc. Videos are central within MOOC, and the different type of interaction that can be applied to the videos varies.
5.1.3 Head Mounted Display (HMD)

When participating in e-learning or watching interactive videos, one might want to change the speed of a video for various reasons. Sunghyun Song, Jun-dong Cho, Jeong-ki Hong, Andrea Bianchi and Ian Oakley (2015) published a paper: ‘Automatically Adjusting the Speed of E-Learning Videos’, where they describe a system that varies the playback in response to the viewers needs or activities. Song et al. (2015) created a head tracker that can distinguish seven different head postures. Each head posture represents a different state in which they believe the one being tracked might be in. These ([x]) are the states: when the user is sitting normally [1] the video plays at original speed (1x) but when the user is looking forward and down [2] the video playback is at 0.8x speed, because the user is presumably taking notes. If the user moves closer to the screen the user is in a state of focus [3] which pauses the video, if the user moves further from the screen, e.g. reclines, the user is skimming [4] and the playback speeds up to 1.2x. The user is distracted if looking sideways according to Song et al. (2015) [5] and the playback slows down to 0.8x. If the user is looking entirely away from the screen [6] the playback pauses. If this remains for 5 seconds or more the video automatically rewinds 15 seconds. This last state is called wait state [7]. This technique could be used in future work for the study as a next step of interaction.
5.2  Video Clip Websites with Educational Videos

Today, there are many video clip websites on the market, and they all try to niche their platform to a specific area. Some might say that Vimeo focus on videos with high quality and YouTube focus more on the common person. There are also a lot of video clip websites that are focused on education in some sort of form. These are amongst others: SkillShare, LinkedIn Learning, Khan Academy, Clipper, and TeacherTube. Even though there are a lot of video clip websites, the market for a video clip website that offers online editing and a variety of interactive opportunities is still lacking. This section is about comparing some video clip websites that offers educational videos to gather inspiration and ideas for the study. At the end of section 5.2, there is a comparison table between the different video clip websites. The comparison is regarding quality, speed, cc, transcript, annotations, editing, and price which will be explained further at the end of this section.

5.2.1  Vimeo

Vimeo describes itself as “the world’s best community for video creators” (2018). The website offers a search function where around 330,000 results are presented when using the search term “education”. These results do not just represent educational videos since it covers all categories, everything from food to arts and design. None of the categories are directly related to education and learning. If using Vimeo Plus, Vimeo Pro, or Vimeo Business, there are some interaction tools available (2017). Through these tools one can add cards to a video that links to things related to the video. The cards consist of a headline, link (if needed), description, and thumbnail.

5.2.2  YouTube

YouTube’s goal is, according to them, “to provide everyone with a voice and a way out in the world”. They believe in four core principles: freedom of speech, freedom of communication, the opportunity to succeed, and belongingness. The search term “education” provides 27,000,000 results. The first result is #Education which is a YouTube channel created by YouTube themselves called YouTube EDU (short for education). YouTube EDU was created on 23 January 2014 and has over 10,000,000 subscribers (as of 26 April 2018). The playlist #Education has over 755 videos and is provided by various acclaimed YouTube channels such as TED-Ed, Vox, National Geographic, TED, and more. All the videos are categorized in grade, level, and or subject.

https://vimeo.com/
https://www.youtube.com/
5.2.3 **SkillShare**
SkillShare\(^3\) describes itself as an online learning community with thousands of classes in design, business, tech and more (2018). They have over 20,000 classes and they are categorized as: creative, business, technology, and lifestyle. They offer projects that the students use throughout the class. The teachers on the website have profiles where the students can get to know them better and see what classes they are teaching and what projects they have made. One of the things that differs SkillShare from the other websites is that it is possible to add notes to the timeline. The note is at a chosen timestamp and reveals itself if hovering over it, (see Figure 1). This is something that SoundCloud is making use of as well but with audio files instead of video (2017).

![Figure 1. The note element of SkillShare as seen on the preview window. This particular example is a comment popping up at a specific timestamp from someone who is watching the video.](image)

5.2.4 **LinkedIn Learning**
LinkedIn Learning\(^4\) is a website concentrated on learning and education. It is an affiliate to LinkedIn, which is the world’s largest professional network (2018). The search bar on LinkedIn Learning differs from Vimeo and YouTube which say, “Search videos, people and more” or just simply “Search”. Instead, LinkedIn Learning encourages people to “Search for skills, subjects or software” in their search bar. The website is solely focused on learning and teaching and has clear instructions on how to participate in a course. Their content provides different chapters for a course with different sections within each chapter. LinkedIn Learning supplies the learners with a transcript that is clickable, (see Figure 2). A piece of text links to a specific time in the timeline of the clip. In comparison to Vimeo and YouTube, LinkedIn Learning provides exercise files, which one can use to follow the steps provided in the video.

\(^3\) [https://www.skillshare.com/]
\(^4\) [https://www.linkedin.com/learning/]
Figure 2. The contents and transcripts of LinkedIn Learning. When watching the video parts of the transcript text gets highlighted, showing what is being said.

LinkedIn Learning offers three main categories: business, creative and technology. In every main category there are three sub categories: subject, software, and learning paths. The business category is focusing on things related to business, so a subject would for example be marketing, a software Office 365, and a learning path: become a manager.
5.2.5 Khan Academy

Khan Academy\(^5\) has similarities with LinkedIn Learning, in that they are solely focused on teaching others various subjects. They offer practice exercises, instructional videos, and personalized learning dashboard (2018). Khan Academy is mostly directed at mathematics but have many other categories on their website such as science & engineering, computing, arts & humanities, economics & finance and “test prep”. It is worth to mention that Khan Academy is completely free and relies on donations and volunteers. Their interface (see Figure 3) has a lot of similarities to LinkedIn Learning. The content is to the left side with chapters and subsections and the transcript is underneath the video with clickable text that links to the timeline. One of the differences between the two is that on Khan Academy the time shows before the transcripted paragraph.

![Figure 3. The interface of Khan Academy showing the transcript of a video with time on the left of the text. To the left is the content, like that of LinkedIn Learning.](image)

5.2.6 TeacherTube

The goal of TeacherTube\(^6\) (2018) is to provide an online community for sharing instructional videos. One thing that differs TeacherTube from the other video clip websites is that they provide audio and document files besides videos. The videos on the website are categorized in subjects and or grade level. The service is free for everyone, but it is riddled with advertisements. The first thing that pops up when entering the website if using an ad blocker, which removes advertisements, is a message suggesting turning off the ad blocker. One the homepage there are four ad slots. An ad slot is a specific section of a webpage that is made for placing advertisements. In comparison, YouTube who also relies on ads, uses the ads before a video or within a video if it is long video. This is something that TeacherTube also has on their website beyond their normal ad slots. When watching a video there is

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\(^5\) [https://www.khanacademy.org/]

\(^6\) [https://www.teachertube.com/]
an ad before the video and besides that there are nine more ad slots divulged on the website. With this said, the ads can be removed by creating an account and login.

5.2.7 Clipper
Clipper7 (2016) is an online video editor, which provides a search function for YouTube videos. Their slogan is: “Making video and audio as easy to work with as text”. On Clipper one can search for a video clip via YouTube and then record a section of that clip to make a new, shorter clip. This can be helpful when e.g. a teacher is going to show the class a small portion of a long clip. Clipper is unlike the other video clip websites as it is more focused on the user to create their own content.

5.2.8 Comparison Table
The comparison table (see Figure 4) consisted of several interaction elements. The interaction elements that were compared and an explanation of each:

- Quality – can one change the video quality
- Speed – can one change the speed of the video
- CC – closed captions, subtitles mainly for hearing impaired audiences
- Transcript – text of what is being said in a video, sometimes clickable with links to the section where it is being said
- Annotations – (annotations), notes, and cards that can be displayed on a certain timestamp on the video itself, sometimes clickable with links
- Editing – can one edit the videos
- Price per month (in ~SEK) – how much SEK does it cost approximately each month

Since many of them were available on many websites it was decided to just show what differed between the websites instead. The interaction elements that were available on all the websites were: play, stop, pause, volume, scrolling (to change the place of the playhead in the timeline of the video), and full screen mode.

<table>
<thead>
<tr>
<th></th>
<th>Quality</th>
<th>Speed</th>
<th>CC</th>
<th>Transcript</th>
<th>Annotations*</th>
<th>Editing</th>
<th>Price per month (in ~SEK)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vimeo</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>0–$25</td>
</tr>
<tr>
<td>YouTube</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Free</td>
</tr>
<tr>
<td>Skillshare</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>75</td>
</tr>
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<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>300</td>
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<tr>
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<td>Yes</td>
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<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Free</td>
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<tr>
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</tr>
<tr>
<td>Clipper</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Free</td>
</tr>
</tbody>
</table>

*Annotations = notes, cards or annotations that can be displayed on a certain timestamp

Figure 4. Comparison between interaction elements on different video clip websites. The color differences are mainly there to distinguish the video platforms from each other.

7 https://clipperdev.com/
6 Methodology & Implementation

The methodology process can be shown in Figure 5. First, a literature search was conducted. From this research the first list of requirements for the prototype was made. The next step was interviews with experienced teachers and teacher students. Three out of four participated in an observation for the website Clipper. The second list of requirements was created from the interviews and observations. By combining everything gathered up until prototype 1.1, prototype 1.1 was created. Some minor modifications were made on the prototype thus creating prototype 1.2. Prototype 1.2 was the one being used for the usability tests and questionnaire. The usability tests and questionnaires led to more requirements, beginning of a new prototype, and future work.

6.1 Literature Search
To get a grasp of the extensive amplitude that is videos in education, a literature search was conducted. The literature search provides information on what research has been made on the topics and what methods were used. The literature search has been made on three different websites: “OneSearch” (Linnaeus University 2018), the all-in-one search service for Linnaeus University that includes the library and most of their databases, “Google Scholar” (2018), which is Google’s search service especially for articles, and “DiVA” (2018) that provides papers and student theses. The literature search is the base for the first list of requirements, which in turn is the base for the prototypes.
The search terms used for the literature search stemmed from the research questions along with synonyms and other words related to the search terms. These were the search terms that were used for the literature search:

- “interactive video”
- “interactive videos”
- “interactive videos” + “education”
- “video editing”
- “online video editing”
- “e-learning”
- “e-learning videos”
- “elearning”
- “elearning videos”
- “mobile learning” + “videos”.

To filter out irrelevant papers, three steps were followed. If a paper met the criteria of the first step the second step was then proved. A paper that met both the criterias was read thoroughly and registered. These were the criterias:

- Title must contain at least one of the search terms (can also be synonyms or another equableness)
- The abstract must indicate that the paper is mostly regarding the search term from step 1 or from one of the other search terms

Another method that provided papers for the study was by snowball sampling. According to Robson & McCartan (2016, p. 281) snowball sampling is e.g. when an interesting paper has been found that paper provides more interesting papers by cause of their references. The example Robson & McCartan (2016, p. 281) provides in the book is about people and their connection to other people from the same population of interest.
6.2 List of Requirements (1.1)
This is the first list of requirements gathered from a literature research, the second list of requirements, which is a continuation of this one, can be seen in subsection 6.4 List of Requirements (1.2). The full list of requirements that includes both the lists can be found in section 7.1.

Functional
- Ability to search for videos
- Ability to play videos
- Ability to pause videos
- Ability to change playback speed
- Ability to import videos
- Ability to edit videos
- Ability to add interactivity
- Ability to share videos
- Ability to share playlist
- Ability to create an account
- Ability to log in to account
- Ability to change password
- Ability to retrieve a forgotten password

Non-functional
- Works on desktops
  - Windows and Mac
    - Works on all major web browsers (Google Chrome, Mozilla Firefox, Internet Edge/Explorer, Opera)
- Works on mobile technologies
  - Laptops
    - Windows and Mac
  - Tablets
    - Android and iOS
  - Smartphones
    - Android and iOS
- Open Source
- Free
- Usable
- Secure
- Easy for teachers
- Understandable for teachers
- Teachers want to use it
- Teachers enjoys using it
6.3 Interviews

In the preliminary phase of the study, interviews were conducted on two teacher students and two experienced teachers. Experienced teachers have been mentioned earlier and will be mentioned throughout the methodology section and also in later sections. The definition of an experienced teacher in this study is someone who has worked with teachers and or has worked as a teacher for many years. Their main objective these days is to provide teachers with knowledge about technology which can be used in the classroom. They visit schools and give lectures and lend various technologies to schools. The main purpose with the interviews was to get an understanding of what extent the interviewees knew about and used e-learning and more specifically, interactive videos within their education and or working life. All the interviews were conducted with just one interviewee and one interviewer present.

All the interviews that were carried out were semi structured since the interviewer only needed to cover certain topics rather than strict answers to questions (Robson & McCartan 2016, p. 285-286) (see Appendix A for interview template). Robson & McCartan (2016, p. 290-291) argues that semi-structured interviews are most appropriate when the interviewer has a close relation with the research process, which was true in this case. Before the interviews took place, there was an agreement on where they should take place, what the topic was on, and a time estimation. According to Robson & McCartan (2016, p. 286) interviews can be time-consuming and will vary in length, it is unlikely that anything under half an hour would be of any value and anything going much over an hour might be troublesome for the interviewees. The interviewer followed the general advice for interviewers provided by Robson & McCartan (2016, p. 287) which are as follows:

- Listen more, speak less
- Questions should be put in a straightforward, clear, and non-threatening way
- Do not lead the interviewee to certain answers
- Try to enjoy the interview (or at least pretend to do)

As mentioned earlier, probes were used by the interviewer to get the interviewee to expand further on certain topics (Robson & McCartan 2016, p. 289). This was used whenever the interviewer felt that the interviewee had more to give.
6.3.1 Teacher Students

In this subsection, the interviewed teacher students will be presented along with the setting and setup for the interview.

6.3.1.1 The Interviewees

Interviewee No.1 (referred to as TSM1 = teacher student male 1)

- Male around 25 years of age
- Intermediate level teacher student
- Internship for 5 weeks at small country school
- Has studied 2 out of 5 years

Interviewee No.2 (referred to as TSM2 = teacher student male 1)

- Male around 25 years of age
- Specialist teacher student with focus on social studies and history
- Internship at two different high schools two times 5 weeks each time
- Has studied 4 out of 5 years

6.3.1.2 The Setting

The setting for the interviews with the teacher students was in a room with one camera and two microphones, since there is considerable advantage recording the audio in a research interview according to Colin Robson & Kieran McCartan (2016, p. 305). The interviewee was made aware of the recording and gave his agreement for being recorded before starting the session. The camera provided little value compared to the microphone and screen recording. In preparation for the interviews the idea was that the camera could catch expressions and movements that are not as translatable as just audio form. This was later proven to be wrong as the audio proved to be more than sufficient on its own. The camera could have contributed to a more serious tone and might also have made the interviewees nervous, which is not something that was striven after. Since both the interviews were taking place consecutive there was no time in between to see if the camera recording was useful or not. In hindsight the recording with the camera worked as a backup. The interviewer took notes on his laptop and asked questions and, if necessary, follow-up questions simultaneously along with various probe techniques (Robson & McCartan 2016, p. 289).
6.3.2 Experienced Teachers
In this section the interviewed experienced teachers will be presented along with the setting and setup for the interview.

6.3.2.1 The Interviewees
Interviewee No.3 (referred to as ETF1 = experienced teacher female 1)
- Female around 50 years of age
- Has studied junior school teacher, special pedagogy, digital tools, programming, and SKL-education
- Has worked at AV-Media for 8 years, worked in school for 20 years as a junior school teacher and as an intermediate level
- Has a job within adult education

Interviewee No.4 (referred to as ETM1 = experienced teacher male 1)
- Male around 65 years of age
- Has studied intermediate level teacher, specialist teacher (mathematics, physics, chemistry, and technology), Bachelor of Arts in pedagogy.
- Has worked 20 years as a specialist teacher, 10 years as an education manager (Växjö Universitet), 10 years as an IT-pedagogue at AV-Media.

6.3.2.2 The Setting
It was conducted through Skype since that was the program they preferred. The screen and sound were recorded with OBS Studio. ETF1 was at work and the ETM1 was home. Both interviewees showed their face and used their microphones. Both were made aware of the recording and agreed to it before the session started.
6.4 Observations

Three observations were made on the website Clipper (2016). As mentioned in section 2: this study project is about finding out if one can enhance an already existing video clip website with the aid of online editing and added interactivity. Clipper was chosen because the ease of editing, their anonymity, and their linked search to YouTube. Since Clipper is in beta and has been since 2016, it may be unfamiliar for most people and especially teachers in Sweden who has not actively searched for a website like Clipper. A discussion with the developers made it possible to have a direct link to the Clipper team if there were to be any issues. Clipper is free, ad-free and does not require users to create an account.

The participants for the observations were TSM1, TSM2 and ETM1. The main goal with the observations was to figure out what the teachers thought about using interactive videos as a teaching and learning form and what was needed for them to be using that. A secondary goal was to expand or modify a list of requirements.

As mentioned earlier, semi-structured interviews are used for flexible designs. The same goes for participant observations (Robson & McCartan 2016, p. 319-320). The observations with TSM1 and TSM2 were done in a room with just the observing and the one testing the tool. TSM1 and TSM2 used a Lenovo laptop and a web browser that they were familiar with whilst being recorded via webcam and microphone as well as the screen. Loom (2018) (see Figure 5) was used to record the two observations since it has been used with success before. This is how the observation looked like when one of the teacher students tested Clipper (2016).

![Figure 6. Observation on Clipper using Loom as a recording service as seen in the bottom left corner. The participant has added two clips to his cliplist and has also given them titles and descriptions.](image-url)
The third observation on ETM1 was conducted through Skype, where ETM1 shared his screen and the one observing recorded the screen using OBS Studio (2018). All the observations had the same tasks. The tasks were:

- Navigate through Clipper (2016)
- Create a project
- Create a cliplist (playlist)
- Create a clip
- Share the playlist

Whilst navigating, the participants used the think aloud method to express their feelings and thoughts about the service and tasks. The think aloud method offers a better understanding of how and why someone is doing something. All participants agreed before the session started to be recorded.
6.5 List of Requirements (1.2)
This list of requirements is showing what has been added to the list after the interviews and observations. The first list of requirements is not included in this version of the requirements. See subsection 6.2 List of Requirements (1.1) for the first list of requirements. The requirements are divided into two groups: functional and non-functional. Preece, Rogers & Sharp (2015) describes functional and non-functional requirements within software engineering. Functional requirements are something that the system should do, and non-functional requirements are the constraints there are on the system.

**Functional**
- Ability to comment on videos
  - Ability to comment on a specific timestamp
- Ability to make annotations
  - Ability to make multiple annotations on a specific timestamp
  - Ability to make a link as an annotation
- Ability to add images
- Ability to make a detailed timeline
  - Chapters
  - Subjects
  - Links
- Ability to record oneself
- Ability to make transitions
- Ability to drag the playhead as you wish in the timeline to get to a specific time
- Ability to see a timeline for the cliplist (playlist)
- Clear instructions
  - Video and or text that explains:
    - How to create project
    - How to create cliplist
    - How to search clip
    - How to add clip
    - How to record
    - How to adjust time frame
    - How to add title
    - How to add information / description
    - How to add tags / keywords and what the purpose is
    - How to share cliplist
- Clear visibility
  - How long a clip is
  - Where on the timeline one is placed and what time that is
  - Youtube
    - Length
    - Like ratio
    - Views
    - User (uploaded / added by)
  - What is clickable
  - What is draggable
• What is an image
• What is editable
• Clear difference between project and cliplist
• Clear difference between keyword search bar, source bar and search bar
• Clear difference between ‘update clip’ and ‘save as new clip’
• Clear difference between ‘keywords’ and ‘tags’
• Clear difference between record/stop button and the two timespans
• Clear search bar and button
  o Use of enter to “send” data (e.g. search word)
• An edited clip should only show the timeline of the new clip

6.6 Prototypes
Prototypes were created because they answer questions about requirements, feasibility and give ground for usability tests (Preece, Rogers & Sharp 2015). The prototypes created for this study were focused on the design rather than backend and or programming. Prototypes were created based on background research, literature search and requirements gathering. The prototypes have been created with Adobe Photoshop and Adobe XD. These softwares are the state of the art in the industry for graphic and UX design.

6.6.1 Prototype 1.1
The prototype was created with the list of requirements as a guideline. The first prototype (see Figure 8) is a modified version of Clipper (2016, see Figure 7) with boxes showing where elements could be located.
Figure 7. The interface of Clipper showing project, cliplist, preview window, recording button, search bar, description, title, and tags.

Figure 8. The first prototype showing a cliplist, editor window, preview window, second timeline, and search bar.
The focus of this prototype is on placements and sizes of various objects. The boxes are showing different areas of the prototype. To the left there is a cliplist, to the right there is an edit section for a video clip, on the bottom there is a second timeline for the whole cliplist with interaction elements in it, the top shows a search bar.

6.6.2 Prototype 1.2
The second prototype is about the looks and feel of the website (see Figure 9). The changes that has been made are due to the gathered data from the interviews, observations, second list of requirements and prototype testing of the first prototype. This prototype was inspired by the educational community ClipIt.

![Figure 9. The second prototype.](http://clipit.es/landing/)

6.7 Usability Testing
Usability tests were conducted to see how the teachers performed on typical tasks (Preece, Rogers & Sharp 2015). Usability tests can help developers understand usability issues that would otherwise be difficult to glean through more ordinary ways such as reading reports or listening to presentations. The focus of the test was mainly on finding out if the teachers found the interface of prototype 1.2 easy to use. The participants were assigned tasks that they were to accomplish on their own. While performing the tasks they used think-a-loud so that the interviewer could get a better understanding of what they were doing and why.
6.7.1 Participants
The teachers participating were TSM1, TSM2, and ETF1 from the interviews and the observations. Other than the participants mentioned, three more teacher students (TSM3, TSM4, and TSM5) and four more experienced teachers (ETM2, ETF2, ETF3, and, ETF4) participated. There were no more than two people present at every test. One was conducting the test (interviewer) and the other one was testing (interviewee).

6.7.2 The Setting
All the tests with ETFX were issued at their workplace at a time, date, and location of their choice. A laptop was provided, which they all could control without any problem. The laptop recorded the screen and microphone with OBS Studio.

All the tests with TSMX were issued at Linnaeus University at a time, date, and location of their choice. A laptop was provided, which they all could control without any problem. The laptop recorded the screen and microphone with OBS Studio.

All recordings were approved before the sessions started.

6.7.3 The Tasks
The first usability test was on Clipper, and the second on prototype 1.2. Since prototype 1.2 is an altered version of Clipper it was important to get the participants to understand the concept of Clipper first, so that they later could understand the potential of the second prototype.

6.7.3.1 Clipper
- Read the description at the homepage carefully
- Create a project
- Create a cliplist
- Search optional clip
- Create two shorter clips (either from the same source video or two different ones)
- Give the clips a title and description
- Add the clips to the cliplist
- Share the cliplist

6.7.3.2 Prototype 1.2
- Look around
- Click what is clickable
- Try to explain what is showing
- Try to explain how X would work potentially
- Think-aloud all the time
6.7.3.3 Questionnaire
After the participants had tested both Clipper and prototype 1.2 they completed a questionnaire (see Appendix E). In the questionnaire they answered questions about how well they understood the website and prototype by showing certain aspects of the services. At the end of the questionnaire there was a question regarding the feasibilities of prototype 1.2.
7 Results

This section comprises the results from the methodology section. The results are shown in order from when the first data gathered to the last data gathered. Excluded in this section is the literature search since that has already been covered in section 6. In total there were 27 unique data gathering situations with 11 unique participants (see Figure 10). The students who were participating were all teacher students at Linnaeus University in Växjö. The experienced teachers as mentioned earlier were working at AV-Media Region Kronoberg and Mot Nya Höjder.

![Number of participants for every data gathering method](image)

**Figure 10.** Chart showing number of participants for every method.
7.1 Requirements
From the literature search, interviews, and observations two lists of requirements were made. Previously in the methodology and implementation chapter there are two list of requirements listed. In this section the entirety of both list of requirements will be presented, divided in two sections: functional and non-functional.

Functional
- Ability to search for videos
- Ability to play videos
- Ability to pause videos
- Ability to change playback speed
- Ability to import videos
- Ability to edit videos
- Ability to add interactivity
- Ability to share videos
- Ability to share playlist
- Ability to create an account
- Ability to log in to account
- Ability to change password
- Ability to retrieve a forgotten password
- Ability to comment on videos
  - Ability to comment on a specific timestamp
- Ability to make annotations
  - Ability to make multiple annotations on a specific timestamp
  - Ability to make a link as an annotation
- Ability to add images
- Ability to make a detailed timeline
  - Chapters
  - Subjects
  - Links
- Ability to record oneself
- Ability to make transitions
- Ability to drag the playhead as you wish in the timeline to get to a specific time
- Ability to see a timeline for the cliplist (playlist)
- Clear instructions
  - Video and or text that explains:
    - How to create project
    - How to create cliplist
    - How to search clip
    - How to add clip
    - How to record
    - How to adjust time frame
    - How to add title
    - How to add information / description
    - How to add tags / keywords and what the purpose is
    - How to share cliplist
• Clear visibility
  o How long a clip is
  o Where on the timeline one is placed and what time that is
  o Youtube
    ▪ Length
    ▪ Like ratio
    ▪ Views
    ▪ User (uploaded / added by)
  o What is clickable
  o What is draggable
  o What is an image
  o What is editable
• Clear difference between project and cliplist
• Clear difference between keyword search bar, source bar and search bar
• Clear difference between ‘update clip’ and ‘save as new clip’
• Clear difference between ‘keywords’ and ‘tags’
• Clear difference between record/stop button and the two timespans
• Clear search bar and button
  o Use of enter to “send” data (e.g. search word)
• An edited clip should only show the timeline of the new clip

Non-functional
• Works on desktops
  o Windows and Mac
    ▪ Works on all major web browsers (Google Chrome, Mozilla Firefox, Internet Edge/Explorer, Opera)
• Works on mobile technologies
  o Laptops
    ▪ Windows and Mac
  o Tablets
    ▪ Android and iOS
  o Smartphones
    ▪ Android and iOS
• Open Source
• Free
• Usable
• Secure
• Easy for teachers
• Understandable for teachers
• Teachers want to use it
• Teachers enjoys using it
7.2 Interviews
The interviews (see Appendix A for questions) with TSM1, TSM2, ETM1, and ETF1 contributed with useful data that resulted in approximately four hours of recorded material. The data collected from the interviews contributed with requirements.

7.3 Usability Testing & Questionnaire
In this section the results from the usability testing and questionnaire will be presented. The most deviated and or relevant answers will be presented here, see Appendix D to find all the answers (in Swedish). The usability testing and questionnaire resulted in more potential requirements for a new prototype that will not be presented in this study but will be considered for future work. All the answers in this section are translated from Swedish to English. The translations are being as close to the original as possible.

There were seven questions regarding Clipper and eight regarding ClipIt. All the questions concerned how well the participants understood the two services. Four of the questions for both services were on the same subject which made it easier to compare answers. These subjects were regarding playlist, search bar, video window, and recording box. The questions for Clipper besides those already mentioned were regarding search results and tags. The questions for ClipIt besides the ones already mentioned were regarding interaction, editing window, timeline, and the last question was an open ended one regarding the prototype. Firstly, the answers from the four questions will be presented. The answer presented here are mainly focusing on what the experienced teachers said since they are the most invested in the subject and knows what the teachers would like and or understand.

7.3.1 Playlist
The playlist or “cliplist” is a prominent feature on both services as it is the place where one can find the various clips that has been cut out from longer videos. As mentioned earlier, only the most deviated answers will be presented in this section.

7.3.1.1 Teacher Students
Starting with Clipper, the teacher students had a convincing understanding of the playlist except for one who did not seem as perceptive as the others. This is what the student had to say regarding the playlist:

“I think what is being marked are different examples of what types of clips one can do with the program, I would guess.”

A more confident answer provided for this question was:

“The marked spot shows the playlist with clips and in what order they are in.”

Moving on to ClipIt. The teacher students were confident with their understanding here as well except for one who had this to say regarding the playlist of ClipIt:

“Information videos and or instructions on ClipIt's various features.”

Another student said this:
“It’s your cliplist. The clips in the list will be played in that order. You can also see the length of each clip.”

7.3.1.2 Experienced Teachers
The experienced teachers had a better understanding of Clipplers playlist than the teacher students. They all comprehended what it was and its purpose. This is what one of the teachers said:

“Here you can see the clips I have created and selected to save in this project.”

The playlist on ClipIt was not as understandable as that of Clipper but they still had a grasp on what it was for. Two of the experienced teachers made a connection to the timeline:

“Here you can see the clips in the order as they are shown in the timeline.”

“The clip should start playing [when clicking on it] and the marker in the lower horizontal “player” should show where are.”

7.3.2 Search Bar
The search bar is one of the most important features on both services as it is where one can find videos to create short clips from. The difference regarding the search bar of both services were quite noticeable.

7.3.2.1 Teacher Students
It was not hard for the teacher students to understand the search bar of Clipper. Some of the teachers did not like that one has to click on the YouTube logotype to make a search instead of just pressing enter. Here is what two of the teacher students had to say regarding that:

“It was a little difficult to understand that you were supposed to click on the YouTube symbol”

“Even though YouTube is a big base, it feels unnecessary and confusing to have a search bar that is based on that you can choose search engine by yourself when there is only one to choose from.”

The search bar of ClipIt was also understandable but not as understandable as that of Clipper. This is what one of the students had to say:

“It’s where you import original clips from YouTube. You should be able to paste a link or search in the [search] field.”

Another one said pointed out that it was a good feature that one can chose to search from multiple sources and another one did not understand the feature at all.

“It seems like a good idea to choose to search from several different sources.”

“Unclear what the purpose of the “service”-button is.”
7.3.2.2 Experienced Teachers
All the experienced teachers could use and understand the search bar on Clipper. They commented on the search procedure:

“I pressed on enter intuitively to initiate the search. But I was forced to use the button. Missing enter-search. Buttons for other video platforms [besides YouTube], perhaps. And in that case, maybe a search for all platforms.”

“You type in what you would like to search and then you click on the YouTube button. It would have been clearer if it would have been a button that said “search”, for example.”

The experienced teachers understood the search bar of ClipIt and its functionality. One hinted to the lack of affordance on Clipper:

“[It is a] Search bar where I write my keywords. The search starts auto”magically” or with Enter.”

7.3.3 Video Window
This is the window that shows the video that is about to be edited and or playlist.

7.3.3.1 Teacher Students
The teacher students provided answers that proved their understanding of Clipper’s video window.

“It’s the window where you can see the clip. You can enter full screen mode in longer clip so that it’s easier to click on the part you are interested in cutting out.”

“It’s the window where the video is being shown. You can watch the video in its entirety here.”

Similarly, as Clipper, there was no problem in understanding ClipIt’s video window.

“It shows what clip you are watching and at what time you are on. Maybe you could add a sound function where you can adjust the volume.”

7.3.3.2 Experienced Teachers
Clipper’s video window was easy to understand according to the answers the experienced teachers gave.

“Preview window for chosen clip.”

“This is where the chosen video is being played. You can choose time for start and stop.”

ClipIt’s video window yielded similar results to that of Clipper’s. Although, one of the answers was difficult to comprehend and did not give any valuable data. The question “What is this? Is there a need for any change?” was regarding ClipIt’s video window that was shown in a picture. The answer for this question was simply put:

“No.”
Contrary, another experienced teacher answered:

“Preview window to look at chosen clip. Opportunity to add transitions, footnote etc.”

7.3.4 Recording Box
This is the box where one can record a section of a video. For this section the participants were to explain all the elements present in the recording window.

7.3.4.1 Teacher Students
All the teacher students except for one could explain what was being shown in the example for Clipper. This is what that one teacher answered:

“A link to share specific clips in a list.”

Here is an answer from another teacher student:

“[The] Source is from what clip you are watching. The second box is the start time from where you begin to record. The third box is what end time the clips you have recorded are or what time you are on. The first box is a record button that you click on to start record, it is also a stop button while recording. The long box is a link to the specific recording. The last button is a button to copy the link.”

The recording box of ClipIt was understandable according to the teacher students. Some were clearer with their response. Here are two examples, one not so clear and one clear:

“You click to start recording.”

“Furthest to the left is where you start and stop your recording. I think the box in the middle was an info box. The last two boxes show start and stop time.”

7.3.4.2 Experienced Teachers
The experienced teachers could explain all the presented elements for the recording box on Clipper.

“Record button, source for the original clip, time for started recording, time for finished recording, link to the created clip.”

The experienced teachers could explain all the presented elements for the recording box on ClipIt as well. They could not explain the elements as thorough as they explained the elements of Clipper’s recording box.

“You click to start recording.”

“This is where you adjust what part of the clip you would like to record (start and stop). You record by clicking on the red button.”

7.3.5 Project vs. cliplist
This question is solely about Clipper. The question was to explain the difference between a project and a cliplist (playlist).
7.3.5.1 Teacher Students
This one was hard to explain for the teacher students as two left answers that were quite unclear. This is what one of the teachers answered:

“I think it is the difference between what programming you are doing and what object you are working on. It does not benefit me personally, but it is clear they are two separate things.”

“The difference is that I have created the one at the bottom while the is some sort of “common area” where all clips are being saved. Clear and simple.”

7.3.5.2 Experienced Teachers
The experienced teachers provided a similar result as the teacher students. Three of the five understood it clearly.

“The upper row is the chosen project and the lower one is the cliplist you have chosen.”

This is what another experienced teacher answered:

“I guess that the upper row is the overall name for the list. The other one is the first added clip. But I’m not sure!”

7.3.6 Tags vs. keywords
This question is solely about Clipper. The question was to explain the difference between tags and keywords.

7.3.6.1 Teacher Students
The teacher students understood what it was and difference between the two. One of the teacher students was uncertain in the answer but understood it correctly:

“I’m not sure about the upper one. The lower one is a box where you can create tags. I guess the upper one is a box where you can search for tags.”

7.3.6.2 Experienced Teachers
The experienced teachers provided shared a similar understanding as the teacher students, although two of the answers were vague:

“Keywords for the finished video clip??”

“The upper row is where you search after keywords in a clip. The lower row I think you’re searching for tags in selected clip?”

7.3.7 Editing Box
This question is solely about ClipIt. The question is regarding a box where one can edit title, description, tags and more.

7.3.7.1 Teacher Students
All the teacher students understood what it was.
“After you are finished with your edited clip in the program, step two is to name and write description about your clip.”

“It’s the box that I can fill in by myself. What’s the name of the clip? How do I describe it? What tags and keys? Which link? Also, from what timeframe the clip is taken.”

7.3.7.2 Experienced Teachers
The experienced teachers provided answers that indicated that they understood the editing box.

“Box to put in title, information about the clip, tags, overview of the full length and the selected length for the clip.”

“Here you can see or write title and description. A clear and well reference.”

7.3.8 Interaction
This question is solely about ClipIt. The question regards what sorts of interactions one can do on ClipIt.

7.3.8.1 Teacher Students
All the teacher students could explain what was being shown except for one who answered:

“Don’t know.”

Another student answered:

“It is questions you can add the movie. I think it looks good and apparent, but I could not create anything. It also seemed like it was possible to add comments and animations in the clip.”

7.3.8.2 Experienced Teachers
The experienced teachers understood what the purpose was.

“A box where you add your questions, transitions and footnotes.”

“Annotations [questions] that pops up in the movie that you can answer.”
7.3.9  Last Question
In this section an excerpt of each answer from the open-ended question regarding CliplIt will be presented.

7.3.9.1  Teacher Students
The question in question: “Do you see any use of prototype number two [ClipIt] in your role as a teacher?”

1: “Yes, you can show the students a coherent clip about the same subject. You can cut together a clip to illustrate a problem or phenomenon from society. It’s simple and clear which makes it possible to use by the students for presentations or similar. This prototype signals clarity and simplicity which would enable students to pull it off by themselves. Clips are always good in education and therefore it is good with a program where one can make his own clips.”

2: “There really is a use for the program (even the first one) [Clipper] in the teaching profession. The smooth part about is that you can collect relevant information from a big pool of clips from different sources and then channel those for the selected scope of work. There are several amateur movies that have been edited by people who spend maybe 80 % or so on talking about irrelevant things.”

“It is great to have annotations in the cliplist to create a more interactive walkthrough thus making the students more involved. It will require some inventory of what's actually available on YouTube, Vimeo and so on but after that, the tool will be incredibly useful in the classroom.”

3: “I see areas of use for this, for sure! I think it would have been a good to either hand out as homework or use in the classroom. I think it is great that you can add information and questions in the clip. It would be great if it could be possible to see what the students answered to the questions.”

4: “The second prototype was a lot clearer and better than the first tool. Yes, it can be useful to be able to shorten videos or just pick out a certain section from a documentary, or such, to show the students. Functions such as footnotes and questions are good to use. Instead of pausing the video you can just use some of those functions for the sake of the students. Anything to make it clear and favor the students.”

5: “...that would be useful in a classroom where I want to show several scenes and clips. There could also be some sort of quiz where the students can choose, via text fields as the video keeps going in the background. That could make the watching more informative and educational because the students then have to pay more attention to what is happening.”
7.3.9.2  Experienced Teachers

The question in question: “Do you see any field of application for teachers? How could they use it in the classroom?”

1: “To be able to interact with your students through a film you send out is to raise the functionality of “flipped classroom” a few bars. … I see use in all areas.”

2: “Definitely in all areas of education. Both as studying material and test material.”

3: “To be able to use different videos to highlight something on to get the students to ask questions/answer questions is really interesting. Not sure how the answers to the questions in the clip will be represented.”

4: “Absolutely! Very useful in schools.”

5: “To be able to create questions and other comments in videos. It could be for example explanations or concepts. Videos that the students can later watch several times to learn. Good for students who learn through listening as well as doing. Students with a different native language may have translations in the comments, for example concepts or short summaries. Also, to describe what to look at in the video.”
8 Implementation of Prototype

In this section the implementation of the final prototype will be presented.

8.1 Design

The design of the prototype will be presented in two categories: colors and shapes. The final prototype can be seen in figure 11. To the left there is a cliplist featuring various clips named accordingly with the time for each clip presented. To the right there is an edit window where one can add a title, description, and tags to a created clip. There is also information showing the original source, original full length and the clipped section. The prototype was designed in Adobe Photoshop and Adobe Xd.

![Figure 11. The final prototype showing various elements.](image)

8.1.1 Colors

The colors used for the prototype originated from the ClipIt logo (see figure 12).

![Figure 12. The ClipIt logotype.](image)

The sharp red color was used sparingly since it is such a distinct and popping color. It was therefore only used as an accent color. The red color is featured on the record button and in the timeline at the bottom showing on what time in the timeline you are located. The dark yellow can also be perceived as a distinctive color and was also used sparingly. It is only featured in the bottom timeline for the annotations. The blue color is the main color of the whole prototype since it is the color that is most in focus on the original ClipIt website. Different tints and shades of the blue
color were used throughout the prototype to put focus or not put focus on various areas. Beyond the colors from the ClipIt logotype, white, grey, green, and a gradient of white were used as well.

### 8.1.2 Shapes
All the shapes are geometrical because that is what is most common in a computer environment. The shapes used stem from rectangles, triangles, and circles. The search button was made by applying a shadow underneath a rectangle to make it protrude and look clickable. The two dropdown menus have a small rectangle with a triangle pointing down in the top left corner.

### 8.1.3 Lines
Lines were used to make distinctions between different areas and or objects. They are most noticeable and used in the bottom timeline.

### 8.1.4 Typography
The two typefaces used for the prototype are Futura PT and Arial. They are both sans-serif typefaces which is suitable for a computer environment. The chosen typefaces are inspired by the original ClipIt website.

### 8.1.5 Images
Images are used throughout the prototype to engage the user by imagery and not only by texts. It gives the prototype more personality.

### 8.2 Functionality
The functionality of this prototype is solely focused on click interactions that links to new scenarios (see figure 13). For this prototype there were 11 different pages that were linked. The one in the top left is the “homepage” that links to every other page which in turn links back to the homepage. Every line that is being shown (see figure 13) is a link from an object to a different page.

![Figure 13. All the links between different scenarios.](image-url)
The areas that are clickable in this prototype are the service dropdown menu to the left of the search bar, the projects dropdown menu above the playlist, and the interaction menu on the video window. The latter one was there to show an example of how one could edit different interactions for a video (see figure 14 and Appendix E).

**Figure 14.** Possible scenario for what would happen when you right click on your video window.

When clicking the service dropdown menu, one can choose what service one would like to make a search from (see figure 15).

**Figure 15.** In the top middle next to the search bar there are a selection of various services one can make a search from.
When clicking on the project dropdown menu, one can choose what project one would like to see (see figure 16).

**Figure 16.** In the top left there is an example of the various projects one can view.
9 Conclusion

In this section the answers to the research questions will be presented. The answers derive from the results of all the gathered data from the literature search, comparison of video platforms, interviews, observations, usability tests, and questionnaires. The final prototype and the full list of requirements could potentially be answers to the research questions, but this following section is the answers to the questions in text form and not in a list nor by design.

9.1 Research Questions

Q: How can a web-based video editing tool with interactivity opportunities for teachers look like and work?

A: According to the data gathered from all the tests this tool would need to be easy to use since teachers are varying in technology and creative skills. The tool can be easier understood if there are clear instructions on how to operate the tool. The editing process which is the principal element must be easy. That is why there is only one button to press when making a clipped section of a videoclip in the prototype. It should make the teacher feel secure so that they can provide content of their own and not be afraid to. It should be available on different platforms and in different browsers so that the teachers can use what they feel is the most comfortable setting. It should be free for use, multifunctional, and have access to a large video library.

Q: What elements are needed in an interface, making teachers able and willing to edit interactive online videos?

A: Something that was mentioned and tested positively was the use of two timelines. One timeline for the current clip and one for a whole playlist where one can see different interactions and transitions. Explanatory text fields are required where one e.g. can hover over a symbol and get an explanation of what that symbol is for. A search function where one can make a search from multiple video sources was sought after. Clear visibility for all elements is a requirement.

Q: What interaction factors can teachers use and what factors do teachers want to use to present data through online videos?

A: The participating teacher students and experienced teachers of this study mentioned that they could use annotations where one can add clickable questions and answers or links on top of a video. The teachers want to use clickable questions in their clips for students to answer while they are watching. Comments and footnotes are two other welcomed factors that can be used. Playlists can be used to present clips in a predetermined order. Transitions can be used to link together different clips.
10 Future Work

The next phase of this project would be to create a more functional prototype so that the teachers could get a better understanding of what sort of interactions that could be added to a video clip and how those interactions can be added. Instead of just clicked and linked based as the prototype is in its current state, the future prototype could provide IFTTT (if this, then that) and more technical scenarios.

One prominent feature that was in talks but not finalized for this thesis was a statistic page for the teachers. On this page teachers could see statistics for all the students showing what they have been doing, what they are going to do, and what they are currently doing. For example, student X have been watching the playlist on WWII and has answered correctly on all the questions so far. Something that has not been covered in this thesis is how the service could be adapted for people with disabilities such as impaired hearing or sight. The service is neither adapted for GDPR. It would be interesting to see how that would look like and work. Another feature was interaction through a microphone. Using a microphone, one can answer questions, “write” questions, comment, provide feedback etc. In section 5.1.3 an interactive head-mounted display was described as something to potentially be used in future work.
11 References

11.1 Papers / Journals


11.2 Books


11.3 Websites


Appendices

Appendix A Template for Interviews
(Translated from its original form in Swedish)

Introduction by interviewer

Name: X

Studying/working: X

Experience: X

Questions about e-Learning:

1. What different forms of e-learning do you know?
   a. Have you used any?
      i. What did you like the most/least? Why?
   2. How big or small impact do you think videos have within e-learning?
   3. Do you consider e-learning to be a competitor or complement to the teacher?
   4. How do you think the future of e-learning will look like?
      a. How do you think you will use it?

Questions about programming:

1. How can teachers learn how to code?
   a. Are there several ways?
      i. What method would you prefer? Why?
   2. How can teachers show/present/report that they have learned to code?
      a. Are there several ways?
      i. What method would you prefer? Why?
   3. How can teachers teach their students to code?
      a. Are there several ways?
      i. What method would you prefer? Why?

Appendix B Template for Observations
(Translated from its original form in Swedish)

Questions about Clipper after observation:

1. What was good?
   a. Could it be done better?
2. What was bad?
   a. Could it be done better?
3. Suppose you have a self-made video posted on the website, how would you like it to be illustrated?
4. Do you feel any lack or excess of interactivity and or function that you would like to add or remove?
Appendix C Literature Search

These are the papers that have provided ground for this thesis. They are also the backbone to the first list of requirements found in section 6.2. The papers that are included in the reference list are not included here.


Appendix D QA: from the Questionnaire regarding Usability
First the question is presented followed by the answers from the teacher students and then the experienced teachers.

Vad är det rödmarkerade? Vilken information får man ut? Är det något som behöver läggas till eller tas bort?

6 responses


Det rödmarkerade tror jag är olika exempel på vilka typer av klipp man kan göra med programmet är min gissning. Den information som står är att det står olika benämningar på klippet som handlar om “programming” eller ”code”. Rubriker hade behövts

1

I det rödmarkerade fältet finns ”spelistan” med klipp och i vilken ordning de kommer i.

Det är min playlist. Vad klippen heter och mellan vilka sekunder de spelas. Nej

Det är klippen som ligger i clipped. Man får rita på hur långa klippen som man vill ut är samt vad de heter. Behöver inte tas bort något, kanske snyggas till lite.
Vad är det rödmarkerade? Vilken information får man ut? Är det något som behöver läggas till eller tas bort?

5 responsas

- Här ser man de klipp jag skapat och valt att spara i detta projektet.
- Det är clip som man valt ut och lagt sig i rangordning.
- Man ser de klipp som ligger i en spellista.
Vad är det rödmarkerade? Hur fungerar det? Är det något som behöver läggas till eller tas bort?


Där hämtar man de klippen som man vill arbeta med från youtube. Man importerer klippen där. Loggan gör det tydligt. Namligt "steg 1" i programmet, inget som enligt mig måste tas bort eller läggas till.


Sökrutan och tjänsterna man kan välja klipp från. Fler videoklippsbaser. Även om Youtube är en stor bas i sig känns det onödigt och förvirrande att ha en sökruta som är baserad på att man kan välja sökmotor själva när det bara finns en att välja mellan.

Det är där man söker på en video som man vill använda. Lite svårt att veta att man skulle trycka på youtubesymbolen så kanske att man skulle kunna söka direkt i sökrutan.
Vad är det rödmarkerade? Hur fungerar det? Är det något som behöver läggas till eller tas bort?

5 responses


Sökfält, där det finns flera alternativ av söksidor.

Sökrutan för att hitta ett klipp jag vill använda. I detta fall är YouTube.

Sökrutan för att hitta ett youtubeklipp. Man skriver in det man vill söka på och därefter klickar man på youtubeknappen. Tydligare hade varit en knapp som t ex såger "sök".

Sökruta för att söka filmklipp på youtube.

Vad är detta? Är det något som behöver läggas till eller tas bort?

6 responses

Det är resultaten man får upp från sin sökning som man gjort och sen tryckt på youtubeknappen. Det hade kunnat vara bra om man själv hade kunnat välja hur man vill sortera klippen som kommer upp, tex antal visningar eller popularitet.


Ser bra ut! Så önsker jag att få upp ett förnärmare listatid för att länkas till en hemsida där man ska klippa in och ha sig.

Listan du får upp efter att du sökt efter en video. Dvs urvalet av videos. Nej det var tydligt

Det är när man klickat på youtubesymbolen och fått söka på det man vill titta på. Enkelt och tydligt.
Vad är detta? Är det något som behöver läggas till eller tas bort?

5 responses

Här ser jag vilka videos som matchar mina sökord.

Har visas alternativ på min sökaing.

Antar att detta är söklistan man får upp. En "välj-funktion" hade varit bra. Kanske där man kan välja flera samtidigt om man nu hittar flera klipp i samma söklista vore smart?

Träffarna som du får när du söker på youtube. Synta en knapp för att lägga till det klipp som man valt?

Det är de Youtubeklipp som kommer upp när du söker.

Vad är detta? Vad är skillnad mellan den övre och undre? Övriga kommentarer?

6 responses


Jag tror det är skillnaden på typ av programmering man gör och det objekt man jobbar med. Personligen gör det ingen nytta för mig men att det är två olika saker är tydligt.

Den övre är projekt och den undre är specifika listor. Skulle kunna vara att projekt är "Historia för årskurs 4" och i klippen kan det vara "Introduktion för vikingskungen".

Den övre är ett projekt, en specific cliplist och den undre är menyraden för alla dina cliplistor. Otydligt utan att klicka på menyraden men gör man det först när man.

Skillnaden är att den under har jag skapat själv medan den över är en mer "allmän" flik där alla klipp sparas. Tydligt och enkelt.
Vad är detta? Vad är skillnad mellan den övre och undre? Övriga kommentarer?

5 responses


Här visas hur många projekt jag har skapat och temat.

Antar att den övre är det övergripande namnet på listan. Och den andra är första tillagda klippet. Men inte säkert!

Övre raden är det valda projektet och undre raden den klipplista som man valt.

Det överta är de klipp som är kategoriserade som programming, under är hela spellistan.

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Vad är detta? Vad är skillnaden mellan den övre och undre? Övriga kommentarer?
**Vad är detta? Vad är skillnaden mellan den övre och undre? Övriga kommentarer?**

6 responses

<table>
<thead>
<tr>
<th>Sådana är fält för sökning av klipp för alla användare av clipper. Det vänstra som ligger högst är till för mig som inloggad användare att söka på andra klipp och det tagsta till höger är till för mig att bestämma i vilket sammanhang ett klipp ska kunna hittas.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ett medel för att göra det lättare att hitta bland sina klippistor.</strong></td>
</tr>
<tr>
<td><strong>Ttags dvs nyckelord. Den övre är en sökruta för tags och den undre är en ruta där du mäter in dina tags så att det sedan går sätt söka efter ord istor för namn på videos eller clipist.</strong></td>
</tr>
<tr>
<td><strong>Det gör det enklare att hitta videos, genom nyckelorden och taggarna. Skillnaden är att &quot;keys&quot; är för sökningar medan tags också visas relaterade videos.</strong></td>
</tr>
</tbody>
</table>

**Vad är detta? Vad är skillnaden mellan den övre och undre? Övriga kommentarer?**

5 responses

<table>
<thead>
<tr>
<th><strong>Den undre används för att lägga till taggar som man kan öka på om man har många klipp/objekt i projektet. Den övre söker i rubriker, taggar och beskrivningar bland klipp jag redan har.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I den undre skapar jag tags som sedan gör det lättare att hitta bland mina skapade projekt med hjälp av den övre, då jag skriver tags.</strong></td>
</tr>
<tr>
<td><strong>Nyckelord för det färdiga videoloppet??</strong></td>
</tr>
<tr>
<td><strong>Övre raden söker man på nyckelord i klipp. Undre raden söker man kanske på taggar i valt klipp?</strong></td>
</tr>
<tr>
<td><strong>Det övre är en sökruta där du söker efter de ord som du har taggt klippet med. Det understa är där du lägger in sökordet eller taggarna för dina klipp.</strong></td>
</tr>
</tbody>
</table>
Vad är detta? Beskriv gärna varje ruta från vänster till höger.

The numbered list in the last answer had a number 5 as well: 5. En kopieringsknapp för videolänken.
Vad är detta? Beskriv gärna varje ruta från vänster till höger.

5 responses


Record knapp, vilken webbläsare som clip är hämtat från, klockslag för påbörjad record, klockslag för avslutad, länk som skapas urifrån mitt clip.

1. url till det använda klippet, 2. start och sluttid för klippet, 3 den röda prickan är "klippknappen".


Här spelar du in dina klipp. Länk till filmen det kommer från, tiden i filmen som klippet kommer från. Inspekionsknapp samt länk till klippet och kopiera klippet.

Vad är detta? Vad kan man göra med det? År det något som behöver läggas till eller tas bort?
Vad är detta? Vad kan man göra med det? Är det något som behöver läggas till eller tas bort?

Det är klippet från youtube. Tycker klippen är bra och visar det som behövs.

Här ser du ditt orginalklipp. Kunde varit tydligare skeenden om något ändras av dig som användare.

Rutan där man ser klippet. I längre klipp kan man få starta helskärmssläge för att lättare klicka på den delen man är ute efter att klippa ut. Eftersom Clipper är ett bra medel för att ta ut relevanta delar i längre klipp kanske man kan förrstora rutan lite, men problemet kan fortfarande kvarstå och då kanske layouten blir lisäsig.

det är klippet som är under inspelning ditt valda youtubeklipp

det är själva fönstret där videon visas. Här kan man kolla på videon i sin helhet.

Vad är detta? Vad kan man göra med det? Är det något som behöver läggas till eller tas bort?

Förhandsgranskningsfönster.

Film/clip som hämtas och som jag kan klippa

Här spelar den valda filmen upp. Kan välja tid för start och stopp.

Förhandsgranskningsfönster för valt klipp.

Rutan där filmen visas.

Vad är detta och vad visar det? Är det tydligt eller oftydligt? Behöver något ändras?
Vad är detta och vad visar det? Är det tydligt eller otydligt? Behöver något ändras?

6 responses


Detta är spelaren på klippet som man gör i programmet. Siffrorna representerar ett importerat klipp från youtube eller en sekvens i ett klipp som sedan ändras genom att man klipp eller liknande. Symbolerna visar när funktionerna dyker upp i klippet. Tydligt!

Fallet visar kronologiskt hur klipplista går och vad som finns placerat i den. Det är supertydligt och pedagogiskt med bra färger som visar vad som kommer vid de olika tillfällena.


Det visar hur många filmer det är, vad som händer i dom (textutor, fotnoter och övergångar), när en ny video visas. Lite svårt att förstå till en början men helt ok.

Vad är detta och vad visar det? Är det tydligt eller otydligt? Behöver något ändras?

5 responses

Tidslinje med ett antal annoteringar (bubblor, frågor) och fotnoter. De gröna röberna är övergångar mellan klipp. Antalet klipp numrerar i över o underkant.

Mitt skapade clip med alla clip samlande i en vågrätt linje. Det är relativt tydligt. Kanske andra ordval vid varje figur.

Kolla det händelselinje ... är inte säker på vad numreringen betyder. Inte heller transition.

De är klippen i spellistan med inlagda fotnoter, övergångar mm.

Tidslinje för vad som händer i spellistan, visas annoteringar, övergångar och fotnot som dyker upp.
Vad är detta? Vilken information får man ut? Vad kan man göra? Behöver något ändras?

6 responses

Tycker det är tydligt vad som visar. Kanske den sista rutan eller delen med block är lite otydligt vad den visar. Även kanke här att man hade kunnat lägga till hur långt varje klipp är för att snippa rätt ut det själv.

När man är klar med sitt redigerade klipp i programmet är steg två att döpas, beskriva och få information om sitt klipp. Tydligt att det är ett steg 2. “Edit och description” visar tydligt vad man ska göra.

Fallet visar beskrivningen av klipplisten och annan information. Det är ett bra komplement för att ha lite koll på vad som finns där.

Nej, tydligt. Det är titel, beskrivning, länk etc för det klippet man klickat på i sin klipplist. även orginaländgd på klippet samt den längd du valt att spela in.

Vad är detta? Vilken information får man ut? Vad kan man göra? Behöver något ändras?

5 responses

Här visas/skriva titel och beskrivning. En tydlig och bra kallhänvisning.

Varje enskilt clip som visar tags, tid, länk, namn


Ruta för att lägga in titel, information om klippet, taggar, översikt av full längd samt vad längd på klippet.

Redigera ditt klipp med titel, beskrivning, sökord, hel film

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Vad är detta? Vilken information får man ut? Vad borde hända om man klickar på t.ex. en bild? Behöver något ändras för att göra det tydligare?
Vad är detta? Vilken information får man ut? Vad borde hända om man klickar på t.ex. en bild? Behöver något ändras för att göra det tydligare?

6 responses


Fallet visar vilka klipp som finns i listan. Jag antar att det är klippens längd som visas upppe i de små blå rutorna till höger och det kan vara bra att veta för att se vilka klipp som får mest utrymme i hela listan.


Det är listan på videos som användaren valt. Kan tycka att klippet borde visas när man klickar på det, alternativt att mott klippa klipp visas. kanske att hela kolumnen hade hetat "chosen clips" eller något så jag vet att det är det jag valt.

Vad är detta? Vilken information får man ut? Vad borde hända om man klickar på t.ex. en bild? Behöver något ändras för att göra det tydligare?

5 responses

Här ser man klippen i den ordning de ligger i tidslinjen.

clipet bör komma upp och i nedre vägratta "spelare" bör markören visar var man befinner sig.

jag tänker att det där är klipplistan. klickar jag på ett klipp kanske det ska komma upp i den stora rutan för att kunna editera igenom man inte var nöjd?

klipp i listan samt klippens längd.

Vad är detta? Vad borde hända om man trycker på pilen?

6 responses

Man borde kunna välja bland olika projekt som finns. Så som jag tänker lillaaff.

Den markerar att man håller på med funktionen "scratch". Videon borde spelas upp då.

Att trycka på pilen borde visa en meny för de olika listorna som finns.

Fler clipplists bör dyka upp för att man ska kunna lägga till fotnoter osv i sin cliplist.

Lite osäker men kanske en introduktion av mina valda klipp. Om det är så, så borde min introduktion visas.

Vad är detta? Vad borde hända om man trycker på pilen?

5 responses

Här visas minoslaka projekt?

Visa förslag på hur man kan jobba med programmet.

här triller ju en valbar lista ut. antar att man kan redigera, spara eller något

Spellistans namn. Man ser vilka klipp som ingår i listan.

Att man får upp hela spellistan för Introduction Scratch. Det är namnet på spellistan.
Vad är detta och hur borde det fungera?

6 responses


- Där importera du orginalklipp från youtube. Man borde antingen kunna klistra in en länk eller söka i fältet.
- Det här är sökfältet för vilka originalfilmer man vill dra klipp ifran och vilken plattform de tas ifran.
- Under service väljer du videoklippbasas, vimeo, youtube osv. i sökrutan söker man efter videos och valt tjenst söks det ifran.
- En sökruta där jag söker efter klipp. Okänd vad "service"-knappen är till för.

Vad är detta och hur borde det fungera?

5 responses

Sökfönster där jag skriver mina sökord. Förhoppningsvis startas sökningen automatiskt eller med enter.

Sökfält och det fungerar ypperligt.

Pilen väljer var jag vill söka min originalfilm och sedan skriver man in sökorden i fältet

Man skriver ett sökord för att hitta klipp på det temat. Man väljer var man vill söka genom att klicka på "Service" (t ex youtube).

Sök klipp i din spellista.
Vad är detta och vilken information får man ut? Vad gör och eller visar de olika delarna? (Från vänster till höger)

6 responses

Längst till vänster startar samt stoppar man sin inspelning. Rutan i mitten tycker jag mest var en införuts. Det två sista rutorna visar start samt stopptid.

Där klipper du orginalklippet. Det visar en start och stoppfunktion samt vilka tidpunkter i orginalklippet som du använder dig emellan.

Fältet visar inspelning/inspelningen och berättar hur den fungerar i ljudgrå text. Längst till höger finns två rutor som visar vilken intervall som klippts ut.

Man klickar för att börja spela in, man får den informationen man behöver.

Det är menyn som man klipper med. Från vänster: klipp/stoppknapp, sedan instruktioner, mellan vilka tidpunkter man spelat in.
Vad är detta och vilken information får man ut? Vad gör och visar de olika delarna? (Från vänster till höger)

5 responses

Start och stoppknapp, följt av beskrivning hur man gör. Start och stopp tid exponeras i de återstående boxarna.

Inспelningknapp med kloksslag från början till slut.

Start och stoppknapp får vara redan innan och slutet måste klipp

Här ställer man in vilken del av klippet som man vill spela in (start och stopp). Man spelar in genom att klicka på den röda knappen.

Här kan du göra ett klipp i en fil, skriva in från och spela upp till du vill göra ett klipp.

Vad är detta? Behöver något ändras?

CLIPIT

Tipp in start och slut tidpunkter och tryck på search eller spela in.

Klicka på spela in för att starta filen. Filens ljudspelning stoppas när du klickar på stäng.

Vad är detta? Behöver något ändras?

6 responses

Det visar vilken klipp man kollar på samt vilken tid i klippet man är och så. Kanske lägga till en ljudfunktion där man kan höja och sänka ljudet. Även över musymbolen lägga till någon införut först om man håller ögonen med musan.

Originalklippet samt hur videon du arbetar ut ser ut. Inget behöver ändras.

Rutan där klippet visas. Ser toppen ut!

Välj videoklipp som ska animeras eller klippas. Nej

Skärmfönstret som klippet visas i. Nej.
Vad är detta? Behöver något ändras?

5 responses

Förhandsgranskningsfönstret, med aktiv annotering.

Nej

Här ser jag mitt klipp med annoteringar. Antar att symbolen betyder att jag ska högerklicka men vet inte vad som händer då.

Förhandsgranskningsfönstret för att kolla på valt klipp. Möjligt att lägga in övergångar, fotnot mm.

Här spelas klippet upp.

Vad är detta och vad gör man med det? Behöver något ändras?

Vad är detta och vad gör man med det? Behöver något ändras?

6 responses

Det är frågor som man kan lägga till i filmen. Tycker den ser bra och tydligt ut men gick inte riktigt testa att skapa något själv. Det verklade även som att det gick att lägga till kommentarer samt animationer i klippet.

Vet ej

Detta är det man kan "lägga till" i själva listan för att styra klippelistan mot det målet man vill komma mot. Exempelvis kan det vara frågor som riktar sig till att ta ut förkunskaper hos elever i ett visst ämne eller också lägga till information. Jag vet inte om det sistnämnda kanske är funktionen med "footnote".

det är en "annotation" dvs rutor, frågor, rubriker som man kan skapa för att göra videoen med informativ och utmanande. Nej

Det är "annotations". Textrutor som poppar upp vid bestämde tid. Nej.
Vad är detta och vad gör man med det? Behöver något ändras?

5 responses

Annoteringen. Frågan till elev/studenten.
Ser tydligt ut. Det är av fråga eller uppmaning för att ta sig vidare.
Möjligtvis att frågan har en bakgrundsfarg och de olika svarsalternativen annan?
Ruta för att lägga in dina frågor, övningar och foton.
Annoteringar som dyker upp i filmen och som du kan svara på.

Appendix D QA: Last Question
First two images showing the answers from the teacher students followed by one image showing the answers from the experienced teachers.


5 responses

Jag ser absolut användningsområden för den! Jag tycker det hade varit ett bra sätt att antingen ge som läxa eller använda i klassrummet. Tycker det är kanonbra att man kan lägga in information och frågor i klippet, hade man även kunnat se vad eleverna svarat på frågorna hade det varit toppen!

5 responses

Appendix E

When clicking on ‘Add annotation’ in figure 14 from section 8 this shows.
When clicking on the triangle in previous figure (Appendix E) this shows. This is an edit window where one can change how long an annotation will be visible (duration), what color and opacity the background will have, what text that is to be presented and how it transitions (in and out).