Designing a video playing interface for second language learners

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With an unprecedent use of videos in education, several video playing interfaces have been proposed to enhance video learning. However, little research to date has explored how video playing interfaces should be designed for the need of language learners. In this pilot study, we explored how language learners utilize and interact with different types of macro- and micro-scaffolding features while they watch academic lectures and government advertisements. We elicited the learners' thought processes and tracked their interactions with the scaffolding features in several prototypes of video playing interface. The analyses revealed some important findings concerning scaffolding in video learning, most notably being the video type and the difficulty of its content seem to effect how language learners use micro-and macro-scaffolding. Based on the findings, we propose a new video playing interface.

Introduction

Over the past decade, videos have been increasingly used in education due to advances in video broadcasting technology and a remarkable affordability of video production software. Recent pedagogical innovations in education, e.g., MOOCs, blended learning, and flipped classroom, make use of videos to deliver learning contents that can be accesses anytime and anywhere. Unlike traditional forms, videos provide learning contents more dynamically in both auditory and visual channels, which shown to be an effective way to enhance learning compared to static and less dynamic learning contents (Berney & Bétrancourt, 2016). Nevertheless, if designed poorly instructional materials in videos can place extraneous load on learners' limited cognitive resources (Mayer, 2001). To alleviate the negative effects, several studies have, among others options, explored segmenting videos into smaller chucks, adding pauses, or using scaffolding activities (e.g, Merkt, Ballmann, Felfeli, & Schwan, 2018).

Making the case for language learners

Despite a large increase in video material, little has been developed with language learners in mind. Understanding video content for language learners can be very challenging. For one, the transient nature of video makes it difficult for language learners to process multimodal information. As English is the often the primary language of global resources, e.g., MOOCs, learners need to have a strong command of the language to study effectively; less proficient students may be unable to follow course and thus lose motivation. One way to support language learners is to design a video playing interface that caters for their needs. In this study, we explore the use of macro-scaffolding features (headings and table of content) and micro-scaffolding features in several prototypes of video playing interfaces. To our knowledge, exploring how language learners utilize and interact with these video features has not been investigated before.

Related studies

Perhaps one key characteristics computer-based learning environments (CBLEs) is that it requires self-regulated learning skills (Devolder, van Braak, & Tondeur, 2012). Self-regulated learning is a multidimensional construct but in its basic form it refers to learners' taking an active role of their learning (Mega, Ronconi, & De Beni, 2014).Obviously, learners require supports or scaffolding in self-regulated learning environments more than in traditional environment (Dabbagh & Kitsantas, 2005). In CBLEs, Sharma and Hannafin (2007) described scaffolding as ". . . the provision of technology-mediated support to learners as they engage in a specific learning task" (p. 29). There is a significant body of research on scaffolding with printed texts. However, little research to date has investigated how scaffolding can be implemented in video-based learning. As video technologies are advancing rapidly, there are many possible ways to support or scaffold learners in video learning environments (Merkt & Schwan, 2014).

Micro-scaffolding

Videotexts pose additional difficulties for language learners that print and audio texts do not present; most notably, the processing of transient delivery of multimodal information. To eliminate the effects, some researchers suggest that learners should be given a control over the flow of the information by, for example, allowing them to play, stop, rewind or replay the video text (e.g., Hasler, Kersten, & Sweller, 2007). When given such control, learners seem to achieve better learning outcomes (Schwan & Riempp, 2004). Basic micro-level features (e.g., start, stop, and replay) are available that may help learners better control the processing of information (Merkt, Weigand, Heier, & Schwan, 2011).

Macro-scaffolding

The role of headings and table of contents (TOC) have been studied extensively with printed textbooks, and act as textual signalling devices (Schneider, Beege, Nebel, & Rey, 2018) that communicate different types of information to the readers, e.g., demarcation, organization, labelling, and identifying the topic (Lorch, Lemarié, & Grant, 2011). While headings and TOC have been shown to benefits readers, little is known if the same benefits can be achieved with video learning. Recently, Cojean and Jamet (2017) documented the benefits of both macro-scaffolding (TOC) and micro-scaffolding (markers in the timeline) on information-seeking activity. Merkt and Schwan (2014) examined the effects of three video playing interfaces (non interactive, common, and enhanced video player) with the enhanced video has more options of micro-and macro features. In summary, previous studies have proposed designs of macro- and micro-scaffolding to enhance video navigation, information seeking, and self-regulated learning. How though, given their unique constraints, do language learners utilize the scaffoldings embedded in differing videotexts?

Methodology

In this study, we report the results of an initial cycle of Design-Based Research (DBR) project that seeks to develop a video playing interface for language learners. DBR is "a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings, and leading to contextually-sensitive design principles and theories" (Wang & Hannafin, 2005, p. 6-7). DBR has been used in education to align advances in research with educational practice (for review read Anderson & Shattuck, 2012). DBR is particularly well suited for developing new technology-enhanced learning interventions (Wang & Hannafin, 2005) including those in Computer-Assisted Language Learning (CALL).

While it has acclaimed a good standing in many research fields and communities, a number of critiques was levelled against the use of DBR. Most notably, Barab and Squire (2004) argued that "if a researcher is intimately involved in the conceptualization, design, development, implementation, and re-searching of a pedagogical approach, then ensuring that researchers can make credible and trustworthy assertions is a challenge" (p. 10). Anderson and Shattuck (2012), however, have argued no approach can claim that bias is totally absent. They further argued that the knowledge the researchers bring to the research project "adds as much as it detracts from the research validity" (p. 18). As we ourselves are language instructors and researchers, we believe that our collective knowledge and deep understanding of the context is an asset. Following a typical DBR journey, this pilot study was undertaken in four phases as illustrated in Figure 1.

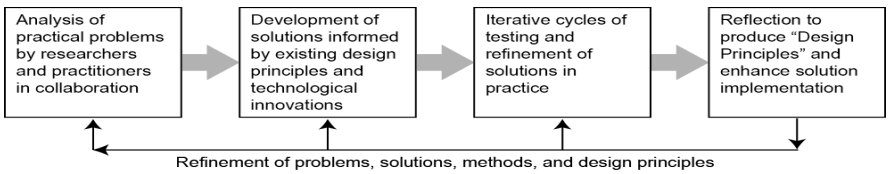

Figure 1: Reeves' Design-Based Research approach. Adapted from (Reeves, 2006, p. 59).

Selection of video materials

In a comprehensive survey study, Winslett (2014) documented a wide spectrum of video types and production styles have been utilized in the production of educational videos. While Winslett (2014) could not link a particular type of video to a certain learning outcomes, there are growing empirical evidences suggesting the

varying impacts of video genre and production style on how learners interact with and learn from videos (Chen & Wu, 2015; Hong, Pi, & Yang, 2018). We hypothesized that there is relationship between learners use of scaffolding and video length, type, and content. Therefore, we selected four videos that diatonically different in genres (academic lectures vs. government advertisements), and production styles (documentary, lecture, PowerPoint slides).

Video playing interface design

We designed four initial prototypes of video playing interfaces which contain one of the following options: concise headings and TOC, detailed headings and TOC, and embedded headings. The concise and detailed TOC are used videos from both genres (see Figure 1 for an example). Embedded headings and concise TOC used with one academic lecture. We use the term "embedded headings" to refer to those headings already embedded within video by the original instructional designer as it is commonly used in a slide-based academic videos.

Figure 1: A prototype of video playing interface with a detailed TOC and control buttons

Participants

After gaining human research ethics approval, we recruited four English as a Second Language learners to participate in this study. The learners are all adult and male students from Saudi Arabia who, at the time of the study, have completed an advance English course and recently commenced their graduate studies in an Australian university.

Data collection and Analyses

A web application was purposefully developed to: (a) host the video playing interface designs and making them accessible to the participants, and (b) video record the participants as they verbalize their thoughts and track their clicks and interactions. The application was implemented using Django 2, a Python web framework, and frontend coding languages (HTML, CSS, and JavaScript). We tracked the participants' interactions using Google Analytics. Additionally, semi-structured post-hoc interviews in Arabic were conducted in which participants were asked to discuss experiences, and if they have any suggestions for improving the interface designs.

To eliminate the novelty effect, all participants took part in a warm-up task to become familiar with the platform and its features. Recordings of verbal reports and post-hoc interviews were first transcribed and then analysed and coded by one of the authors. A second coder was asked to blind code 20% of randomly selected transcripts; following that, the two coders discussed discrepancies until full agreement of the codes was achieved.

Findings and discussion

The analyses of verbal reports, interviews, and tracking data resulted in a number of findings concerning the use of micro (play, pause, rewind, and forward) and macro scaffolding (headings and TOC). These findings, and their implications, are summarized in Table 1.

Table 1: Findings and implications for design

Categories	Findings	Implications for design
Frequency of use	• Learner use concise TOC more than detailed one. • Learners use micro level features more frequently with longer videos.	• Use concise headings and TOC for video navigation.
Purpose of use	• Detailed headings and TOC do not seem to help learners develop conceptual understanding of video content. • Concise TOC may be better than detailed TOC for video navigation and understanding. • When they are embedded in the video, headings seem to be more beneficial.	• Avoid using detailed headings and TOC • Use embedded headings for better video understanding
Video type and content	• Video content and production style seem to affect learners' use of micro- and macro scaffolding. • Video content difficulty may interact with how frequently learners use video features.	• With difficult content, use both concise TOC and embedded headings

The quantitative analyses of click events showed that language learners used TOC less frequently than we anticipated, perhaps because they were not asked to do any activity with the video. If, for example, learners watch the videos to take a comprehension test at the end, they may use micro-level features more frequently. In their verbal reports, learners indicated that they start exploring different video features when they find video content either boring (easy) or confusing (difficult). Therefore, relying on quantitative data alone can lead to misinterpretations of learners' behaviours. Additionally, the data does not show any indications of learners using scaffolds to build structural knowledge of the video content. Taken together, these preliminary findings have already resulted in an improved design of our interface (Figure 2).

Figure 2: A proposed video playing interface with a visual indexer and a search bar

One change in our interface is the inclusion of an interactive visual indexer that allows learners to save timestamped frames to help them jump between different segments of the video, as a way to promote greater learner control. A second feature allows for improved search functionality. Both features will be investigated in our planned second cycle of research.

Conclusion

In this pilot study, we explored how language learners use and interact with micro and macro-scaffolding features while watching videos. The results suggested that concise headings and TOC is better than detailed ones and language learners seem to use video features differently when video content is challenging. Note should be made here that these findings are generated from small pilot study and should not be generalized to other contexts. We plan to further investigate the effects of scaffolding features with a larger sample.

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