



Restructuring Unstructured Video Resources for Collaborative Learning and Work

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ABSTRACT

Online video resources have been ubiquitously used for purposes ranging from personal interests to occupation needs. And rich social features provide valuable affordances for collaborative learning and work. However, open access and social nature of content production and sharing exacerbate problems such as information credibility and overload concerns, which may reduce learning or work performances. To efficiently amplify their informative and social power, my studies propose to restructure video resources and associated social communications to facilitate collaborations from the aspects of content production and organization. More specifically, my research design novel social interaction experience to scaffold users to contribute high-quality content and develop scalable computational pipelines to reorganize existing resources.

CCS CONCEPTS

• **Human-centered computing** → **Interactive systems and tools**; • **Applied computing** → *E-learning*.

KEYWORDS

Video; Online Learning; Reflection; Information Retrieval

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1 INTRODUCTION

With millions of active online users every day, there emerge various informative videos across platforms including social media and video-sharing platforms. People consume these videos for different reasons, spanning from personal interests to occupational necessities. Online videos have become a new source of knowledge to guide people's daily lives (such as make health decisions) and work (e.g. program with new languages). More importantly, the public access and social nature of these videos drive innovative collaboration opportunities. For instance, researchers have observed

that audiences co-constructed supplementary knowledge via discussions after viewing videos to extend the video content in the comments [4], which implies the informative values of social interactions and demonstrates peer production practices as in organized peer production products such as GitHub and Wikipedia.

Online videos on social platforms provide valuable resources and affordances for users to consume and upload videos and discuss the content with people in and outside of their social networks [5]. Rich social activities, such as uploading videos, posting, commenting, and replying, may perform informal, sometimes implicit, collaborations with two key components: user-generated content and social connections. Textual and video sharings, that indicate how the online communities understand and think about the same information, may help circulate informative ideas that would otherwise be difficult to reach [5]. The sharings could also increase the exposure of diverse content and perspectives, which is particularly important for news. At the same time, it may offer users a social presence of peers or collaborators that can lead to positive learning or work outcomes, such as positive motivations, learning performances, and collaborative experiences [1].

While abundant video resources and informal collaborations seem favorable to assist people with intellectual tasks, the open and social nature may also lead to information credibility and overload concerns. Misinformation and propaganda could spread widely and rapidly with catastrophic consequences. It increases the need to consume videos analytically by filtering misinformation, and resolving content and discussion conflicts in high-stakes domains such as health and finance [7], particularly when people may apply the knowledge in their work and personal lives. As for information overload, while access to a wealth of resources may empower individuals, the overabundance of information could be inefficient or even counter-productive. It would be tough to find appropriate videos in the numerous resources. And videos and corresponding social discussions are not well-organized for purposes relevant to knowledge acquisition and application at jobs or school [8].

To address these limitations, my research aims to facilitate synchronous and asynchronous collaborations for diverse intellectual tasks by developing high-quality structured informative resources. More specifically, my studies propose to restructure unorganized videos and comments from two lines of work: facilitate users to create high-quality content and organize existing content. It's not easy for current naturally-occurred collaborations to create quality collaboration artifacts with structure as the collaborations tend to be loosely organized and implicit. One major reason is that users may feel it difficult and lack strong willingness to actively practice thinking activities and participate in the collaboration. As it only takes a small portion of cognitive load to consume videos passively,

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thinking processes require more effort, especially deep thinking processes such as reflection, augmentation, and critical evaluation. On the other hand, it is not readily available for users to master sufficient skills and domain-specific background to finish all the processes required for knowledge acquisition from the resources [2]. Relevant skills include but not limited to digital literacy, reasoning, credibility evaluation, inference, decision making, and so on. It requires massive training and attention to perform these skills on daily basis. Besides domain-independent skills, the lack of domain-specific background may also block necessary task processes. Moreover, unorganized collaborations may miss cooperation and necessary human efforts to build up information structures based on individual inputs. Therefore, my research is divided into two synergistic lines: 1) the first line explores strategies to motivate users to think about the content when consuming the information and produce informative and quality inputs. 2) On the other line, my studies design innovative mediating technologies to restructure video resources according to the internal knowledge structure and social focus to facilitate knowledge transfer processes during the collaboration.

2 WORK IN PROGRESS AND EXPECTED CONTRIBUTION

2.1 Study 1: Social Nudging to Encourage Thinking and Sharing

Inspired by nudging as a lightweight intervention that demonstrates satisfactory performances for behavior change [3], we began exploring the potential of sharing peer users' thinking activities to nudge for high-level thinking and knowledge production when people watch online videos. We aimed to understand how the transparency of peers' thoughts may affect the engagement of thinking and thinking performances during view-only and spontaneous interactions, particularly with a concept map-based visualization interface. We designed a nudging interface that affords collaborative concept map-based note-taking and commenting along with video watching (see the screenshot of Figure 1). We conducted a between-subject experiment that evaluated the influence of peer comments and conceptual summary of video content when participants were asked to make sense of health videos. We surveyed their engagement of reflection, critical thinking, as well as understanding level. We also coded participants' comments into interpretation, analysis, and evaluation. The results supported that with the availability of peers' understanding and comments, people tended to engage more in understanding and reflective thinking, but they didn't have more active critical thinking activities (See Figure 2). Moreover, participants would be more likely to produce more constructive comments, perform further analyses and pose questions.

Following the one-way input of peers' thoughts as social nudging, we are working on another experiment to understand the change in people's thinking engagement and comment quality with our nudging interface when peers interact synchronously. We proposed to examine both potential boosting effects and negative influences such as groupthink for individual and group performances. The first part of this work was published at CHI 2022 Late Breaking Work [6].

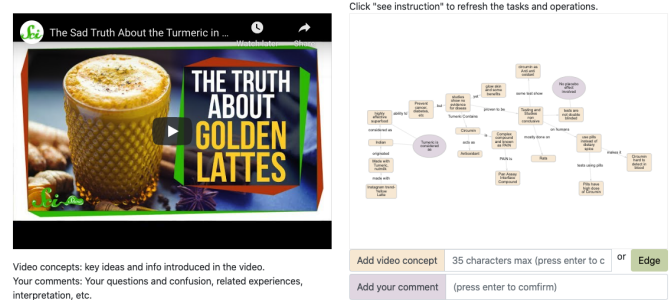


Figure 1: Screenshot of DeepThinkingMap

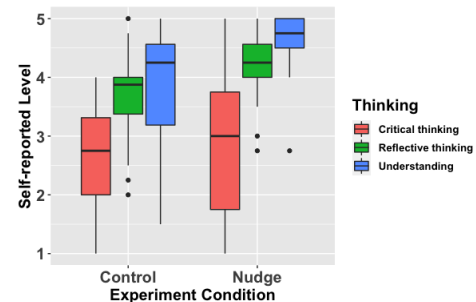


Figure 2: Boxplot of Thinking Engagement

2.2 Study 2: Automatic pipelines to restructure video resources

To address the overload of online videos and corresponding comments, we proposed to design automatic approaches to restructure these resources to support subsequent users and asynchronous collaboration. Conventional video recommendations and search engines tend to focus on relevance-oriented information search and personal recommendations, but do not always take into account the inert structure of knowledge to connect resources. Based on the benefits of concept map on visual learning and knowledge organization, we developed computational pipelines that analyze the transcripts of YouTube videos and corresponding comments, and generate conceptual visual recommendations of links between resources. Recent techniques have also studied to extract useful features and structures from educational data to build concept maps [9]. With a scalable prototype that extracts the knowledge structure of video transcripts designed by colleagues, we found that concept-map-based video navigation helped learners explore the knowledge of interest systematically with a clear overview from dozens of videos. It boosted the efficiency of video learning, reduced searching time, and further enhanced peers' learning satisfaction and motivation. This work was published in WWW 2021 [8]. In addition to video transcripts, we propose to restructure video comments to aggregate individual comments into collaborative artifacts to provide both social video navigation and crowd knowledge overview. We will evaluate the influence of the scale of video and comment resources and digital literacy for collaboration performances and learning experiences.

2.3 Expected Contribution

I expect my studies can deepen the understanding of underlying social mechanisms that may influence online collaboration processes for intellectual work, and how system designs can provide structural guidance for online video consumption. The findings of these studies will shed light on the design space of innovative interfaces and systems to facilitate efficient collaborative learning and working processes. With the ubiquity of video resources nowadays, they may contribute evidence to help online intelligent workers and general users in real-world scenarios.

3 GOAL FOR DOCTORAL COLLOQUIUM

The Doctoral Colloquium would take place towards the end years of my Ph.D. I would like to gain insights and feedback from peers and senior researchers about the framing and the intended contribution of my work. And I'm looking forward to perspectives from different backgrounds and expertise to strengthen my rationale in the studies. Moreover, it would also be a great opportunity to have discussions and brainstorm which may lead to alternative innovative research directions that my current methods or research insights could take. It would also help me make connections with researchers from various topics, and enrich my Ph.D. experiences.

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