
Designing Videos with Pedagogical Strategies: Online Students' Perceptions of Their Effectiveness

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Abstract

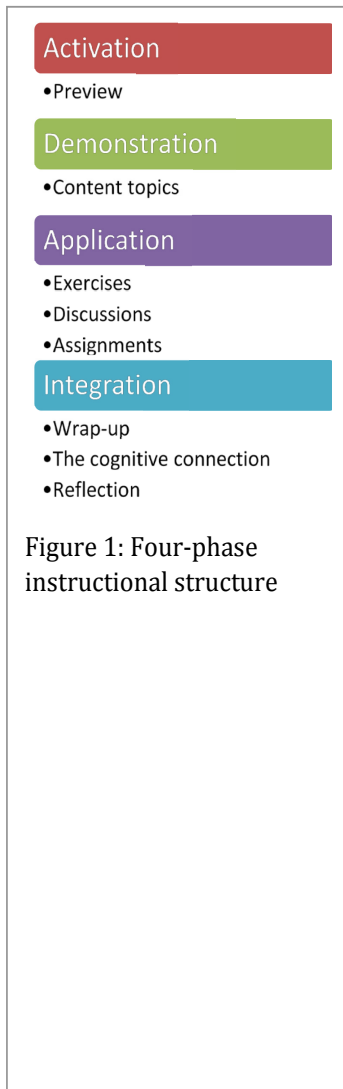
Despite the ubiquitous use of videos in online learning and enormous literature on designing online learning, there has been relatively little research on what pedagogical strategies should be used to make the most of video lessons and what constitutes an effective video for student learning. We experimented with a model of incorporating four pedagogical strategies, four instructional phases, and four production guidelines-in designing and developing video lessons for an online graduate course. In this paper, we share our experience as well as students' perceptions of their effectiveness. We also discuss what needs to be done for future research.

Author Keywords

artificial intelligence, educational videos, learning at scale, MOOCs, online learning

Introduction

Online instruction is provided predominantly through short content-based videos [5]. Despite the enormous literature on designing online learning, there has been relatively little research on what pedagogic strategies should be employed to make the most of the video lessons and what constitutes an effective video for teaching and learning [5,6, 7]. On the other hand,



many computer scientists have examined students' different video interaction patterns and the potential of leveraging the patterns to provide insights for improving the MOOC learning experiences [4, 8, 9, 10, 11]. These analyses provide insights into how students interact with videos and how videos with different production styles and navigations make difference in student engagement. Although these studies examined and analyzed massive amount of data on students' video watching, students' perceptions of the effectiveness of the videos are generally lacking.

Goel & Joyner [2], experimented with a model of incorporating four pedagogical strategies, four instructional phases, and four production guidelines-in designing and developing 26 video lessons for an online graduate course. They also surveyed students on their perceptions of the video lessons' effectiveness. In this paper, we analyze the survey findings as well as our experience of designing and developing the videos. We also discuss about what needs to be done for further research on exploring the effectiveness of educational videos in online learning.

Design and Development of Video Lessons for Online KBAI

Knowledge-Based Artificial Intelligence (KBAI) is a core course in artificial intelligence. It has been offered online since Fall 2014 as part of the Georgia Tech Online Masters of Science in Computer Science program. In designing videos for this course, we tried to leverage the key strength of video as a medium by integrating the design with four pedagogical strategies [2]: (1) *learning by example*: Each video lesson presents an example of a real-world task for which we want to build an AI agent. This example is then used

throughout the explanation of the method in that lesson to tie the method back to a particular practical problem; (2) *learning by doing*: Each video lesson includes several interactive exercises, one for each main concept in the class; (3) *adaptive learning*: We equipped the exercises with a tutor to give students targeted, personalized, just-in-time feedback on their responses to the exercises; and (4) *learning through reflection*: At the conclusion of each video lesson, the instructor recaps of the main points of the lesson and connects it to other parts of the course. Students are then asked to summarize and submit what they have learned. We created a coherent and dynamic instructional structure in every video lesson by adopting and applying the principle of four-phase instruction [12, 13] (see Figure 1). We adopted four video production guidelines from research literature that have been found to be effective in engaging students [4, 5, 14]: (1) *Keep it short and to the point*: The length of the video clips ranges from 1 to 5 minutes; (2) *Demonstrate by tablet capture*: A digital whiteboard is used to illustrate examples with instructor voiceover. Graphics, charts, animations, and instructor's handwriting are used for the demonstration; (3) *Pair teaching*: We experimented with pair teaching in some of our videos. We were hoping that the interactive conversation/discussion format of teaching would help build a connection between the presenters and the students, stimulating their interest and engaging them as well; and (4) *Provide learner control*: The 26 video lessons are organized based on the structure of the course topics and students are provided with a schedule on when they should finish studying each of the lessons. However, all the videos are available to the students and they are free to study at their own pace.

Statement	
Item 1	The lectures are informative and easy to understand.
Item 2	The exercises provided during the lectures kept me engaged.
Item 3	The feedback I received from the exercises enhanced my understanding of the lesson.
Item 4	Overall, the video lessons were valuable in helping me learn.

Table 1: The 4-item scale in end-of-course survey

Students' Perception of the Video Lessons' Effectiveness

We administered the end-of-semester survey in Fall 2014 and Spring 2015. A 4-item scale was used to get an insight into students' perceptions of the video lessons' effectiveness (see Table 1). Each item was rated on a 7-point scale (1 = strongly disagree, 7 = strongly agree). The results of multivariate analysis of variance (MANOVA) indicated that there was no significant difference on the ratings among students from two semesters on each of the four statements. The lectures were particularly highly rated in terms of being informative and easy to understand (M = 6.43). Students were very positive about the exercises. They agreed the exercises kept them engaged (M = 6.01) and the feedback from the exercises helped enhance their understanding of the lessons (M = 5.70). Overall, students strongly believed that the video lessons were valuable in helping them learn (M=6.51).

We asked student what, if any, course elements they would like to see in other online courses. There were 86 responses for Fall 2014 and 105 for Spring 2015. Among the total of 191 students who responded to the question, 46 (24.1%) of them recommended the video lessons among various course elements. Thematic analysis [1, 3] was used to analyze the 46 responses and these are the elements that the students liked about the video lessons: (1) Interesting, insightful, useful, and easy-to-understand lectures. (2) Pair teaching; (3) The interactive exercises. (4) Personalized feedback from the tutor; and (5) Instructional structure of the video lessons. We also asked students what changes they would recommend be made to the course or to the video lessons. In the Fall 2014 survey, a total of 97 students responded to

the question regarding what changes they would recommend be made to the course and 10 of the students recommended changes be made to the video lessons. In the Spring 2015 survey, we specifically asked a question on what changes they would recommend to be made to the video lessons and 88 students responded to the question. However, 36 out of the 88 students responded by saying the video lessons were excellent and no changes were needed. Therefore, thematic analysis [1, 3] was conducted on 62 responses, 10 from the Fall survey and 52 from the Spring survey. Here are the two major changes they proposed: (1) Provide more exercises and more challenging exercises; and (2) Provide more examples, resources, and guidance on how concepts can be incorporated into course projects.

Discussion and Future Work

The preliminary findings of this study indicate that the model for designing and developing online KBAI video lessons was successful in creating an interactive learning environment to effectively engage students and improve their online learning experience. We hope this model will help instructors, instructional designers, and video production professionals make informed decisions on designing and developing educational videos.

In order to further accommodate students' needs, more exercises could be designed as optional exercises so that those who need more exercises could choose to practice more. To meet the needs of the students who want more challenging exercises while not making the exercises too difficult for other students, branching exercises could be used to achieve a balance. As for the learner support that students wanted for the course

projects, case studies, project examples, and other resources could be provided as study guide instead. On the other hand, the current study only explored students' perceptions of the video lessons' effectiveness. Future studies are needed to explore how

students' use of the video lessons affects their learning performance.

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