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Effect of Instructor Inclusion type and Course Complexity on Students' Learning in Lecturer Video

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ABSTRACT

Instructional contexts using slideshow and lecturer video are reported to be more engaging and appealing to students compared than context without instructor's video. But to which proportion instructor's inclusion should take in the instructional video still remains unknown. This study examined students' perceived instructor's presence (SPIP) and satisfaction using two types of instructor's inclusion, combining with two learning courses at different complexity levels. Explanatory Factor Analysis was done for students' perceived instructor's presence, three factors were identified, sense of connection, usefulness for clear-clarification, helpfulness for assisting-understanding. MANOVA analysis showed that there was interaction effect for students' perceived satisfaction between course complexity and the type of instructor inclusion. For bigger instructor inclusion, students' perceived instructor presence was higher for more complex learning course. For easier learning course, students' satisfaction was higher for smaller instructor inclusion. This preliminary finding provides hints for instructional video designers and facilitators.

CCS Concepts

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Keywords

Audio-visual resources; Social Presence; Mental effort; Satisfaction

1. INTRODUCTION

Instructional contexts using videos have been around for ten decades. With the rapid development of broadband Internet, opportunities for learners to engage with and use video to support learning have increased. In the U.S., 32% of higher education students in 2012 took at least one online course in the form of audio-visual instruction (Allen, 2013). In other countries like Japan and China, video instruction and learning is also widespread.

Lecture capture, in which the instructor is shown in a video, has been reported to be more engaging and appealing to students than other forms of instruction, like instruction without video (Owston, 2011), with visual cues (e.g., color, graphics, or an instructor's picture) signaling expressiveness, accessibility, engagement, and politeness. Sipusic, et al. (1999) argued that the video component of distance learning technology was particularly important: video-mediated communication could in fact support both the courses and relational components of discourse that are necessary for effective learning. It could generate higher user satisfaction, academic performance and enjoyment than classroom lectures.

Although many educational organizations create and share video lectures, no conventional standard is available to create a video lecture. No guidelines are available for the presentation style of video lectures (Ilioudi et al., 2013). Importantly, the merits and limitations of each video lecture type for online learning have not yet been thoroughly investigated (Chen & Wu, 2015).Though research has demonstrated that there are advantages of video learning with an instructor's inclusion, the specific interaction mechanism between teacher's presence and students' learning need to be examined carefully, especially from the perspective of the ways to include the instructor and how the properties of learning courses' should be considered. This study examines students' learning by observing satisfaction and self-reported perceived presence by using a two-factor experimental design. Results of this study significantly contribute to efforts to select the appropriate instructor inclusion type for specific learning course in online learning.

2. METHOD

2.1 Experimental setup

After observing the popular instructor inclusion ways for online video learning, two types of instructor inclusion are designed in this study. One is the "picture-in-picture" (PIP) design, the learning material was shown by slides, and the instructor's video was synchronized in the upper-left corner of the slide. The instructor occupied about one sixteenth (6%) of the whole slide screen and his face could be seen clearly (Figure 1, left side). The instructor moved a pink cursor to show the point that he was explaining. The second video design used Chroma Key (CK) to produce an effect like a weather forecast report. The instructor stood in front of the slide and occupied about one fourth (25%) of the whole video screen. He used a pink pointer (to maintain consistency with the pink cursor in the PIP design) to point to the courses that he was explaining (Figure 1, right side).

Videos on two courses--the ozone layer and signal processing--were produced using both PIP and CK designs. The ozone layer course was from a basic science subject, and the courses were easy to understand without deep reasoning or inference. The signal processing course was from an engineering subject and was reported by college students to be complex. It required deep understanding and strong reasoning to understand the terms. Because there was no uniform standard to evaluate the complexity of the learning material, we asked the participants to evaluate the complexity of the learning materials after they finished the learning process.

The courses on the ozone layer covered basic information (e.g., history, discovery, measurement, and protection) and the courses on signal processing included some introductory terms and principles (e.g., frequency, sampling, digitalization), so that it could be understood by college students from varying backgrounds. To make sure the concepts for each course were clearly organized and conveyed, we had two instructors review the courses. The main concern was to make the lecture understandable; thus, the completeness and logical connection of the material was the first priority when organizing the courses, and time length for the two courses was not strictly controlled as the same. The ozone layer video was 10 minutes long, and the signal processing video was 16 minutes long.

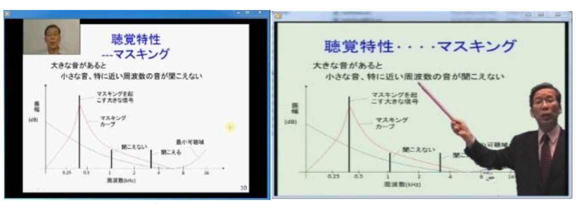

Figure 1. PIP (left, instructor inside the picture) and CK (right, instructor in front of the picture) design

Participants were seated in a comfortable chair, and the resolution for the stimulus display was 1208*1024 pixels. The computer voice volume was set to a moderate level. The experimental procedure was as follows:

(a). Participants were first randomly numbered and their learning task was decided.

(b). Participants completed a pretest on the first learning material, five simple questions about the learning courses.

(c). Participants watched a video on the course with instructions that there would be a posttest after learning. After that, they had 3 minutes to freely review the learning material. They could have direct interaction with videos such as stopping, rewinding, and replaying by mouse click.

(d). Participants completed a posttest on the learning material and completed the 29-item questionnaire.

Sixty participants (48 males, 12 females) from the Tokyo Institute of Technology took part in our experiment. Their average age was 22.6 years old, and the majority majored in computer science, electronic engineering, chemistry, geography, and human science.

2.2 Instruments

We designed a 29-item questionnaire to examine the following four variables: (a) perceived instructor presence, (b) complexity of learning material, (c) mental effort, and (d) satisfaction. The questionnaire was in Japanese, and all responses were given on a 5-point Likert scale.

For students' perceived instructor's presence, we designed 13 items from Short(Short, 1976). Five-point Likert scale was used, "1" indicated "not at all," "5" indicated "very much"), with internal consistency of .87. Explanatory factor analysis was done for these 13 items and showed good fitness for factor analysis (KMO=0.801, Bartlett test of Sphericity <0.01). Three factors were abstracted based on Eigen value over 1, with total explaining variance at 62.13%. Varimax rotation method was adopted and the component matrix was shown in Table 1. Combined with the questions asked in each item, the abstracted three factors was named as "sense of connection", "usefulness for clear-clarification", "helpfulness for assisting-understanding", which constructed the concept of "students' perceived instructor presence".

For complexity of the learning material, we asked 1 item about how complex participants thought the learning material was. A score of "1" indicated "not complex at all", while "5" stood for "very complex".

For mental effort, we modified Salomon's AIME model (Salomon, 1981) and two items ("How much did you try to understand the courses" and "How much effort did you put into the learning process"; "1" indicated "little,","5" indicated "a lot", Pearson's r =0.75, p<0.01) were asked about students' self-perceived mental effort.

For the satisfaction dimension, we designed 13 items that asked about learners' impression towards the learning courses; video design, and learning experience. A score of "1" indicated "very bad," while "5" stood for "very good/well" with internal consistency of .90.

Learning performance gain was measured by subtracting the pre-test score from post-test score.

Table1 Rotation Component Matrix for instructor's presence

3. RESULTS

Q1: Do students' perceived complexity differ for the two learning courses?

The complexity of the learning material was calculated from 1 item in the questionnaire. Independent T-test showed that signal processing (M = 3.73, SD = 1.31) was significantly ($t(58)=5.64$, $p<0.01$) more complex than the ozone layer (M = 2.03, SD = 0.99). This is in line with our assumption.

Q2: Are perceptions of instructor presence different for videos with different types of instructor inclusion and the complexity levels of the learning courses?

For perceived presence, two-way ANOVA showed there was no main effect on the type of instructor inclusion or the type of leaning courses. There was a significant interaction effect ($F(1,56)=4.342$, $p=0.042$) between them, The interaction plot is in Figure 2.

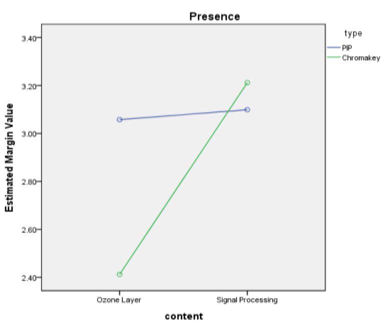

Figure 2. Interaction effect between the types of instructor inclusion and learning courses

Simple effect analysis showed that for CK design, signal processing has a more benefit than ozone layer, which meant for bigger instructor inclusion (Chroma key design), students' perceived instructor presence was higher for more complex learning course. For smaller instructor inclusion (PIP design), there was no significant difference between easier and complex learning courses in terms of students' perceived instructor presence.

Q3: Are students' mental effort different for videos with different instructor inclusion and the complexity levels of the learning courses?

For mental effort, two-way ANOVA showed no main effect of the type of instructor inclusion or type of learning courses, and there was no interaction effect between them.

Q4: Are students' satisfaction different for videos with different instructor inclusion and the complexity levels of the learning courses?

In terms of satisfaction, a two-way ANOVA showed no main effect of the type of instructor inclusion or type of learning courses, there was an interaction effect between the types of instructor inclusion and learning courses($F(1,56)=7.532$, $p=0.008$), the interaction plot is in Figure 3. Simple effect analysis showed that for easier learning course ozone layer, students' satisfaction was much lower in CK design than PIP design; and for more complex learning course signal processing, students' satisfaction was higher in CK design than PIP design.

Rotation Component Matrix[a]

	Component		
	1	2	3
Q13 Teachers' gesture was clearly seen and it made me relax.	.861		
Q11 Teacher's facial expression made me feel genial.	.806		
Q12 I felt closer to the teacher by seeing his face.	.747		
Q1 Teacher's presence helped me stay concentrated.	.626		
Q3 I felt more motivated to learn the content because of teacher's presence.	.512		
Q6 I prefer to listen to teachers' explanation without teacher's presence.		.753	
Q5 Teacher's presence hid some contents, which affected my learning.		.750	
Q4 Teacher's presence design was attractive to me.		.636	
Q10 I prefer to learn slide without teacher's voice and presence.		.602	
Q9 Teacher's voice helped me understand better.			.816
Q8 I had a clear idea where the teacher was talking.			.754
Q7 I tended to follow teachers' voice.			.587
Q2 Teacher's presence didn't help my study.			.477

a.Abstraction Method: Priciple Component Rotation Converges at four iterations.

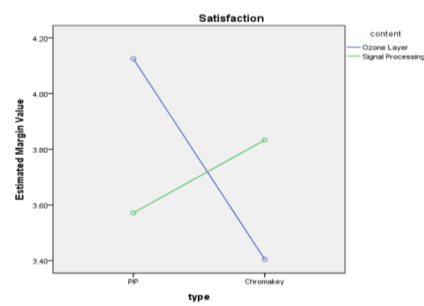

Figure3. Interaction effect between the types courses on satisfaction

Q5: Is students' learning performance gain different depending on the type of instructor inclusion and the complexity levels of the learning courses?

In terms of learning performance gain, a two-way ANOVA showed a main effect of type of learning courses, ($F(1,56)=14.568$, $p<0.01$), the performance gain was higher for ozone layer than signal processing in both designs.

Significant Pearson product-moment correlations among the complexity of learning material, mental effort, instructor presence, and satisfaction are shown in Table 2. Students' perceived presence was positively correlated with mental effort and satisfaction. A positive correlation was found between mental effort and satisfaction too.

Table2. Pearson product-moment correlations among complexity, instructor presence, mental effort, and satisfaction

Variable	Complexity	Presence	Mental effort	Satisfaction	gain
Complexity	1				
Presence	-	1			
Mental effort	-	0.274*	1		
Satisfaction	-	0.461*	0.402*	1	
Gain	0.315*	-	-	-	1

Based on the correlation table above, a linear regression analysis found that students' perceived instructor presence and mental effort were significant predictors of satisfaction (R2 = 0.295, p = <0.01).

4. DISCUSSION

Research has demonstrated that there are advantages of video learning with instructor's inclusion but there is little literature regarding different ways to include the instructor. This study contributes to the literature on the proper way to include the instructor to lecturer video, and how to measure students' perceived instructor presence in this context.

First, the construct of students' perceived instructor presence is measured. Three factors "sense of connection", "usefulness for clear-clarification", "helpfulness for assisting understanding", was identified. This is an initial explanatory factor analysis result and its construction needs further confirmation.

Second, there is interaction effect between the type of instructor inclusion and courses in terms of satisfaction. That is, for easy learning courses, the smaller type of instructor inclusion, namely the picture-in-picture type, is most suitable; for complex learning courses, the larger type of instructor inclusion, namely chroma key, was favorable. It might be that for complex learning courses, students prefer to see the teacher having a larger presence and feel more closely connected with the teacher, with this psychological connection helping students to feel safe and engage more deeply in the learning process.

Instructor presence and mental effort were positive predictors of learning satisfaction (though the R square was not big), suggesting that these elements should be taken into account to maximize students' positive learning experience. In the current study, we did not find a significant correlation between complexity of learning material and satisfaction. That is, students were not necessarily more satisfied with easier learning material. It was the learning performance gain they achieved, the joy, pleasure, and connectedness students obtained from the learning process that made them feel satisfied.

In our case, learning performance gain was largely dependent on the complexity of the courses itself rather than mental effort, with the correlation between learning performance gain and mental effort being neither significant nor strong. Salomon's study (1983) indicated that simply expending more effort did not guarantee increased achievement when learners are unable to create a coherent mental model of the courses.

There are several points in this study needs further study. First, the way to estimate students' mental effort should be enriched. Methods of assessing mental effort and similar constructs (such as concentration, use of cognitive capacity, mental workload) fall into three main categories: opinion measures, dual-task techniques, and physiological measures (Cennamo, 1993).

Second, students' personal characteristics should be considered for further research. Chen & Wu(2015) found that sustained attention of verbalizers is also significantly higher than that of visualizers. Also, cognitive load related to the voice-over type is significantly higher than that with the lecture capture and picture-in-picture types. Furthermore, the cognitive load for visualizers markedly exceeds that of verbalizers who are presented with the voice-over type. This line study of consideration on students' learning preference should be furthered.

5. CONCLUSIONS AND FUTUREWORK

This research examined students' perceived instructor presence and satisfaction in terms of instructor's inclusion type and course complexity in Lecturer video. The construct of students' perceived instructor presence was identified. Perceived instructor presence and satisfaction were both found to be higher when learning complex courses in the CK design whereas for easy courses, the PIP design was favorable. Both instructor's presence and mental effort were significant predictors of satisfaction.

As other media learning research showed, learning differences do not lie in the medium alone (Salomon, 1981). However, clarifying the capabilities of media, and the methods to employ them is helpful for multimedia designers and learners as media interacts with the cognitive and social processes by which knowledge is constructed. The initial findings from this study help us understand effective ways of incorporating teacher's presence into slide video media.

6. ACKNOWLEDGMENTS

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