

Invited Lecture

Effects of Instructional Videos on Students Learning

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ABSTRACT E-learning has become popular these years, and the advantages of flipping the classroom are also widely depicted in literature. However, the widely used element in video instruction, overlaying of a small video of the instructor over lecture slides, is understudied. A new technology called Learning Glass, which can be used for recording lectures and allowing instructors to write lecture notes while maintaining face-to-face contact with students, was used to record instructional videos. The effect of the presence of instructors in instructional videos for university students in two metropolitan universities (Los Angeles and Hong Kong) was studied. Participants were randomly assigned to watch a video with and without the presence of the instructor. The extent to which the participants have grasped the video materials was assessed via pre- and post-tests. Participants' satisfaction towards the video was also evaluated via a survey near the end of the experiment. The effect of the instructor's presence and where the participants come from was studied. It was found that the instructor's presence did not impose a statistically significant difference towards participants' acquisition of the video contents. One possible reason is that individual learning preference is more important than instructing all learners with one approach. It was, on the other hand, found that participants from Los Angeles were more willing to recommend videos to the others and to watch more for learning. This may be related to the fact that e-learning is more popular in Los Angeles. Results of this study may help us recognize the implication of the presence of the instructor in videos as well as providing a better learning environment in the future.

Keywords: Instructional videos; Video design; Gesture; Instructor's presence; Learning Glass; E-learning.

1. Introduction

E-Learning has played a more and more significant role in education over the past few years. Many institutions, for instance, offer online courses for distance learning for a wide variety of audiences. For non-distance-learning courses, the approach of flipping the classroom has also been popular due to various advantages (e.g., Bergmann and Sams, 2012). To deliver the contents to the course participants in both cases, various learning resources such as online quizzes and presentation slides have to be provided. Often instructional videos form the central part of these learning materials as a way to

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provide course participants with a direct narration of the course materials.

Instructional videos can come in a wide spectrum of styles (Chen and Wu, 2015). They can be a recording of a lecture for sharing with students; they can also be of the voice-over style, which mainly displays presentation slides accompanied with synchronous narration by the instructors on the contents. The picture-in-picture approach, on the other hand, allows presentation slides and voice narration to be shown simultaneously together with the instructor's appearance.

The effects of different types or different features of videos on the learning effectiveness are rarely studied. Chen and Wu (2015) compared the learning effectiveness of different types of video lectures and reached a conclusion that the learning performance with videos showing the lecturer is significantly better than voice-only videos. Some researchers proposed that the presence of a lecturer in videos could enhance the learning process, probably by non-verbal communications such as gestures (Valenzano et al., 2003).

Gestures are regarded as an important tool to present abstract ideas and enhance students' comprehension of course materials in classroom (Alibali and Nathan, 2007). Kizilcec, et al. (2014) found that students strongly preferred instruction with the face and perceived it as more educational. Some studies demonstrated that children exposed to gestures of the lecturer in instructional video had better understanding of taught concepts about linguistics and symmetry compared to those who were exposed to videos without gestures (Valenzano et al., 2003; Church et al., 2004). However, those experimental settings mostly stimulated the classroom environment, aiming to examine the effect of gestures in face-to-face learning mode. The role of gestures in E-Learning at the university level, especially in the instructional videos for self-learning purpose, is seldom investigated and receives little attention currently. If a link can be established between gestures and learning performance in E-Learning, it might be useful in designing the teaching materials and enriching learning experience for college students.

2. Objective

In this study, we investigated the effect of instructor's gesturing in instructional videos for university students and test if the learning performance would be significantly different for videos with or without the presence of the instructor. Results of this study may help us recognize the implication of instructor's presence in instructional videos and provide a better learning environment in the future.

3. Hypothesis

We hypothesized that instructional videos with the presence of instructors would not affect the student performance. If students are given identical tests before and after watching an instructional video, the performance of the students who watched the

videos with or without the presence of instructor will not have statistically significant difference.

4. Methodology

4.1. Experimental video

Two recordings from the same 10-minute presentation in English were created. The presentation was about statistical concepts of mean and median, emphasizing the mean as the balancing point of data and how the mean and the median related to the shape of data distribution. The instructor was a Psychology professor who has 8 years of teaching experience in Statistics at a university in Los Angeles, US. One recording (Recording 1) included the video, audio and presentation slides, such that the gestures and facial expressions of the instructor were clearly visible in the recording (see Fig. 1). The recording was prepared with Learning Glass, which was a transparent screen that the instructor could write on. Using the Learning Glass, the instructor was recorded as forward facing in the video which allows for natural eye contact with the camera, gesturing and demonstrating what has been written on the glass. The instructor mainly used gestures to indicate the position of data on the number line and underscore the concept of balancing point. Another recording (Recording 2) was identical to the first one except the absence of the instructor, so it contained the same audio track and presentation slides only. Both videos are 9 minutes long.



Fig. 1. An illustration of Recording 1 (Left) and Recording 2 (Right)

4.2. Pre-test and Post-test

The questions of pre-test and post-test were identical. The pre-test was administered to assess participants' prior knowledge about mean and median. The post-test evaluated the potential enhancement of their knowledge after watching the video. They consisted of ten questions each. In the first three questions, students had to figure out the relationship between mean and median in the given graphs. The remaining questions focused on mean as a balancing point and the concept of mean and median. All questions carried equal scores. Participants were, furthermore, asked to rate their

learning satisfaction at the end of the post-test, i.e. “How likely are you to recommend this video to a friend who’s interested?” and “If you were taking a statistics class, how interested would you be in another short video with the same professor?” in a seven-level Likert scale with 7 representing the highest level of satisfaction.

4.3. Procedures

Undergraduate students from a university in Los Angeles ($n = 211$) and from a university in Hong Kong ($n = 129$) were invited to participate in the study. Participating students from both universities all use English as the medium of instruction but come from a variety of study backgrounds.

4.4. Participants

Participants were invited by emails which included a link to access the experiment. At the beginning of the experiment, the participants completed the online pre-test. Then they were randomly assigned to one of Recording 1 and Recording 2. After watching the recording, the participants took the post-test. The improvement in the understanding of participants towards the topic could be measured by the increase in the score of the two tests. Statistical method was applied to test if there is a significant difference between the two groups. The whole process was launched in online format. Participants could take part in their leisure. This simulated the actual online learning process that caters for diversified learning habits. Participants were expected not to spend more than 30 minutes to complete the experiment.

5. Results

Tab. 1 shows the average gained scores of the participants from both universities. The average scores of the pre-test and the post-test in the two groups (Recording 1 and Recording 2) were calculated. The gain scores were used to understand how the videos enhanced the knowledge of the participants. A two-way ANOVA was conducted using gained scores as the dependent variable, while location and the presence of the instructor were used as independent variables with $\alpha = 0.05$.

Tab. 1. The average gained scores of the participants from both universities

Average gained scores	Recording 1	Recording 2	All participants
University in Los Angeles	2.23 (n=98)	2.19 (n=113)	2.21 (n=211)
University in Hong Kong	2.05 (n=61)	2.37 (n=68)	2.22 (n=129)
All participants	2.16 (n=159)	2.26 (n=181)	2.21 (n=340)

Tab. 2 shows the results of the two-way ANOVA. Since 0.923 and 0.871 are both greater than 0.05, the two factors, location and the presence of the instructor, are

statistically insignificant to the performance of the students which were measured by the gained scores.

Tab. 2. The results of the two-way ANOVA

Source	Value	Standard error	t	Pr > t	Lower bound (95%)	Upper bound (95%)
Intercept	2.195	0.168	13.037	<0.0001	1.864	2.526
University in Hong Kong	0.022	0.231	0.097	0.923	-0.431	0.476
University in Los Angeles	0.000	0.000				
Instructors-with	0.040	0.247	0.162	0.871	-0.446	0.526
Instructors-without	0.000	0.000				

In addition, the participants were asked to rate their learning satisfaction at the end of the post-test. Tab. 3 summarises the results to the question “How likely are you to recommend this video to a friend who’s interested in learning more about mean?”, while Tab. 4 shows the results of the two-way ANOVA with location and the presence of the instructor as independent variables with $\alpha = 0.05$.

Tab. 3. The results to the question “How likely are you to recommend this video to a friend who’s interested in learning more about mean?”

Average scores (0-7)	With instructor	Without instructor	All participants
Participants from Hong Kong	5.16 (n=61)	4.72 (n=68)	4.93 (n=129)
Participants from Los Angeles	5.55 (n=98)	5.24 (n=113)	5.38 (n=211)
All participants	5.40 (n=159)	5.05 (n=181)	5.21 (n=340)

From Tab. 4, both p-values are less than 0.05. This means that both factors are statistically significant.

Tab. 4. The results of the two-way ANOVA

Source	Value	Standard error	t	Pr > t	Lower bound (95%)	Upper bound (95%)
Intercept	5.219	0.124	42.085	<0.0001	4.975	5.463
University in Hong Kong	-0.457	0.163	-2.799	0.005	-0.777	-0.136
University in Los Angeles	0.000	0.000				
Instructors-with	0.355	0.158	2.243	0.026	0.044	0.667
Instructors-without	0.000	0.000				

The participants in Los Angeles are more likely to recommend this video to a friend who’s interested in learning about mean in comparison with the participants in Hong Kong. In addition, the presence of an instructor also has a positive effect on whether they would recommend the video to a friend.

Tab. 5 summarises results to the question “If you were taking a statistics class, how interested would you be in another short video with the same professor?”, while Tab. 6 shows the results of two-way ANOVA with location and the presence of the instructor as independent variables with $\alpha = 0.05$.

The two-way ANOVA showed that the factors of location and the presence of an instructor are both significant. The participants in Los Angeles are more likely to watch another short video with the same professor in comparison with the participants in Hong Kong. In addition, the presence of an instructor also has a positive effect on whether they would be interested in another short video with the same professor.

Tab. 5. The results to the question “If you were taking a statistics class, how interested would you be in another short video with the same professor?”

Average scores (0-7)	With instructor	Without instructor	All participants
Participants from Hong Kong	5.02 (n=61)	4.60 (n=68)	4.80 (n=129)
Participants from Los Angeles	5.77 (n=98)	5.34 (n=113)	5.54 (n=211)
All participants	5.48 (n=159)	5.07 (n=181)	5.26 (n=340)

Tab. 6. The results of the two-way ANOVA

Source	Value	Standard error	t	Pr > t	Lower bound (95%)	Upper bound (95%)
Intercept	5.342	0.121	44.102	< 0.0001	5.104	5.580
University in Hong Kong	-0.743	0.159	-4.665	< 0.0001	-1.057	-0.430
University in Los Angeles	0.000	0.000				
Instructors-with	0.423	0.155	2.733	0.007	0.119	0.727
Instructors-without	0.000	0.000				

6. Discussion

Based on our results, the presence of the instructor in videos does not impose a statistically significant difference in students’ performance between the pre-test and the post-test. Previous educational studies have suggested that adopting one teaching approach for all students may not be the most effective; taking care of learning preferences of different students would be more important. To investigate the effect of instructional video design on learning effectiveness, the narrative style of the instructors in the video, the design of the presentation slides and the relation with the subject contents can be our future directions.

In terms of perception of the video, our results showed that participants who had watched a video with the instructor in it (Recording 1) were more likely to recommend it to the others as well as watching more videos of the same instructor. The presence of instructors can capture viewers’ attention through the use of various body languages. Such presence can also help showcasing the involvement of the instructors in the course, thus fostering more satisfaction in the students.

Participants from Los Angeles, furthermore, are more likely to recommend our videos (both Recording 1 and Recording 2) to their friends as well as watching more, compared to their peers in Hong Kong. Such a difference can be related to the environment of the two locations. Although both cities are metropolitan, they show differences: Hong Kong, with a population of around 7.5 million, is about ten times

smaller than Los Angeles County, which has a population of 10 million. With relative ease of public transportation, remote learning in Hong Kong is not very common. In contrast, the population in Los Angeles is more spread out with more reliance on private transportation. Because of this, participants from Los Angeles would be more used to e-learning and watching instructional videos for learning.

The current study has its own limitations. The results, for example, may be related to the subject contents of our video, and it is still up to further research to assess if similar findings can be obtained for other subject areas. Our results, furthermore, can be affected by the use of Likert scale in our surveys, as participants with different cultural backgrounds can interpret the scale differently: some participants may be more willing to use the whole Likert scale, while some may tend to restrict themselves more to the middle part.

7. Conclusion

The effect of instructors' presence on learning effectiveness is studied among participants from Los Angeles and Hong Kong. While the presence of the instructor in the video does not demonstrate statistically significant difference in participants' acquisition of the video contents, it does help to encourage participants to watch more similar videos and to recommend it to their peers. Compared to their counterparts in Hong Kong, participants from Los Angeles are also more willing to recommend the video to their friends and to watch more of the same style. This may be related to the fact that e-learning and the use of instructional videos for learning are more widely practised in Los Angeles. These findings can be of value for instructional video design so as to improve teaching and learning effectiveness.

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References

- M. W. Alibali and M. J. Nathan (2007). Teachers' gestures as a means of scaffolding students' understanding: Evidence from an early algebra lesson. *Video Research in the Learning Sciences*, 349–365.
- J. Bergmann and A. Sams (2012). *Flip Your Classroom: Reach Every Student in Every Class Every Day*. Eugene, OR/Alexandria, VA: International Society for Technology in Education; ASCD.

- C. M. Chen and C. H. Wu (2015). Effects of different video lecture types on sustained attention, emotion, cognitive load, and learning performance. *Computers & Education*, 80, 108–121.
- R. B. Church, S. Ayman-Nolley, and S. Mahootian (2004). The role of gesture in bilingual education: Does gesture enhance learning? *International Journal of Bilingual Education and Bilingualism*, 7(4), 303–319.
- R. Dunn and S. A. Griggs (2000). *Practical Approaches to Using Learning Styles in Higher Education*. Westport, CT: Bergin and Garvey
- R. F. Kizilcec, K. Papadopoulos, and L. Sritanyaratana (2014). Showing Face in Video Instruction: Effects on Information Retention, Visual Attention, and Affect. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI'14*, 2095–2102.
- W. M. Roth (2001). Gestures: Their role in teaching and learning. *Review of educational research*, 71(3), 365–392.
- L. Valenzeno, M. W. Alibali, and R. Klatzky (2003). Teachers' gestures facilitate students' learning: A lesson in symmetry. *Contemporary Educational Psychology*, 28(2), 187–204.