

College Students' Preferences on Principles for the Effective Instructional Video Design for Online General English Classes in Korea

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Abstract: The present study investigates the preferences of students regarding the principles for the effective design of instructional videos to identify factors that influence engagement. A questionnaire was distributed to 232 students enrolled in online liberal arts classes at a private university in South Korea. Frequency analysis was conducted to determine preferences, whereas an independent sample *t*-test and one-way analysis of variance were administered to verify any differences in preferences according to gender and grade. The findings are as follows. First, out of the 12 principles that should be considered in the design of instructional videos, the students most preferred the review quiz principle. Moreover, this factor was found to exert the greatest influence on engagement. Second, incorporating real-life situation principles into instructional videos also had a significant impact on engagement. Third, female students expressed higher levels of preference than did male students in terms of the preview, course content on screen, and review quiz principles. Fourth, sophomores preferred the review quiz principle more than the freshmen did. The results of the present study are in line with those of previous research in that the effective instructional design of multimedia lessons requires reducing extraneous processing, managing essential processing, and fostering generative processing. Particularly, the study found that Korean students value video lectures with generative activities for meaningful learning. Based on the findings of the study, pedagogical considerations of the design of recorded lectures and its structure for active engagement, and suggestions for future studies are provided.

Keywords: instructional video design, fostering engagement, movie English, cognitive theory of instruction, multimedia principle

1. Introduction

Coronavirus disease 2019 (COVID-19) has led to considerable changes to the educational environment worldwide (Moser, Wel and Brenner, 2021). The majority of university classes in South Korea have been forced to switch to online education called emergency remote learning (Korean Ministry of Education, 2020) at short notice. Particularly, liberal arts classes have been conducted almost entirely online since the spring semester of 2020 because of the large number of students. In Korea, non-face-to-face classes have been conducted in one of three types, namely, synchronous courses using live video conferencing software, such as Zoom; asynchronous courses with prerecorded instructional videos; and hybrid courses using a combination of both types.

Among them, instructional videos are popular among students (Henderson, Selwyn and Aston, 2015). This medium gives them control over the pace of learning (Murray, Koziniec and McGill, 2015) and easy access anytime and anywhere. Moreover, teachers can track students' learning. Videos can hold learners' attention with a lecturer's narration, onscreen printed text, and diverse media. Scholars found that effectively designed videos can facilitate better learning (Castro-Alonso, Wong, Adesope, Ayres and Paas, 2019; Höffler and Leutner, 2007) and increased motivation (Abeysekera and Dawson, 2014).

However, the rushed transition to online teaching came with various drawbacks. It failed not only to check the learners' attitude, interest, and understanding but also to sustain attention to lectures (Szpunar, Jing and Schacter, 2014) as verified by the dropout rate, which was reported to be higher than that of offline classes (Lim, et al., 2021). Several studies argued that online education is not as effective as face-to-face traditional instruction (Krause and Coates, 2008; Pickering and Swinnerton, 2019) and that poor course designs and pedagogies for online instruction have led to poor learning outcomes (Woodworth, et al., 2015). Furthermore, problems with the low-quality lectures because of unprepared learning design are constantly being raised (Kong and Lee, 2021).

Teaching online is fundamentally different from face-to-face teaching (Johnston, Killion and Oomen, 2005; Mayer, 2014b). In terms of technology use, the content design, learning assessment, student motivation,

student diversity, and online settings are different (Boettcher, 2011; Clark, 2014; Davis, 2000; Fayer, 2017; Quitadamo and Brown, 2001). Thus, online classes require different approaches (Choe, et al., 2019) and necessitate the development of new lesson planning skills among instructors. Moore (2003) stressed that the quality of instruction has far more of an impact on the students' decisions to attend lectures than giving penalties.

Unfortunately, the majority of professors in South Korea have hardly conducted online classes or video production. They are unprepared to teach with little resources and time (Che and Lee, 2020). Even so, creating high-quality instructional videos after a short training course continues to be difficult. One of the challenges for professors is creating appealing instructional videos while maintaining high levels of educational outcomes, motivation, and engagement. Hence, identifying the factors that influence online classes is crucial for improving student engagement. Engagement is a useful variable that directly or indirectly predicts the learning process and learning outcomes. Moreover, several studies reported that the level of engagement exerted a significant effect on class satisfaction (Lim, et al., 2021).

Previous research listed principles for effective instructional designs (Fyfield, Henderson and Philips, 2019; Mayer, 2020; 2021). However, empirical studies on whether such principles can be applied to actual online classes for general English within the context of Asian countries are few (Costley, Hughes and Lange, 2017). To address this research gap, the present study aims to provide basic data for the quality management of instructional videos and improvement of satisfaction with online classes. By applying the existing evidence-based principles for the effective design of instructional videos in online classes, this study intends to investigate the preferences of students and to identify factors that influence engagement. The research questions for the study are as follows:

1. What are the preferences of college students in terms of the design of instructional videos for liberal arts classes?
2. Are there differences in preferences by gender and year?
3. What is the relationship between preferences on instructional design principles and student engagement?

2. Literature Review

2.1 Cognitive Theory of Multimedia Learning and Instruction

Mayer (2021) suggested evidence-based principles for designing instructional videos and for grounding in cognitive theories of learning and instruction. According to Mayer (2021), three principles from the science of learning are dual channels, limited capacity, and active learning principles. In other words, learners apply separate visual and verbal channels and should engage in active cognitive processing. However, they can only process a limited amount of information in each channel at one time (Swellie, Ayres and Kalyuga, 2011). With these principles regarding human cognition, Mayer (2021) also listed three demands on the learner's cognitive resources during instruction, namely, extraneous processing, essential processing, and generative processing.

Extraneous processing occurs when interesting but distracting and irrelevant materials are included. When an extremely extraneous overload occupies cognitive capacity, there is not enough room for the others (essential processing and generative processing) to process. Essential processing is related to content complexity. When learners engage in essential processing, they pay attention to the content and that leads to better retention of information. Lastly, generative processing helps learners to get motivated and to transfer information from working memory to long-term memory. Notably, the effective instructional design of multimedia lessons requires the reduction of extraneous processing, management of essential processing, and fostering of generative processing (Buchner, 2021; Mayer, 2021).

2.2 Principles Implemented in Video Lecture Design

Specifically, Mayer (2021) suggested 13 principles for the design of instructional videos (p.5). First, to reduce extraneous processing, videos should contain relevant materials (coherence principle), highlight key parts (signaling principle), avoid the addition of captions for the same narration (redundancy principle), place text next to the graphic (spatial contiguity principle), and present visual materials with corresponding narration (temporal contiguity principle). Second, to manage essential processing, a video should be broken down into several parts (segmenting principle), should introduce key concepts at the beginning (pre-training principle), and present words as spoken text instead of written text alone (modality principle, see also Mayer, 2019). Lastly, to foster

generative processing, instructors should use conversational language (personalization principle), speak in a friendly manner (voice principle), avoid static photos of the instructor (image principle), include gesture (embodiment principle), instruct learning strategies like summarizing, self-testing and self-explaining (Fiorella and Mayer, 2016), and add activities for meaningful learning (generative activity principle).

Furthermore, Fyfield, et al. (2019) identified 25 principles for the design of instructional videos that consider cognitive efficiency and presented a fourth category named interface design principles besides the three categories presented by Mayer (2014a; 2014b; 2021). Under this category, the subcategories are (1) learner control effect, which denotes a video interface controlled by learners for pausing, playing, speeding up, and slowing down (Kühl, et al., 2014); (2) segmentation, which suggests that a pause should follow important information (Mayer and Pilegard, 2014); and (3) integrated practice activities, such as those about activity integration during the presentation or after watching a video (Szpunar, et al., 2014).

To sustain attention to online lectures, Szpunar, et al. (2014) implemented interpolated testing. In two experiments, 80 students were instructed to conduct a test four times while watching a 21 min video lecture. The findings demonstrated that interpolating an online lecture with testing helped students to quickly and efficiently learn lecture content and to retain more information. Moreover, they reported increased note taking, less mind wandering, and even reduced anxiety for the final test. Roediger and Karpicke (2006) also supported the idea that tests could be used to significantly enhance learning. Lee and Song (2021) reported the positive effect of video lectures with embedded quiz questions.

2.3 Previous Studies on Effects of Lecture Video Design

Choe, et al. (2019) conducted a survey to identify the preferred styles of students for online lecture videos. A total of 183 undergraduates at the University of California, Los Angeles, CA, USA, participated and expressed strong preferences for video styles using Learning Glass and Demonstration. Additionally, they strongly preferred engagement and connection even in asynchronous courses, which supported the concept of Mayer's (2021) personalization principle. Brame (2016) considered three elements for video design, namely, cognitive load, student engagement, and active learning. Cognitive load follows Mayer's (2021) three demands on the cognitive resources of learners during instruction. To maximize student attention to educational videos, Brame (2016) recommended creating videos with duration of 6-9 min and using a conversational style to develop a sense of social partnership. Strategies to promote active learning are (1) packaging videos with interactive questions, (2) using guiding questions, and (3) making videos as part of a larger homework assignment. Rickley and Kemp (2021) conducted a quasi-experiment to observe the effect of video lecture design on perceived learning and student satisfaction. They found that principle-based designed video lectures had a meaningful effect on learners' perceived learning and satisfaction. Jamie et al. (2017) pointed out that only a small number of students are watching video lecture. To figure out the relationship between the perception of the instructional design and engagement, they conducted a survey to 1801 cyber university students. Based on the results, they concluded five key elements of instructional design for online classes, namely, designing methods, setting the curriculum, establishing time parameters, establishing netiquette, and utilizing the medium effectively (p.200)

3. Method

3.1 Participants

Participants comprised students enrolled in the course Movie English for Speaking at a private university in Seoul, South Korea. The researcher took charge of two classes with 130 students per class and taught them for the whole semester. The course was elective and held once a week for 100 min across 15 weeks. All liberal arts classes were conducted online only because of the COVID-19 pandemic. Recorded video lectures were provided to students for 13 weeks except for the course introduction and orientation at the first week and the final exam at the 15th week. A total of 260 students completed the questionnaire. However, 28 were excluded from analysis because they were given the freedom to skip any question if they were hesitant to answer. Out of 232 students, 81 (34.9%) and 151 (65.1%) were male and female, respectively. There were 47 (20.3%) freshmen, 60 (25.9%) sophomores, 70 (30.2%) juniors and 55 (23.7%) seniors.

Their scores for the Test of English for International Communication ranged from 135 to 985 points with an average score of 604. Scores below 550, between 551 and 700, and above 701 were considered beginner, intermediate, and advanced levels, respectively.

The majors of the students varied and were classified into three groups on the basis of the academic division of the university, namely, Humanities and Social Sciences (n=103; 44.4%), Engineering and Sciences (n=99; 42.7%), and Arts and Sports (n=30; 12.9%). Table 1 provides a summary of the demographics of the participants.

Table 1: Demographics of participants

Category	Item	N	%
Gender	Male	81	34.9
	Female	151	65.1
Year	1	47	20.3
	2	60	25.9
	3	70	30.1
	4	55	23.7
TOEIC score	Beginner (below 550)	94	40.5
	Intermediate (551–700)	73	31.5
	Advanced (above 701)	65	28
College	Humanities and Social Sciences	103	44.4
	Engineering and Sciences	99	42.7
	Arts and Sports	30	12.9

3.2 Data Collection Instrument and Method of Analysis

To obtain data for the study, a questionnaire was distributed to investigate the students’ preference for the design instructional videos. Through a preliminary survey on 135 students at the beginning of the semester, the students were asked what elements should be included in online instructional videos. Twelve items were selected for the final questionnaire (Table 2).

Table 2: Twelve video design principles and survey items

	Principle	Items
Extraneous load	Spatial/temporal contiguity	Course content on the screen
	Signaling	Highlight key parts
	Redundancy (caption)	Subtitles
	Redundancy (music)	Background music and sound effect
Essential load	Segmenting	Wrap-up (summary of the lesson)
	Modality	Diverse media
	Pre-training	Preview (for the previous content)
Generative load	Personalization	Incorporating real-life situations
	Generative activity (organize)	Teaching digital skills
	Generative activity (compare)	Feedback on assignments
	Image/embodiment	Instructor’s face and gesture
	Generative activity (test)	Review quiz (immediately after videos)

For student engagement, three items were used from the questionnaire of Kim and Lee (2019), namely, (1) When I start watching videos, I pay attention to them and watch all at once without pause; (2) I take notes while watching videos; and (3) I work as hard as I can to carry out assignments and quizzes related to the videos. Cronbach’s alpha value for the items was .656, which indicates that they are valid and acceptable.

The researcher translated and applied the questionnaire to facilitate ease in the understanding of statements. Items were rated using a five-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). The collected data were analyzed using SPSS for frequency. After ranking the preferences for the 12 items for instructional design on the basis of mean and standard deviation, repeated-measures analysis of variance (ANOVA) was performed to verify if a difference exists between the means for the one to five rankings.

Additionally, an independent sample *t*-test and one-way ANOVA were administered to determine any differences in the 12 preferences according to gender and grade. Scheffé’s method was applied as a post hoc test. To further investigate the effect of preference on engagement, linear regression was used.

3.3 Procedures of the Study

3.3.1 Week 1: Preliminary Survey

At the beginning of the study, the students were requested to respond to a preliminary questionnaire regarding instruction design preference, which included multiple questions and open-ended questions. Data from short-answer questions were translated, counted, and categorized into groups on the basis of the frequency of topics and are presented descriptively.

3.3.2 Weeks 2–13: Online classes with recorded videos

The researcher of the study was the instructor for Movie English for Speaking class. Students were taught about the culture and language on the basis of movie scripts. The talking head style video (Choe, et al., 2019) was provided. Video production was made using the university’s content management system and sent to students via a learning management system (LMS). Additionally, this LMS space was used for attendance, video lectures, forums, quizzes, assignments, and surveys. The students watched three videos (20 min each) per week, and 12 instruction design items (Table 2) were incorporated into the videos at least four times. Watching the video lectures once a week was compulsory within the designated period, and students must click the video for attendance.

3.3.3 Week 7, 14: Questionnaire

Learner preference on the selected 12 principles for instructional design of online lectures was investigated using Likert-type scales with and one short open-ended question. The questionnaire was administered twice by dividing the 12 principles into two. Six principles were included in the first questionnaire and the other six principles were asked later (see Appendix). A total of 260 students completed the questionnaire, whereas 28 questionnaires for students with missing items, those who missed watching videos, or those who refused to respond were excluded from the analysis.

4. Results

4.1 What are College Students’ Preferences on Instructional Video Design in Liberal Arts Classes?

Table 3 provides the results of the ranking of the preferences for the 12 principles of instructional design. The top five items are review quiz (4.17; highest average), course content on the screen ($M=4.04, SD=0.84$), wrap-up (summary of the lesson: $M=4.02, SD=0.74$), incorporating real-life situations ($M=3.75, SD=0.79$), and highlight key parts ($M=3.75, SD=0.74$).

Table 3: Descriptive statistics for instructional design principles (n=232)

Rank	Items	Min.	Max.	M	SD
1	Review quiz	2	5	4.17	0.60
2	Course content on screen	1	5	4.04	0.84
3	Wrap-up (summary of the lesson)	2	5	4.02	0.74
4	Incorporating real-life situations	1	5	3.75	0.79
5	Highlight key parts	2	5	3.75	0.74
6	Teaching digital skills	2	5	3.65	0.73
7	Diverse media	1	5	3.54	0.69
8	Subtitles	1	5	3.53	0.92
9	Preview (for the previous content)	1	5	3.51	0.85
10	Feedback on assignments	1	5	3.03	0.85
11	Background music and sound effect	1	5	2.94	0.91
12	Instructor’s face and gesture	1	5	2.64	0.82

The results of repeated-measures ANOVA for the top five rankings to verify a difference between means are as follows: The Greenhouse-Geisser correction was applied because the sphericity test result was significant (Mauchly’s $W=.920, p<.05$). A significant difference was observed between the means the top five rankings ($F=17.309, p<.001$). Consequently, the average score of the first ($M=4.17, SD=0.60$), second ($M=4.04, SD = 0.84$), and third ($M=4.02, SD=0.74$) ranks were higher than those of the fourth ($M=3.75, SD=0.79$) and fifth ($M=3.75, SD=0.74$) ranks, as shown in Figure 1. The results are in line with those of previous research (Buchner, 2021; Mayer, 2021) in that the effective instructional design of multimedia lessons requires reducing extraneous

processing(course content on screen), managing essential processing(wrap-up), and fostering generative processing(review quiz) (Buchner, 2021; Mayer, 2021).

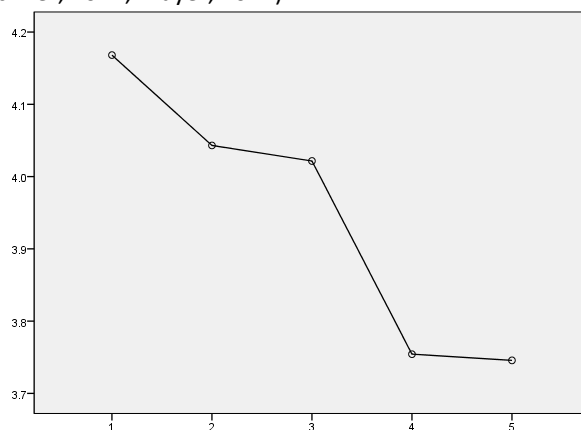


Figure 1: Average score difference among the top five items

4.2 Are There Differences in Preferences by Gender and Year?

We conducted a *t*-test and a one-way ANOVA to verify any difference between gender and year (freshmen to seniors). Table 4 indicates a significant difference between males and females. Specifically, the female students mainly preferred preview for the previous content ($t=-2.373, p<.05$), course content on the screen ($t=-2.566, p<.05$), and review quiz ($t=-2.957, p<.05$). As confident independent learners, female students tend to actively use quiz questions to monitor their learning.

Table 4: Instruction design preference by gender

	Gender	N	M	SD	t	p
Preview (for the previous content)	M	81	3.33	0.82	-2.373	.018*
	F	151	3.61	0.86		
Course content on the screen	M	81	3.85	0.79	-2.566	.011*
	F	151	4.15	0.85		
Review quiz	M	81	4.01	0.64	-2.957	.003**
	F	151	4.25	0.56		

After examining differences by year, significant differences were found only for the review quiz ($F = 3.758, p<.05$). Moreover, the sophomores prefer review quiz than the freshmen do. This could indicate that freshmen students viewed review quizzes right after videos as an extra assignment, while others took such quizzes as a way of checking whether they remembered the key content of the class, without viewing them as a burden because they are aware they can be related to final exams and grades.

Table 5: Instruction Design Preference by Year

	Year	N	M	SD	F	p	Scheffé's correction
Review quiz	1	47	3.94	0.57	3.758	.012*	2 > 1
	2	60	4.32	0.62			
	3	70	4.19	0.52			
	4	55	4.18	0.64			

4.3 What is the Relationship Between Preferences on Instructional Design Principles and Student Engagement?

Table 6 presents the results of correlation analysis to determine the correlation between preferences and engagement. For student engagement student engagement ($N = 232, \text{Min} = 2, \text{Max} = 5, M = 4.01, SD = .599$)., three items were used from the questionnaire of Kim and Lee (2019), namely, (1) When I start watching videos, I pay attention to them and watch all at once without pause; (2) I take notes while watching videos; and (3) I work as hard as I can to carry out assignments and quizzes related to the videos. Items were rated using a five-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). The relationship between

engagement and incorporating real-life situations ($r=.156, p<.05$) and review quiz ($r =.466, p<.001$) displayed a significant correlation.

Table 6: Correlations between top five instructional design principles and student engagement

	Engagement	Review quiz	Course content on the screen	Wrap-up	Incorporating real-life situations	Highlight key parts
Engagement	1					
Review quiz	.466***	1				
Course content on the screen	.021	.097	1			
Wrap-up	.007	.080	.075	1		
Incorporating real-life situations	.156*	.097	.178**	.202**	1	
Highlight key parts	.062	.127	.157*	.297***	.159*	1

* $p<.05$, ** $p<.01$, *** $p<.001$

To evaluate the effect of preference on engagement, the results of investigating the effect of the top 5 rankings are shown in the following Table. The low R-squared value indicates an inherent amount of unexplainable variability. Considering the scarce empirical studies that investigated whether the principles of instructional video design can be applied to actual online classes for general English are few, this result implies that the factors influencing the engagement or satisfaction of recorded video lectures remain unidentified and warrant further study.

Review quiz ($\beta=.462, p<.001$) and incorporating real-life situations ($\beta=.129, p<.05$) exhibited significant results, course content on the screen, wrap-up (summary of the lesson), and highlight key parts were insignificant. Thus, the instructional design principles that influence engagement are review quiz and incorporating real-life situations, and the effect can be seen that review quiz is larger than incorporating real-life situations.

Table 7: Model summary for regression values

	Unstandardized coefficients		Standardized coefficient	t	Sig.
	B	SE	β		
Review quiz	.463	.059	.462	7.826	.000***
Course content on the screen	-.031	.043	-.044	-.732	.465
Wrap-up (summary of the lesson)	-.044	.050	-.055	-.882	.379
Incorporating real-life situations	.097	.046	.129	2.127	.035*
Highlight key parts	.005	.050	.006	.095	.924
R ² =.235, adj. R ² =.218, F=13.851, p<.001					

5. Discussion

Out of the 12 principles that should be included in the instructional videos, the students mainly preferred review quiz. Moreover, the study found that this factor exerted the greatest influence on engagement. For offline classes, taking quizzes or tests are the typical factors that give students feelings of stress (Staats, Cosmar and Kaffenberger, 2007). In online classes, however, students can check the extent of their understanding of the content of lessons without pressure. As such, review quiz was considered to be beneficial for engagement (Dykman and Davis, 2008; O, 2020). This finding is consistent with those of previous research, i.e., review quizzes are effective for learners (Brown, et al, 2015).

Moreover, the students preferred the reduction of extraneous load, as indicated by the ranking for course content on the screen (second). Looking at course content on the screen, including texts, PowerPoint slides, and other visual aids, while listening to the instructor’s narration not only helps to reduce extraneous load but helps students focus on essential materials. Moreover, searching for lesson contents in textbooks, while listening to the instructor’s explanation without displaying the text on the screen, can be distracting for learners.

Additionally, to reduce the load on the learner’s information processing, instructors should emphasize the important points through verbal and visual signals (highlight key parts, top five). Alternatively, the findings suggest that providing a subtitle (top eight), which is identical with instructor’s narration and background music, or sound effect (top 11) and instructor’s face and gesture (top 12) are redundant, such that extraneous materials

should be excluded rather than included. This result is in contrast to those of previous studies, i.e., students performed better when the instructor maintained eye contact (Fiorella, et al., 2020) and showed gestures (Mayer and DaPra, 2012). Thus, the study infers that subtitles, background music, and the instructor's face and gestures are seemingly irrelevant with the visual input through text and movie scenes on the screen and the auditory input of the teacher's narration.

To manage essential processing, the segmenting principle should be considered, as Mayer (2021) stated that segmenting enables learners to build a mental representation of the part before moving on to the next (p.7). The participants preferred a summary of the lesson (top three) at the end of videos and initiating videos with a preview of the previous lesson (top nine) instead of lengthy storytelling-style videos. Moreover, the participants reported that understanding and remembering the course content by utilizing diverse media (top seven) are easy. Notably, students learn better with text on the screen instead of spoken words from a video lesson in learning a second language in particular (Lee and Mayer, 2018).

The findings confirm that the effective design of instructional videos requires fostering generative processing. Seemingly, the participants prefer not only an explanation of the contents of textbooks but also how these contents can be applied to real-life situations (incorporating real-life situations, top four). For instance, they were interested in the instructor's personal story regarding misunderstandings due to cultural differences.

Additionally, they wanted to hear from the instructor on how to study English and organize materials and useful websites with recommendations and guidance on use (teaching digital skills, top six). This result supports the findings of Magnussen (2008), Brown and Ford (2002), DeRouin, Fritzsche and Salas (2004) that is, e-learning platform proficiency influenced engagement. As Darrington (2008) pointed out, many students are not tech-savvy, which is necessary for learning. Hence, instructors should consider providing guidance on essential digital skills. Several students preferred feedback on assignments (top 10) to be included in video lectures to help them better prepare next time. Notably, effective instructional videos help learners to get motivated and to transfer information from working memory to long-term memory.

Female students were more likely to prefer review quiz and course content on the screen. The results demonstrate that they are confident independent learners who are academically engaged in online courses and may outperform their male counterparts online (Price, 2006). Additionally, Hsiao (2021) stated that face-to-face courses are more suitable for male students, who tend to be passive in learning and display less independent learning abilities. Seemingly, constant attention and monitoring for male students are required in the e-learning environment.

Significant differences in preferences according to year were found only for review quiz ($F=3.758, p<.05$). Specifically, the preference levels of the sophomores were higher than those of the freshmen, who exhibited the lowest preference levels. This result could be an indication that freshmen students recognized review quiz immediately after videos as an extra assignment, whereas the others took the quiz to verify whether they remembered the key contents of the class because they are aware that review quizzes can be related to final exams and grades. This discrepancy should be considered for freshmen students without university experience and interaction due to COVID-19. As such, further studies that provide detailed instructions and explanations why students should take review quizzes and their benefits for learning are required.

6. Conclusion

This study investigated preferences for the design of instructional videos and their relationship with engagement in videos among college students enrolled in general English online lectures at a private university in South Korea. The study found that out of the 12 design principles, review quiz immediately after videos was highly preferred and exerted the greatest influence on engagement. Incorporating real-life situations (top four) also exerted a significant impact on engagement. Based on the results of this study, the following instructional video structure can be made as shown in Figure 2. To manage essential processing, a video should be broken down into three parts: pre-, while-, and post-video lecture (Segmenting principle). At the beginning of the lecture, instructors should preview of the previous lesson and its connection with today's lesson. In the middle of the video lecture, course content (texts, PowerPoint slides, and diverse media) should be incorporated and instructors should emphasize the key points and explain how these contents can be applied to real-life situations (incorporating real-life situations). In contrast, extraneous materials such as subtitles, background music, or

sound effect and instructor's face and gesture should be excluded. At the end of the video lecture, instructors should give summary of the lesson. Finally, a review quiz right after the video lecture promotes student engagement, therefore, should be provided to check their understanding.

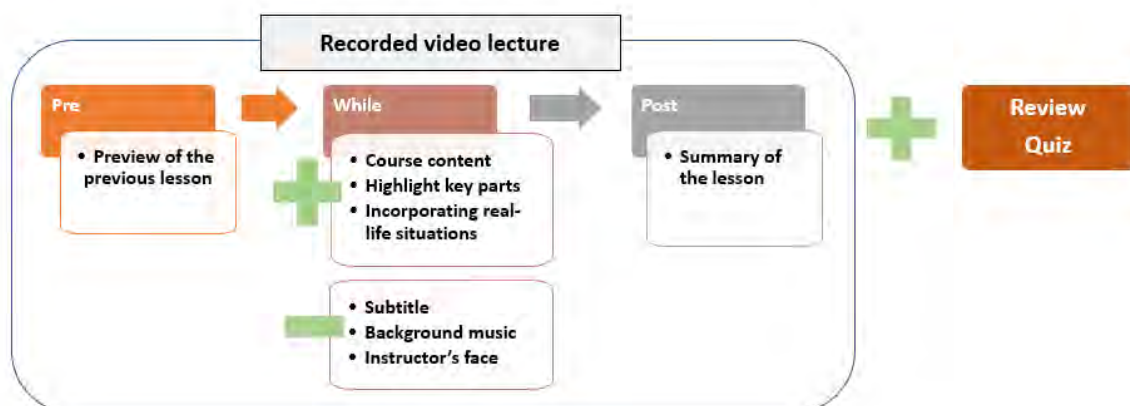


Figure 2: Suggested recorded video structure of this study

The findings of the present study draw pedagogical implications for the design of recorded lectures and their structure for active engagement. The results of the present study are in line with those of previous research in that the effective design of multimedia instructional videos requires reducing extraneous processing, managing essential processing, and fostering generative processing. Particularly, it was found that Korean students value video lectures with generative activities for meaningful learning. Based on these findings, the study suggests that instructors should make generative activities integrated with recorded video lectures less of a burden.

Particularly, participation should be prioritized over scores. Hence, teachers should be creative in designing instructional videos and activities for learners to enhance their motivation and transfer of knowledge from working memory to long-term memory.

The present study acknowledges its limitations, which should be addressed in future studies. For instance, the results were obtained from a particular set of students in the South Korean context. Thus, further research using different contexts and long-term and qualitative data is necessary to verify this study.

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Appendix

Questionnaire #1

1. Which method of learning do you favor/prefer the most?
 Prerecorded video lectures Zoom lectures Both pre-recorded video and Zoom lectures
2. Suitable duration for online classes (per class)
 less than 10 min. 10-15 min. 15-20 min. 20-30 min. more than 30 min.
3. With a scale from 1 to 5, please give me your opinion on the items for instructional design of online lectures. How important is each of the following statements?

Items	Not important				Very important
	1	2	3	4	
Preview					
Diverse media					
Feedback on assignment					
Instructor's face and gesture					
Course content on the screen					
Highlight key parts					

4. Please write any additional comments in the space below.

Questionnaire #2

1. With a scale from 1 to 5, please give me your opinion on the items for instructional design of online lectures. How important is each of the following statements?

Items	Not important				Very important
	1	2	3	4	
Incorporating real-life situation					
Summary of the lesson					
Background music					
Teaching digital skills					
Subtitle					
Review Quiz					

2. Please rate how strongly you agree or disagree with each of the statements.
 - (1) When I start watching videos, I pay attention to them and watch all at once without pause
 Strongly disagree Strongly Agree
 ① ② ③ ④ ⑤
 - (2) I take notes while watching videos.
 Strongly disagree Strongly Agree
 ① ② ③ ④ ⑤
 - (3) I work as hard as I can to carry out assignments and quizzes related to the videos.
 Strongly disagree Strongly Agree
 ① ② ③ ④ ⑤
3. Please write any additional comments in the space below.