

# Students' Perceptions of the Value of Using Videos as a Pre-class Learning Experience in the Flipped Classroom

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**Abstract** The flipped classroom is an instructional model in which students viewed the learning content before class through instructor-provided video lectures or other pre-class learning materials, and in-class time is used for student-centered active learning. Video is widely utilized as a typical pre-class learning material in the flipped classroom. This paper reports the findings from a survey about students' attitudes and preferences regarding the pre-class learning experiences in an undergraduate science course that utilized a flipped classroom model. Findings demonstrate that students had positive attitudes towards using pre-class videos in the flipped classroom. Students had different perceptions towards the four types of pre-class learning materials used in this course, including three types of videos and text-formatted materials. Students' attitudes and preferences on pre-class learning materials did not differ across class levels, major fields, or previous experience of learning via videos. Students suggested that pre-class videos should be kept short and engaging.

**Keywords** Pre-class learning · Survey · The flipped classroom · Video

This paper shares findings from a survey study about students' values of pre-class learning experiences regarding viewing videos in a flipped classroom undergraduate science course. The flipped classroom is an instructional model in which students are exposed to initial learning content prior to class, outside the classroom, through instructors' video lectures and other pre-class learning materials; and utilize in-class time for student-centered, authentic, and active learning experiences, such as problem solving, collaborative work, laboratory experiments, field trips, and creation (Gerstein 2011). Unlike the instructor-centered, lecture-based instructional model, the two main phases of instruction are "flipped" (see Fig. 1). In the flipped classroom model, the students' exposure to initial learning content is completed *before* the classroom sessions through various means, often technology-based or technology-enhanced, and learner-controlled, such as instructor-provided videos (O'Neil et al. 2012), which compose the pre-class self-directed learning phase (Bishop and Verleger 2013). The in-class time is then employed for students' active learning (Gerstein 2011; Strayer 2012), which composes the in-class active learning phase (Bishop and Verleger 2013).

The general theoretical underpinning for the flipped classroom is using videos to shift students' passive learning in traditional instructor-centered, lecture-based classroom to outside the classroom, and in the formal classroom space, students engage in individual and collaborative activities that foster deep understanding and higher-order thinking (Ng

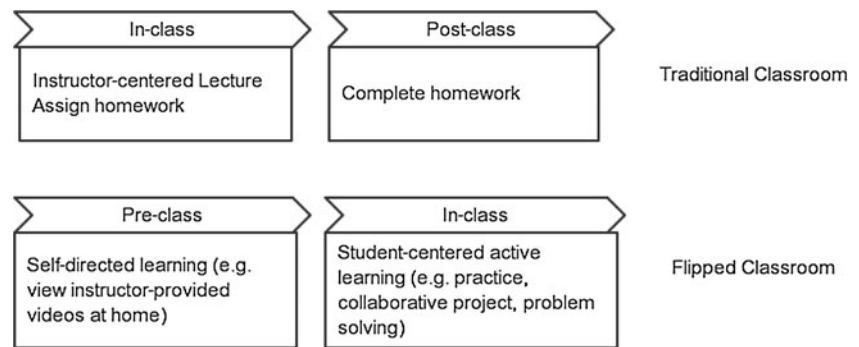
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**Fig. 1** Traditional classroom vs. flipped classroom



2014). Learning theories that support the flipped classroom concept are the cognitive constructivist theory (Bruner 1966) and the social constructivist learning theory (Vygotsky 1978). (Ng 2014; Moroney 2013; Milligan et al. 2013). These theories assert that meaningful learning only happens when the student is actively interacting with learning materials and engaged in the reception, integration, and communication of information and techniques (Moroney 2013; Ng 2014). Moreover, Flipped Learning Network (2014) indicated that in order to create successful flipped classroom instruction, instructors must incorporate four key features, known as the “four pillars”: flexible environment, learning culture, intentional content, and professional educator.

The aim of the pre-class learning phase is to better meet the individual learners’ needs (Bergmann and Sams 2012; Davies et al. 2013). A key element of the flipped classroom model is to provide an opportunity for students to gain initial exposure to learning content prior to class (Brame 2013).

Video is frequently used as the pre-class learning material in the flipped classroom model (Davies et al. 2013; Frydenberg 2013; Imran 2013). In this paper, the term “video” refers to *video podcasts* (Copley 2007), *audiographs* (Loomes et al. 2002), *vodcasts* (Vajoczki et al. 2010), or *webcast* (Shim et al. 2007). They all refer to video streaming files distributed in a digital format through the Internet for educational purposes in the form of video clips or screen casts “as in capturing what is on the computer screen, adding a bit of audio narrative, and publishing as multimedia” (Richardson 2006, p. 111). Students view videos with personal computers or mobile devices (McGarr 2009).

Video has become popular and is widely used in education worldwide (Kay and Kletskin 2012; Whatley and Ahmad 2007). Videos have been used to: (a) provide learners the access to previous lectures (Griffin et al. 2009); (b) present special guest speakers and special topics (Wang et al. 2010); (c) explain problem solving procedures (McGarr 2009); (d) offer supplementary materials (McGarr 2009) and class summaries (Whatley and Ahmad 2007); (e) deliver administrative information to students (Shim et al. 2007); and (f) enable students to learn by

collaboratively investigating, planning, generating, and sharing their own topic-based videos (Kearney 2013).

Hew (2009) summarized that “the main advantage of podcasting is the simplicity, convenience, and time savings that it offers to learners” (p. 334). In some other studies, learners indicated that learning via viewing videos was enjoyable (Copley 2007) and motivating (McGarr 2009). Videos can explain concepts which are difficult to explain through text or graphics (Evans 2014), improve students’ understanding (Richardson 2006) and problem solving skills (Kay and Kletskin 2012; Vajoczki et al. 2010), and promote online learners’ social presence (Borup et al. 2012).

Few studies to date have examined the students’ different kinds of pre-class video experiences in the flipped classroom. This study focused on three different types of pre-class video experiences in an undergraduate science course that used a flipped classroom model. In addition, this study examined whether students’ attitudes and preferences on pre-class learning materials differed across major fields, class levels, and previous experience of learning via videos. Lastly, this study investigated students’ suggestions for improving the pre-class learning videos in order to improve the teaching and learning efficiency of the flipped classroom model. This study addressed four specific research questions: (a) What are students’ attitudes towards watching videos prior to class? (b) What are students’ perceptions towards different types of pre-class learning materials, including three types of videos and text-formatted learning material? (c) Does a student’s class level, major field, and previous experience of learning via videos, affect his/her attitudes and preferences towards the pre-class learning materials? (d) What suggestions will students offer to improve their pre-class learning experiences?

## Method

### The Course

The course selected for this study addressed the topic of “Water and Civilization”. It was an introductory-level

undergraduate course in environmental soil science at a large research university in the Southeastern US. There were two sections of this course, but the instructor and the syllabus were the same. This class met 1 day per week for 90 min.

Before each class meeting, the students were required to watch an instructor-provided pre-class video. Most videos lasted for about 20–30 min, but the length of some others varied from 10 min to 1 h. Sometimes the students were required to read some text-formatted materials before class. At the end of the pre-class work, the students were required to finish an online quiz averaging 5–8 questions. They were told in the first class of the semester that the grades of the pre-class quizzes would be included in their final course grades. During the in-class time, the students were required to participate in various active learning activities, such as collaborative projects focused on exploration and demonstration, field trips, and role-play games. There were no post-class homework assignments for any in-class meetings.

The pre-class learning materials in this course can be classified into 3 types of videos and one type of Text-formatted Material (TFM). The types of videos include: (a) the *Instructor-Developed Video* (IDV), (b) the *Alternative Source Video* (ASV), and (c) the *Guest Speaker's Lecture* (GSL). IDV is defined as videos produced directly by the instructor for his/her own lecture. In this course, these videos were created in collaboration with a studio on campus or generated through Blackboard Collaborate. These videos provide students with a video recording of the instructor and slides with an outline of information points (see Fig. 2). The content of the slides changed to accompany the instructor's lecture.

ASV is defined as videos not produced by the instructor, but selected from pre-existing online video resources. In this course, ASVs were YouTube videos from well-known channels such as National Geographic and Nature. GSL consists of an audio-recorded guest speaker's lecture with text, images, and charts.

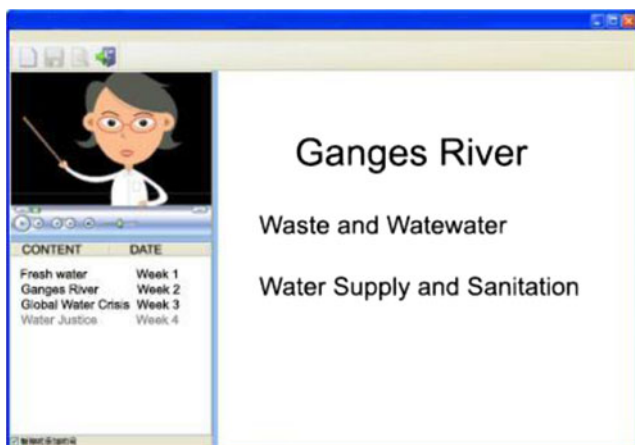


Fig. 2 An example of IDV

## Participants

A total of 55 students from the two sections of this course participated in this study. Among the 55 students, 51 completed the end-of-semester survey. The participants' demographic information is shown in Figs. 2 and 3 (Fig. 4).

Eleven students had the experience of watching instructional videos in other college courses. The remaining students all indicated that they had never learned through watching videos in any other college courses.

## Data Collection

The survey used in this study gathered information about the participants' attitudes and perceptions of their pre-class learning experiences. This survey was adapted from Kay's and Kletskin's study (2012) about students' use of problem-based video podcasts in college mathematics education. The survey questions in this study included students' background information, such as major, class level, and prior experience of learning through videos. Next, the students were asked to rate the helpfulness and ease-of-use of the pre-class learning materials using a 5-point Likert scale (Strongly Disagree = 1, Disagree = 2, Neutral = 3, Agree = 4, Strongly Agree = 5). The students were asked to rate the extent that the videos facilitated their understanding of the course content, and the usefulness of the quizzes. Then, the students were asked to select which type of pre-class learning material they perceived as most helpful to learning, including TDV, ASV, GSL, and TFM. The open-ended questions asked the students to give their opinions about the four different types of pre-class learning materials, the reasons for their preference selection, and their suggestions on how the pre-class experiences in this course might be improved.

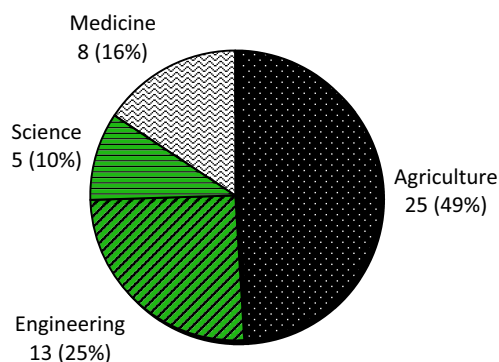
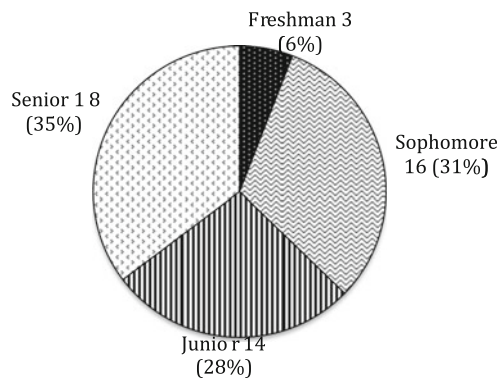


Fig. 3 Distribution of participants by major field ( $N=51$ ). Agriculture: Plant Science, Environmental Soil Science, Animal Science, Wildlife and Fisheries Management; Science: Architecture, Mathematics, Chemistry; Engineering: Civil Engineering, Biomedical Engineering, Chemical Engineering, Mechanical Engineering, Electrical Engineering, Material Engineering; Medicine: Nursing, Kinesiology



**Fig. 4** Distribution of participants by class level ( $N=51$ )

The students completed the online survey anonymously using the Survey function on Blackboard. The students were informed in the invitation that an extra five point credit would be added into their final grade if they completed the survey. A total of 51 valid responses were received. Cronbach's  $\alpha$  was computed to determine the internal reliability of the survey. The reliability was .74, higher than .70, which is the cutoff value for being acceptable (Cronbach 1951; Santos 1999).

### Data Analysis

Responses to the closed-ended questions in the survey were analyzed using SPSS. The students' demographic information, their attitudes and preferences regarding the pre-class learning materials, were summarized using descriptive analysis. A chi-square test of independence was used to determine if students' attitudes towards pre-class materials differed across class levels, major fields, and previous experience of learning via videos. A chi-square test of independence was also used to determine if students' preference on the different types of pre-class learning materials differed across class levels and major fields. Alpha level for all analysis was set as  $\alpha=.05$ .

Open coding was used to analyze the open-ended question responses. Coding is defined as a process of "making notations next to bits of data that strike the analyst as potentially relevant for answering research questions" (Merriam 2009, pp. 178). Open coding is a form of coding by which the analyst is "being open to anything possible" (Merriam 2009, pp.178). Then, constant comparison was used to refine codes and generate themes related to students' key ideas about their pre-class learning experiences and suggestions for improvement (Merriam 2009). However, all items in the survey were analyzed individually in order to gain more detailed insights into the value of the pre-class videos used in this course.

## Results

### General Preference Regarding Pre-class Videos

As shown in Table 1, the students generally had positive attitudes toward the pre-class videos used in this course. They stated that they liked the pre-class videos because they could control the experience of using videos. They felt that the videos facilitated their understanding. They also agreed that the content was well explained in the videos, that the videos were easy to use and helpful for them to finish the quizzes, and that the quizzes helped them understand the knowledge covered in the videos.

With the open-ended question responses, the highest praised features of the pre-class videos were that the videos were interesting, provided students a feeling similar to learning in a classroom, and presented various cultural perspectives.

### Preference on Different Types of Videos

When asked which of the four different types of pre-class learning materials was most helpful to learning, 22 participants (43.1 %) chose IDV, and 16 (31.4 %) chose ASV.

**Table 1** Descriptive statistics of participants' responses in the survey

Statement	Number	Frequency (%)					Descriptive	
		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Standard Deviation
I like viewing pre-class videos better than reading text materials.	51	0	3.9	17.6	43.1	35.3	4.1	.831
The videos helped me understand the topic knowledge better.	51	0	0	9.8	66.7	23.5	4.14	.566
The videos were helpful because I could do them on my own time.	51	0	2	5.9	45.1	47.1	4.37	.692
The videos were easy to learn from.	51	0	2	9.8	60.8	27.5	4.14	.664
The topics were well-explained in the videos.	51	0	2	9.8	66.7	21.6	4.08	.627
The videos were helpful for completing the quizzes.	50	2	2	9.8	52.9	31.4	4.04	.999
The quizzes helped me understand the knowledge covered in the videos.	51	0	2	19.6	58.8	19.6	3.96	.692

Only 4 participants (7.8 %) chose GSL. Moreover, 6 participants (11.8 %) selected TFM.

In the open-ended question responses, the students shared the aspects they liked and disliked about each type of pre-class learning material. IDV ranked first among the students' preferences. The students indicated that IDVs were interesting, easy to follow, convenient for self-control, and provided an authentic classroom learning experience by coordinating the instructor's slides and video at the same time. ASV ranked second among the students' preferences. The students stated that ASVs were interesting, provided a relaxed environment, and demonstrated other perspectives, other cultures, and other geographic features authentically. However, 17 participants (33.3 %) argued that some of the ASVs were so fast that they could not catch up to understand the content; 15 (29.4 %) argued that ASVs had no text hints and this affected their understanding.

As a type of pre-class learning videos, GSL ranked lowest among the students' preference. Up to 43 participants (84.3 %) indicated that GSLs were monotonous, boring, and that they were easily distracted. Nevertheless, 8 participants (15.7 %), including the 4 participants (7.8 %) who chose GSL as most helpful to learning, stated that GSLs were very informative. One participant described that GSL could "show much information in a short time". But the monotonous feeling could not give students a motivating experience, and had negative impact on the promotion of their learning.

As shown in Table 1, 40 participants (78.4 %) agreed that they preferred learning via videos to text format materials. However, the 6 participants (11.8 %) selected TFM as most helpful to learning stated that they were easier and simpler to review, highlight and annotate, and retrieve for completing quizzes. Another 18 participants (35.3 %) who selected video as most helpful to learning also identified ease-of-use as an advantage of TFM, although TFMs were not as interesting or motivating as video.

### The Effects of Independent Variables on the Attitudes and Preferences

Because the sample in this study was relatively small and the data for the dependent variables were not normally

distributed, Chi-square test of independence was selected for data analysis. There were only three "Freshmen" in the independent variable "Class Level", so this category was deleted from analysis. The categories of "Science" and "Medicine" in the independent variable "Major Field" were merged to achieve categories of similar sizes.

The Chi-square test of independence results show that the relationships between students' general attitudes towards pre-class videos and their major fields ( $\chi^2(6, 51) = 11.163, p = .086$ ), class levels ( $\chi^2(6, 48) = 6.042, p = .380$ ), and previous experience of learning via videos ( $\chi^2(3, 51) = 2.640, p = .451$ ), were not significant. However, the Crosstab (see Table 2) shows that Engineering students had a slightly more diverse and less consistent attitude towards the pre-class videos compared to the students in other major fields.

The Chi-square test of independence results show that there was no significant relationship between students' preferences on different types of pre-class learning materials and their major fields ( $\chi^2(6, 48) = 2.620, p = .855$ ), and class levels ( $\chi^2(6, 45) = 4.387, p = .624$ ). However, the Crosstab (see Table 3) shows that the Engineering students' preferences on the four types of pre-class learning materials had a slightly more diverse and less consistent distribution compared to students in other major fields.

### Students' Suggestions on Improving Pre-class Videos

In open-ended question responses, the students suggested that the videos should be shorter and that, in their opinion, 20 to 30 min was the ideal length. In addition, the students showed high interest in the YouTube videos from National Geographic and Discovery, which show the natural and cultural aspects of water resources acquisition and utilization in other countries.

The students suggested that the technical problems associated with the video broadcast should be solved, for a more engaging experience. Some students indicated that the audio and visual effects of some videos were not good enough, and some of the broadcasts were not smooth.

**Table 2** Major field \* general attitude on pre-class video Crosstab

Major field	"I like viewing pre-class videos better than reading text materials."					Total
	1 (Strongly Disagree)	2 (Disagree)	3 (Neutral)	4 (Agree)	5 (Strongly Agree)	
Agriculture	0	0	3	14	7	24
Engineering	0	2	4	2	6	14
Science/Medicine	0	0	2	6	5	13
Total	0	2	9	22	18	51



**Table 3** Major field \* preference on 4 types of pre-class materials Crosstab

Major Field	Type of pre-class learning materials perceived as most helpful to learning				
	IDV	ASV	GSL	TFM	Total
Agriculture	10	9	1	3	23
Engineering	5	3	2	2	12
Science/Medicine	7	4	1	1	13
Total	22	16	4	6	48

## Discussion

Current research reveals that students have a positive attitude towards their flipped classroom learning experience. However, most current research focuses on the in-class activities, and there is little research focused on the pre-class learning in the flipped classroom model. In contrast, this study centers on a detailed investigation into students' attitudes towards the pre-class learning materials used in a flipped classroom course. The four main findings of this study are summarized as follows. First, the students had a positive attitude towards learning via watching videos prior to the in-class sessions. Second, the students had different perceptions on the four types of pre-class learning materials. Instructor-developed Video (IDV) ranked first on the students' preference, followed by Alternative Source Video (ASV). However, a few students acknowledged the advantages of Text-formatted Materials (TFM). Third, the students suggested that the videos should be kept short, recorded and accessed in a manner to eliminate technical problems. Fourth, no statistically significant difference was found on students' attitudes and preferences towards pre-class videos across class levels, major fields, and previous experience of learning via video. The results of this study offer suggestions to the educators regarding designing and developing pre-class learning materials in the flipped classroom courses. Several recommendations can be offered to educators who choose to use pre-class videos in implementing the flipped classroom model in their courses.

### The Flipped Classroom Needs More Than Videos

Students reported that video can facilitate their understanding and individual learning when used as pre-class learning material in a flipped classroom. This finding supports those from previous studies confirming that pre-class videos are valuable for convenience and building students' conceptual understanding (Imran 2013). However, video is neither essential nor sufficient in the flipped classroom model. The flipped classroom needs more than simply a pre-class video experience.

First, the flipped classroom is an ideology committed to empowering students to consume information outside class and demonstrate understanding of learning content in various

ways (Makice 2011). Instructors need to realize that a wide variety of technologies, learning materials, and learning activities, may be used to help meet students' needs in the flipped classroom. No matter which technologies are used in instruction, they should be used in a meaningful way.

Second, if videos are used, the flipped classroom requires some other pre-class learning activities to make sure students have consumed the knowledge covered in the videos and are prepared for the in-class activities. This study supports Frydenberg's (2013) finding that quizzes can motivate students to watch the videos because each quiz counts a small amount toward final grades, and can help students check their understanding of key concepts prior to student-centered, hands-on, active, in-class activities. However, quizzes should not be too long, in order to reduce students' workload. In this study, the 5-min quizzes were well received by the students. Additionally, other activities, such as note taking, can also be adopted in the pre-class learning phase.

### Make Videos More Engaging

The length and the quality of the pre-class videos have a great influence on students' engagement in the pre-class learning phase of the flipped classroom. The students in this study complained that some videos were too long, and suggested that the videos should not be longer than 20 min.

The biggest difference between the pre-class videos in the flipped classroom model and the video podcasting in other educational models is that the former uses videos to help students be prepared for the in-class learning activities. Videos should cover the learning content and present it in a clear and concise manner. Additionally, the videos should be of appropriate pace, not too fast or too slow.

In this study, the three different types of videos represented three different ways of presenting learning content. Students' preference regarding the different types of pre-class learning materials did not differ across class levels or major fields. This phenomenon could be explained by the fact that this course was an introductory level course in environmental science. The course content and the flipped classroom learning experience were new to the students, so their previous learning experience in their own major fields might have little influence on their learning in this course. However, as shown in

this study, engineering students' attitudes towards the pre-class videos were not as pronounced as students from other major fields, and their preference on the four types of pre-class materials were more diverse than the students from other major fields. It is unclear why this happened, but may be due to the small sample in this study.

Educators should consider students' majors, class levels, and course content. For example, in courses focused on broadening students' visions of other regions and cultures, such as this course, the pre-class videos should provide students with a vivid and intuitive demonstration. For courses focused on abstract theoretical knowledge, such as mathematics, the pre-class videos should emphasize logic and steps of problem solving, in order to facilitate students' understanding.

In this study, the Instructor-Developed Video (IDV) was ranked highest among students' preferences on different types of pre-class learning materials, because it provided the students with an experience of hearing the instructor's voice and watching the lessons developed step-by-step on the screen. Providing students an authentic environment in which the instructor is communicating with them can make pre-class videos more engaging. Additionally, educators should take special care when adding text information on videos. Too much text information can distract students from watching the videos. Text hints and key summaries would work better in facilitating students' learning (Mayer 2001).

Alternative Source Video (ASV) was also well received by students in this study. A large number of excellent instructional videos are available online through YouTube, Khan Academy, and other sources. For instructors who may not be very confident in their technical literacy, or have limited time to develop pre-class videos on their own, using alternative source videos can be a viable alternation.

One limitation of this study is that the participants were restricted to the 55 students in an environmental soil science undergraduate course. Due to the small sample size, the results of this study may have limited generalizability. Additionally, only three independent variables, which were major, class level, and previous experience of learning via videos, were included in the analysis. It is possible that other independent variables might have revealed a relationship with the dependent variables examined. Another limitation is that the results were all based on students' self-reported data. No actual assessment of students' learning outcomes was made. Further research should focus on a closed examination on how the pre-class videos actually affect students' learning process and outcomes using an experimental research design, and on various educational settings, subject major fields, and the target groups of students. An experimental design or a correlational study should be adopted in future research to determine whether students have learned more, have achieved higher grades, and their higher-order thinking skills have been improved through learning via viewing pre-class videos.

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