Article

Designing and Developing Multimedia Videos and Micro-Movies for Flipped/Blended Language Learning: An Exploratory Study

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Abstract

Flipped learning/blended has become popular in foreign language teaching. Learning grammar and vocabulary can take place outside of classrooms to save Face-to-Face (FTF) time for more interactive practice. However, good materials to aid students for this purpose are not often available online. This study used an exploratory approach in combination of the Design-Based research method to investigate whether vocabulary and grammar videos and micro-movies designed according to instructional and multimedia design principles helped students learn and how students used these pre-recorded materials for their learning outside of class. Thirty-nine beginning- and intermediate-level Chinese-as-a-Foreign-Language (CFL) learners in a university in the United States participated in the study. Data were collected through questionnaires, reflections, interviews, and verbal protocol. The findings show that these materials enforced students' learning of both vocabulary and grammar. The students enjoyed and benefited from using these materials in terms of learning how to use new grammar points and new vocabulary, practicing listening and writing skills, and acquiring cultural and pragmatic language skills. The students also pointed out what improvements should be made to the materials such as anticipating questions from the students and clarify those questions, using the break-down method more extensively in explaining the grammatical structures, providing a more extensive explanation of the grammar and using more complicated examples, and so on. The findings shed light on how to design online pre-recorded materials to maximize CFL learners' learning. The paper concludes with three design principles drawn from this study.

1. Introduction

Flipped learning is a pedagogical approach that combines individual learning outside of classrooms and group learning in Face-To-Face (FTF) classrooms (Bergmann & Sams, 2012; Keengwe et al., 2014; Talbert, 2017; Zhang & Jaramillo, 2021). It has a few attractive features including providing flexibility in learning, allowing for more interactions in the FTF class, and differentiating learning (Basal, 2015).

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Research shows that flipped learning is beneficial for foreign language learning because it provides time for additional practice and activities in classrooms (Han, 2015), promotes student-centered learning and autonomy (Amiryousefi, 2017), and helps knowledge retention, student engagement, and motivation (Boyraz & Ocak, 2017; Chen-Hsieh et al., 2017).

As defined in Talbert (2017), in flipped learning, "the first contact with new concepts moves from the group learning space to the individual learning space in the form of structured activity, and the resulting group space is transformed into a dynamic, interactive learning environment" (p. 20). The students' first encounter with the learning materials in the individual learning space is a crucial step for determining the success of classroom learning because the dynamic and interactive learning of the target language in the FTF meeting time that could enable greater depth of processing largely depends on how well the students learn in their individual learning space (Leow & Mercer; 2015). To ensure that the FTF meeting time is well spent, the instructor must present learning materials clearly and with sufficient guidance so that the students could learn and use them effectively at their own time and pace. Also, it is crucial for the students to apply and review what they just learned on their own after the interactive FTF learning. While flipped learning stressed the sequence of material presentation outside classroom and in-class interaction, it is natural to use online multimedia materials to supplement learning (Zhang, 2022a, 2022d). Furthermore, flipped learning is also a form of blended learning that utilizes online materials (Zhang & Jaramillo, 2021). Therefore, the term "flipped/blended" is used throughout this article. Two tasks remain to be accomplished for flipped/blended learning: providing quality instructional materials for students to learn new concepts before FTF learning, and offering materials for students to apply and review what they had learned and practiced in FTF meetings. While these learning materials can be in different formats, such as interactive instructional videos, articles, quizzes, and questions (Enfield, 2013; Talbert, 2017), teachers often find pre-recorded lectures essential ingredients for flipped/blended learning (Abeysekera & Dawson, 2015; Educause Learning Initiative, 2012; Lo & Hew, 2017; Lo, Lie, & Hew, 2018; Mok, 2014). Regardless of the format, teachers must be able to engage the learners deeply in learning (Bergmann & Sams, 2012; Talbert, 2017).

In a flipped/blended learning environment, foreign language learning has a special way in deciding what to teach during FTF meetings and what to learning outside of the classroom (Zhang, 2016, 2017; Zhang & Jaramillo, 2021). Grammar and vocabulary learning normally takes place outside of the classroom to save FTF time for interactive practice. Since many instructors acknowledge that good quality online materials for grammar and vocabulary learning are not currently available (Arikan, 2014; Zhang, 2017, 2022e), strategies and frameworks are needed in the profession to enable instructors to design online grammar and vocabulary tutorial videos for flipped/blended learning. While many studies on flipped/blended learning of a foreign language have been conducted, none have focused on the design of grammar and vocabulary tutorials and students' use of them. The purposes of this study are to investigate CFL learners' use and perceptions of online video tutorials and micro-movies that were created based on principles of multimedia design and instruction, and then suggest ways to implement these findings to improve the design of these learning materials for flipped/blended learning.

2. Literature Review

The number of studies on flipped/blended learning rapidly increased in the past five years (Chen et al., 2017; Lee & Wallace, 2018; Turan & Akdag-Cimen, 2020). The majority used quantitative data (Lin, Hsia, & Hwang, 2021; Turan & Akdag-Cimen, 2020) to examine the effectiveness of using flipped/ blended classrooms. However, few studies have focused on the design and development of learning materials that students are required to use before and after FTF learning (Nikitova et al., , 2020; Vitta & Al-Hoorie, 2020). In their meta-analysis study, Cheng et al. (2019) point out, "Authors placed more emphasis on reporting the student learning outcomes of the flipped classroom studies than on the actual design features (pedagogy) of the learning environment" (p. 816). The effectiveness of flipped/blended

learning depends on many factors, such as the materials and guidance to help students prepare for FTF learning, the teaching strategies of FTF learning, and the integration of teaching and learning outside and inside the classroom. Preparing students for interaction and deep learning during FTF meetings is a critical step in enabling them to learn effectively, and a prerequisite is to design the best possible materials.

Many researchers have concluded that explicit teaching of grammar benefits students' second language acquisition (Bowles & Monstrul, 2008; de Graaf, 1997; DeKeyser, 1995; Ellis, 1993; Li & Yan, 2017; Nassaji & Fotos, 2004; Nazari, 2012; Norris & Ortega, 2000; Rosa & Leow, 2004; Zhang, 2017). For flipped/blended language learning, some studies (e.g. Moranski & Kim, 2016; Zhang & Jaramillo, 2021) proposed that grammar and vocabulary learning should be moved outside of the classroom to free up time in the classroom for more interactive activities, such as pair and group speaking practice and such movement of activities allows for more explicit instruction of grammar.

On the other hand, videos created based on Mayer's designing principles of multimedia learning (2009; 2014), usually had a significant impact on education (Mayer & Moreno, 2003), specifically enabling students to shift their cognitive learning focus from remembering to understanding, applying, synthesizing, and evaluating information (Andresen, Brink, & UNESCO, 2013). Multimedia applications can facilitate this acquisition process when they are integrated within the existing curriculum and when they are interesting and interactive (Babiker, 2015; Schmidt & Ralph, 2016). Teaching grammar and vocabulary could resort to multimedia presentation for the purpose of making learning flexible and enhancing students' learning.

As Cheng et al. (2019) stated, "Instructional media used for pre-class learning is an important component that differentiates the flipped classroom strategy from other similar instructional strategies" (p. 794). Pre-recorded videos are the most adopted format required for students to use prior to FTF meetings for the flipped/blended-learning model (Abeysekera & Dawson, 2015; Lo & Hew, 2017; Seery, 2015) and can be used for teaching grammar and vocabulary. In addition, pre-recorded videos can also be used for enhancing students' learning after they have learned and practice the grammar points and vocabulary in a flipped/blended learning environment. For flipped/blended language learning, it would be ideal if these videos are available as Open Educational Resources (OER). However, it is challenging to find engaging and effective teaching materials for this purpose (Arikan, 2014; Zhang, 2017, 2022e, 2022b, 2022c). It is suggested that teachers reject the fallacy that there are always appropriate tools and resource banks on the internet that can be used in foreign language education (Arikan, 2014). To meet the needs of learners, teachers should design and develop multimedia materials that fit the existing flipped/blended learning curriculum.

The unavailability of good multimedia materials for flipped/blended learning has motivated researchers and practitioners to create them for their own use. For example, Zhang (2017; 2022b, 2022c, 2022d) created online multimedia modules to explicitly teach specific Chinese grammar points including the *ba*-construction, *shi…de* construction, and expressing time. These studies showed positive results of using these online modules designed based on Mayer's design principles. Moranski & Kim (2016) also used multimedia in teaching L2 learners Spanish grammar. In their study, the use of pre-recorded videos proved to be an effective learning strategy that facilitated and introduced self-guided learning of grammar. These researchers called for research on creating multimedia materials, especially on grammar and vocabulary teaching in general, and using them for blended learning in general. However, no research has been conducted on examining the different approaches to designing these materials for use outside the classroom, students' perceptions of these materials, and how they use them. Design-based research is needed to inform multimedia design that could be integrated into the flipped/blended learning model in foreign language education. This study intends to answer the following research questions:

1. How do students use and perceive the two types of pre-recorded materials (instructional videos and micro-movies) designed for the flipped/blended classroom curriculum?
2. What improvements to the design of these pre-recorded materials should be made?

3. Theoretical Framework

This study is informed by the essential conditions for the acquisition of grammatical forms (Nassaji & Fotos, 2004), the First Principles of Instruction (Merrill, 2002), and the Cognitive Theory of Multimedia Learning (Mayer, 2009; 2014). After examining current research on grammar instruction, Nassaji and Fotos (2004) concluded that there were three essential conditions for learners to attain "high levels of accuracy and proficiency in the target language" (p. 137): They need to (a) notice and be aware of the target forms; (b) be exposed repeatedly to meaning-focused input; and (c) have opportunities to practice.

Merrill's First Principles of Instruction (FPI) is the most frequently cited meta-theory of instructional design among the available instructional design models (Lo, Lie, & Hew, 2018) and it is widely accepted in designing a flipped/blended classroom approach (Kim, Jung, de Siqueira, & Huber, 2016). In developing the FPI, Merrill reviewed a wide variety of instructional design theories and models and identified five principles of effective teaching and learning (represented in Figure1). The FPI states that learning is promoted when a) learners are engaged in solving real-world problems; b) existing knowledge is activated as a foundation for new knowledge; c) new knowledge is demonstrated to the learner; d) new knowledge is applied by the learner; and e) new knowledge is integrated into the learner's world. These principles can be applied to video design as well as the overall design of flipped/blended learning.

Figure 1
Phases for Effective Instruction (Merrill, 2002, p. 45)
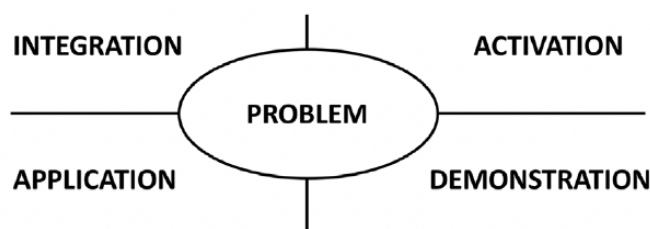
The Cognitive Theory of Multimedia Learning (CTML) is based on three assumptions about cognition by human beings: There are two channels for information processing (auditory and visual). Each channel has a limited capacity, and learning is an active process of information which involves information filtering, selecting, organizing, and integrating. Based on these three assumptions, a basic principle was developed, which states, "People learn more deeply from words and pictures than from words alone" (Mayer, 2014, p. 47). The multimedia design principles implied in CTML can serve as the basis for designing materials for any online or flipped/blended learning (Mayer, 2009). These three theories and concepts underpin this study by guiding the design of the multimedia materials on vocabulary and grammar instruction in the context of the flipped-learning curriculum.

4. Context of the Study and the Design of the Online Component

The study was conducted in two flipped/blended four-credit CFL courses (one beginning-level and one intermediate-level) at a comprehensive Midwestern university in the United States. These courses used *Integrated Chinese* as the textbook and consisted of three 50-minute FTF meetings and one online component per week. The teaching pace, instructional strategies, assignments for the two courses are the same. The multimedia materials designed for the online components were the same as well, that is, there were the pre-recorded multimedia videos for grammar and vocabulary learning before the first FTF meeting and the micro-movies for after learning and practicing for both courses. In short, the materials used for both courses were consistent throughout the semester and the academic year.

## 4.1 Design of the flipped/blended learning curriculum

Bloom's taxonomy and the concept of receptive and productive skills in language learning informed the course design. The language development process and contextual settings were also considered. The online component focused on presentational language elements that require simpler learning processes, such as knowledge, comprehension, and analysis of content items, while FTF meetings focused more on language skills and tasks involved in complex learning processes, such as applying, synthesizing, and evaluating learning objectives (Zhang & Jaramillo, 2021). Using the online component learners can improve their receptive skills by utilizing exercises that they can finish independently online. Meanwhile, instruction of productive skills (speaking and writing), which is more challenging and requires considerable interaction with others, occurred in the FTF environment.

The online component included instructor-created videos, which feature instruction on grammar and vocabulary, and micro-movies of native speakers and advanced Chinese language learners performing various skits designed and written by the instructor. For each chapter, students started by watching the instructional videos on their own, then attended the three FTF meetings, and ended with watching the micro-movies independently, in pairs, or in groups.

Four measures were used to hold students accountable for learning the online components. First, they were required to take detailed notes while watching the instructional videos, which was also an effective learning strategy, particularly during lectures (Bui, Myerson, & Hale, 2013). Second, after a Q&A session in the first FTF meeting, there was a short quiz on the grammar and vocabulary covered in the instructional video (Hew & Lo, 2018). Third, their performance in FTF meetings demonstrated how effectively they could apply what they had learned in the videos. Fourth, students were required to view and transcribe the micro-movies, ask questions, and report and reflect on their learning.

The online components and the FTF meetings were integrated seamlessly. The instructional videos were discussed in the first FTF meeting when the students had time to ask questions on the videos (they may refer to their note they took during video watching before class). Most FTF meetings was spent practicing their learning. After practicing what they had learned in class, the students used the micro-movies to reenforce the grammar and vocabulary outside of the classroom and were assessed during the FTF meetings. Since the first time when they watched the micro-movies was when they had used the first set of instructional videos and have practiced what they learned from the instructional videos during three FTF meetings. By the time when they watched the micro-movies for the second time during the FTF meeting, they had started used the instructional videos to learn new grammar and vocabulary. Figure 2 shows the order in which these activities were integrated in the curriculum.

Figure 2
*Integration Between Online and FTF*
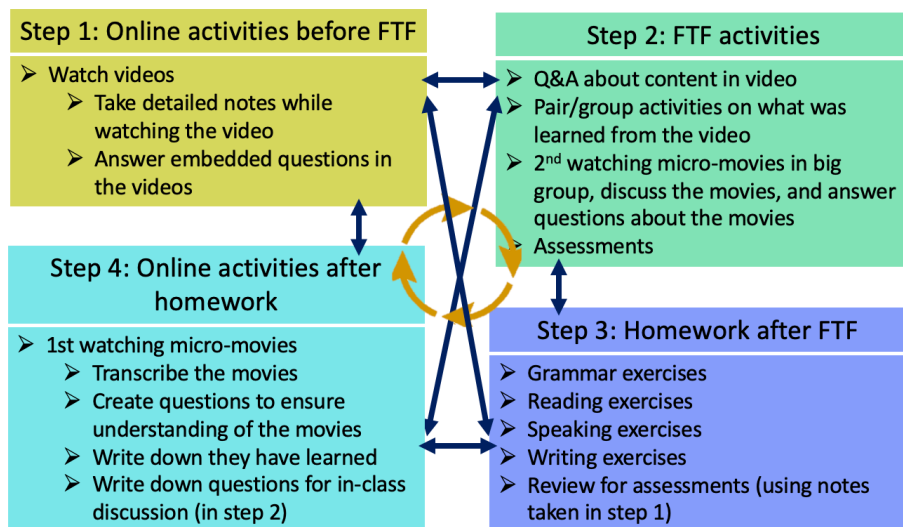
4.2 Design of the videos and the micro-movies

The necessary conditions for grammar learning (Nassaji & Fotos, 2004) form the rationale for designing two sets of videos: The instructional videos were designed to enable learners to identify and become aware of the target form, and the micro-movies were designed to provide an opportunity to expose learners to meaning-focused input.

The creation of content for the two sets of videos was based on Merrill's First Principles of Instruction, the focus of which is solving real-world problems. The essential real-world problem for language learners is to acquire the skills needed for effective communication with people in the target language environment. The instructional videos followed the FPI's five principles by incorporating (a) guided reviews and presentations for learners to *activate* prior relevant knowledge; (b) examples to *demonstrate* new knowledge to help learners learn better; (c) real-life situations for learners to understand how to *apply* the new knowledge in life, make learning more meaningful, and prepare for further application; (d) reflections for learners to *integrate* what they had learned into meaningful categories and find connections. More extensive integration was achieved when students were actively involved in pair and group activities in FTF meetings. The micro-movies served two purposes: a) to *demonstrate* how the challenging grammar points and vocabulary were used in context with a story line; b) for learners to *apply* what they had learned to comprehend the meaning of the stories. See Figure 3.

Figure 3
The Overall Design of the Videos and the Micro-Movies Bsaed on FPI (Merrille, 2002)
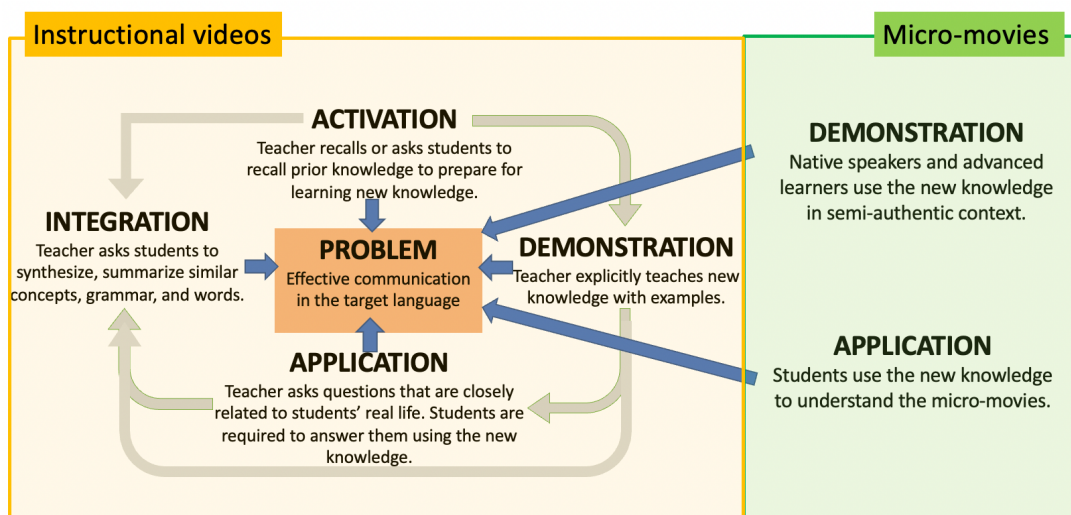
The decision on each video's and each movie's design was based on the CTML multimedia design principles (Mayer, 2009, 2014), which identify three kinds of processing that can occur during multimedia instruction. First, poor instructional design can cause extraneous processing, cognitive processing unrelated to the instructional goal, which can overload limited cognitive processing capacity and impede learning. Second, multimedia containing complicated materials should enhance essential processing, which involves selecting, processing, and organizing relevant information. Third, generative processing should be fostered to help learners make sense of the materials by integrating their learning with their existing knowledge structures. These three kinds of processing generated twelve principles for multimedia design, which were then applied to the instructional videos in ways, such as coherence (e.g., not using extraneous images, sounds or texts); spatial and temporal contiguity (e.g., placing images and text close together and using both when giving explanations); segmenting (e.g., separating grammar points by showing syntactic features and meaning before supplementing with examples); and personalization (e.g., using humor and a conversational style). These design considerations were summarized in Table 1.

Table 1

The Application of the Multimedia Design Principles to the Instructional Videos

Avoid Extraneous Processing	Enhance Essential Processing	Foster Generative Processing
The Coherence Principle 1. No extraneous images, sounds, or texts were used. 2. All texts, images, colors, and narration in the videos served a function to help learners learn. **The Signaling Principle** 1. Each video provided an overview of learning objectives, was organized in a sequence of vocabulary before grammar. 2. Each slide was organized using different fonts and colors to stress differences and importance. 3. All videos were consistent in format. **The Redundancy Principle** 1. When possible, both image and text were used to explain a point. **The Spatial Contiguity Principle** 1. The images and text were placed closely together. **The Temporal Contiguity Principle** 1. The images and text were used simultaneously when the explanation was given.	**The Segmenting Principle** 1. Vocabulary was sorted into groups based on usage and meaning and presented on one slide, when possible. 2. Each grammar point was presented separately with syntactic features and meaning first, then was supplemented with examples. **The Pre-Training Principle** 1. Learners were encouraged to read the textbook first to gain some basic knowledge about the vocabulary and the major grammar points in the videos before watching the videos. **The Modality Principle** 1. Both visual and auditory input were provided: texts and/or images and narrated explanations were provided.	**The Personalization Principle** 1. The instructor used a conversational style when explaining the vocabulary and grammar. 2. Humor was used to make learning more engaging. **The Voice Principle** 1. Machine voice was not used. **The Embodiment Principle** 1. On-screen agents were not used. **The Image Principle** 1. The instructor's image was not on the screen.

4.3 A Description of the Instructional Videos and Micro-movies

For each chapter, there were two instructional videos averaging 12 minutes each and one to three micro-movies averaging one minute each. The instructional language was in both Chinese and English, but the proportion of the use of the two languages was decided on the proficiency level. For the beginning level videos about 70% was in English (e.g., instructions for exercises and grammar explanations) and 30% in Chinese (e.g., commonly used phrases encountered in explanations and instructions). This proportion could make sure that students understand the grammar clearly but also had a chance to be exposed to Chinese. For the Intermediate-level course, the percentage of Chinese used in the instructional videos increased to 50-60% as the language of explanation as the learning advanced. The lower percentage in

using English would not affect students' understanding but could give students more opportunities to practice their Chinese listening comprehension. The instructional videos included four categories of contents:

1. Prior knowledge that is critical for teaching the new content
2. New content (grammar and vocabulary), explanations (auditory input and visual illustrations), examples, and exercises
3. Questions for students to answer in the notebook
4. Summarization or activities for the students to summarize content

Twenty-four instructional videos in total were created for the two courses (two were for each chapter and there were six chapters for each course). Clear, large fonts and images were used consistently. Each video started with a greeting from the instructor and an overview of what will be learned and then proceeded to key vocabulary and grammar structures. Different categories of content were color coded and organized. For example, review of prior knowledge was in blue blocks, questions for the students to answer were in brown blocks, and complementary knowledge points were in green blocks. For vocabulary learning, each slide usually had words that were related to each other. Figure 4 shows sample screenshots of the instructional videos.

Figure 4
Screenshots of Sample Instructional Video Scenes

Twenty-four micro-movies in total were also created for the two courses. Story lines for the micro-movie skits were written to include the most important and challenging vocabulary and grammar structures and be short, funny, and engaging. The topics were closely related to college students' daily lives and a real-life environment was used in shooting. The actors were college students, including both native speakers and non-native advanced learners of Chinese. Challenging structures were repeated to exaggerate the plot and make learning more effective. For example, when the comparison structure was taught, one student complained about feeling inferior to celebrities. In another movie, when teaching the passive voice, which usually indicates unhappy events, one character talked about an unlucky day filled with a series of mishaps.

The native speakers slowed their speaking speed and enunciated more clearly in the beginning-level movies, but their speaking speed was close to normal in the intermediate-level movies. Also, in each movie, a few new words were added, and images and brief explanations were provided on the screen when they were used. A video glossary at the end of each movie listed all new words. To call students' attention to common mistakes, the movies often featured someone making a linguistic error that caused

a misunderstanding. For example, one character used one le (indicating the action has been completed) when he should have used two le (indicating that the action has been continuing for some time and will last into the future). Figure 5 shows sample screenshots of the micro-movies.

Figure 5
Sample Micro-movie Screenshots

5. Methodology

This study adopted an exploratory research method to answer the research questions. Meanwhile, it borrowed the basic concept of the Design-Based Research (DBR) method, a systematic and flexible method of improving teaching practice (Amiel & Reeves, 2008; Wang & Hannafin, 2005). The basic concept of DBR is that the design of educational practice and materials should be for the real educational context and therefore bridge the gap between educational theory and practice (Barab & Squire, 2004; Wang & Hannafin, 2005).This study first provided a detailed account of the design of materials for the real class teaching, and explored how the students used them and perceived the use of the materials. The results of the exploration gave the basis for further refinement and continuous evolution of the design, which was highly valued by DBR (Amiel & Reeves, 2008; Wang & Hannafin, 2005). Using the exploratory method in combination of DBR would not only reveal how students use and perceive the materials designed in a theory-driven way, but also generate reusable design principles are generated so other practitioners can use them in the future.

5.1 Participants

A total of 39 students participated in this study including 17 beginning-level learners and 22 intermediate-level learners. Twenty-four were female and 15 were male, with an average age of 20. They came from different learning backgrounds and academic disciplines, including agriculture, animal science, chemistry, engineering, global resource systems, linguistics, psychology, political science, and business. Thirty-one participants spoke English as their native language; three spoke Indonesian as their native language, and one each spoke Japanese, Korean, Malay, Portuguese, and Vietnamese respectively. Fifteen had not learned any other foreign languages than Chinese.

5.2 Data collection and data analysis

Data were collected via questionnaires, think-aloud protocols, and self-reflective short essays. These different ways of data collection triangulate each other and ensure a comprehensive understanding of the

research questions. For the instructional videos, a questionnaire (see Appendix A) was administered at the end of the semester, which asked the participants to respond to four aspects of information: demographic information, how they used the videos, what they liked and disliked and why.

A think-aloud method was used to obtain detailed insights regarding students' use of the instructional videos, including their strengths and weaknesses in facilitating and guiding students' learning. Identifying the cognitive processes that occur or emerge during acquisition and performance are essential characteristics of the think-aloud method. A record of the thinking practices is particularly significant because it does not rely solely on the account of the products or results of such thought processes (van Someren, Barnard & Sandberg, 1994). Since think-aloud protocols were conducted during the viewing of the videos, they could capture more direct data. Compared to the questionnaire which focused more on post-viewing reflection, data obtained through the think-aloud activity offer a more complete understanding of what is happening in the mind of the participant (Kucan & Beck, 1997). Throughout the semester, 12 (six from each course) of the 39 students completed an individual think-aloud session while viewing different required instructional videos. The average time spent on each think-aloud session was 96 minutes. During the individual think-aloud session, each participant was recorded on Camtasia as they watched the video as they normally did, at the same time, expressed aloud their thoughts regarding the features and the contents of the video (See appendix B for the think-aloud protocol).

For the micro-movies, after the students finished watching each, they wrote down their thoughts about the movie and reflected upon what they had learned while watching it (see Appendix C). At the end of the semester, a questionnaire was administered (see Appendix D), which asked all the 39 participants (a) how they used the micro-movies; (b) their perception of the micro-movies; and (c) the self-perceived effectiveness of the micro-movies on their learning.

The data collected were analyzed using a descriptive data analysis method based on grounded theory (Corbin & Strauss, 2015). The questionnaire data collected for the use the instructional video were recorded. The answers to each questionnaire item were synthesized and categorized. Patterns were identified in each category. For the think-aloud data, the researcher's notes and transcriptions of the sessions were closely read for the theme(s) and pattern(s) to emerge. Once identified, these different themes and patterns were synthesized. The data for the instructional videos from the questionnaire and the think-alouds were combined together to find the themes on how students used the videos and their perceptions about using them.

The individual reflection data for the micro-movies were coded based on different categories (such as, likes, dislikes, and suggestions for improvement) and the answers to the questionnaire for the micro-movies were recorded and synthesized. The two data resources were combined to find the themes on students' use of the micro-movies and their perceptions.

6. Findings

In this section, one subsection will focus on students' use and perceptions of the instructional videos, and one subsection will focus on students' use and perceptions of the micro-movies. In each subsection, how students approached using the videos or movies, their likes, and dislikes will be reported respectively.

6.1 Students' use of the instructional videos

Each of the 39 participants spent an average of 65 minutes watching each instructional video and taking notes. They watched each video 1.55 times on average. They normally took notes while watching the video at a convenient time, and then reviewed it the day before the first FTF meeting. They enjoyed watching them and appreciated having this resource. One wrote, "it is a very great idea to make tutorial videos like these. This is my first time seeing tutorial videos like this usually online classes will only

have instructions … Everything looks great." However, they approached using the videos differently and they had different perceptions of the videos.

6.1.1 How students approached watching the instructional videos

Students developed two approaches for using the instructional videos. The first approach started with reading the information in the textbook and then creating and using flashcards for the characters and words before watching the videos. When they watched the videos, they focused on (a) recognizing the new information that they had not learned in the book, and re-watching challenging segments until they understood completely; (b) repeating in a low voice what the teacher said in Chinese to practice speaking; (c) creating their own sentences using the structures they learned in the video; and (d) finding "tricks" to help memorize the phrases and structures that they were learning.

The second approach relates to how the students (re)played and (re)viewed the video and took notes. Some students followed the sequence of the videos and attempted to predict how the narrative would unfold while trying to comprehend and raise questions. After finishing a segment, they would take notes. Other students paused the video frequently to copy what appeared on the screen. These students wrote down almost everything that was explained because a) they thought everything looked important, b) they wanted to capture all the critical content, or c) they included everything "just in case." They rarely sounded out words or sentences because they only did that for communicative purposes, not for learning.

For all students, the new knowledge prompted them to mobilize their prior knowledge. During this process, they would ask questions or get confirmation, indicating that they were actively learning. They also easily made associations with characters that looked similar and with words that sounded similar. While some gave up exploring the answers, most students had strategies to answer their own questions. For example, some remembered them to find the answer later in the video, some wrote the questions down in their notebook and asked the teacher in the FTF class, and some contacted their Chinese friends to get an immediate answer, or used online apps.

6.1.2 Student feedback: Likes

Students identified three aspects of the videos they liked: the ease of online access, the content, and the format. First, the course management system (Canvas) facilitated flexible, self-paced learning online. Students found that they concentrated on learning because the videos were available at all times, which meant that they could decide when, where, how fast, and how many times they watched the videos. Students also became aware that taking notes helped them to improve their language acquisition, to provide a basis for review, to "focus," to "better retain information," and to "practice" character writing.

Second, student comments addressed all four categories of the video contents: instructional explanations, availability of interactive questions, summarization, and reviews of prior knowledge. All students liked the clear and systemic presentation of explanations of grammar and structures, and the numerous examples given for both. They liked that the videos went beyond the textbook to provide extra comments, details, and "in-depth knowledge." Students also appreciated the guided questions on the videos that they answered in their notebooks. They later received feedback from the instructor in FTF meetings.

Third, students liked the clear, consistent, and logical format of the videos. Color coding for stressing and for different purposes of information helped students stay organized. Three students mentioned that the length, 10-15 minutes each, was manageable. They also liked that there was a blend of well-timed visuals and audio, with clear voice-overs, humorous images and comments, and a cursor that they could follow onscreen through the lessons. Table 2 shows why the students liked about the instructional videos.

Table 2

A Summary of What the Students Liked about the Instructional Videos

Video Availability	Video Content	Video Format
1. Learning was flexible	1. Explanations were clear, systematic, supplemental, simplified, in-depth, and numerous	1. Format was consistent
2. Learning was convenient		2. Color coding helped with being organized
3. Notetaking facilitated writing, engagement, and learning in general	2. Embedded questions helped them practice what was just learned	3. Length of videos was manageable
4. Notetaking supported review	3. Summarization of similar words and related knowledge helped with effective learning and understanding the big picture	4. Voice-over was clear
5. Videos helped them concentrate on learning		5. Both visuals and audio were present
		6. Synchronous visuals and audio were well-timed
		7. Cursor helped them follow what was taught
		8. Images were humorous
		9. Instructor's comments and humor lightened content

6.1.3 Student feedback: Dislikes

There were aspects that four out of 39 students reported that they did not like. First, the videos were occasionally too long and required extensive, time-consuming notetaking. Second, a few students did not like the fact that they were not able to ask questions while watching the videos. Other aspects that were disliked by one or two students were (a) the videos were not downloadable; (b) sometimes video segments went too slow or too fast; and (c) occasionally there was too much information on a slide.

Suggestions given by the students were categorized into five types. First, there should be more visuals, especially "more pictures associated with words and grammar which generate visual and audible connections in the brain. It makes memorization easier." Second, more time should be spent explaining grammar. For example, some students suggested that the break-down method be used more to explain the structures. Third, even though the number of examples was perceived as sufficient, a few students suggested adding more sentence examples for the vocabulary and more challenging and "tricky" sentences to illustrate grammar use in different contexts. Fourth, more questions should be provided to determine if they "actually learned the grammar concepts." Fifth, there should be more character explanations, for example, one student suggested that the instructor in the video "explain what each part of a character represents to help with memory."

6.2 Students' use of the micro-movies

Each student spent an average of 32 minutes on each movie, including watching the video, transcribing it, and writing down comments, feedback, questions and what they had learned. They watched each movie at least three times. All students enjoyed most of the movies because they were "a great way to get more practice listening to Chinese conversation that we can understand at our level," and they "really help and supplement what is being taught in the class." On a scale of zero to five, the students ranked their perception of how much the micro-movies improved their learning. (See Figure 6).

Figure 6

Students' Perception of How Much the Micro-movies Improved Their Learning
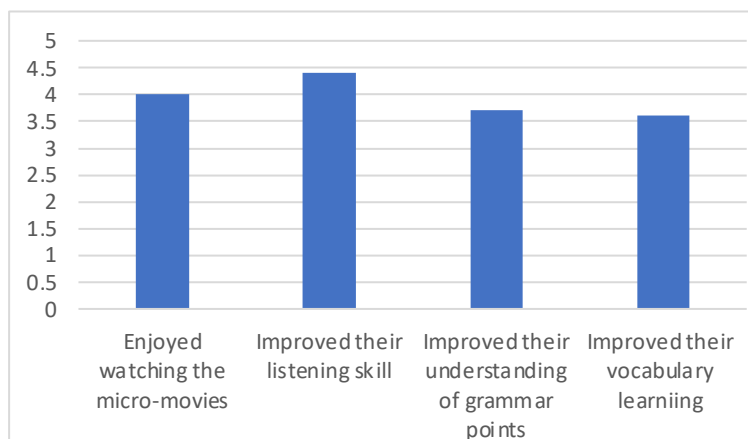
A few equally important aspects positively affected their perception of the micro-movies, including the content, the presentation/performance, the style, and the skills they were practicing (e.g., listening). All students commented that they had become more aware of the new words and grammar, and that the movies provided more practice listening to Chinese conversations. One student said, "I liked watching this video. I think I was able to understand everything somewhat easily and they worked in some new grammar in a good way. I was able to recognize things from class from watching this video."

The questionnaire and student comments indicate several reasons for these positive responses. First, moving from reading text to watching and listening to the videos and micro-movies gave the students a chance to practice their listening skills, adapt to people talking at a normal speed, familiarize themselves with how different people from China speak the language, learn "what a new word they know sound [sic] like in a sentence in the real context," and "make them remember and put to use many important expressions" they just learned. After watching a micro-movie on giving directions, one student said that "it made a lot more sense how to give directions in a more conversational way than just reading a text dialogue about it." In addition, the presentation format made them pay more attention and stay focused; as one said, he learned "how to intently listen to a dialogue as someone is speaking. It takes a lot of brainpower and concentration, but I'm able to understand what they are saying once I concentrate."

Second, the videos were "funny", "enjoyable", "interesting," and "entertaining." A majority of students were so engaged that they even suggested ways to make the movies more interesting. For example, in one movie, two girls were talking about a roommate when the roommate was just lying beside them using her phone. The participants commented, "I liked the idea of them talking about her roommate right in front of her. It would've been even funnier if their roommate showed that she understood their conversation in Chinese."

Third, the theme for each movie aligned with the theme of that chapter and reflected their experience of college life. The movies were perceived as "realistic" and "relatable." The "use of props" and "the natural acting" in the movies "make the movies more believable." The movies were "rather authentic when compared to conversation that we would have in real life." In the movies, some grammar concepts were easily understood because they were applied "in a situation that we have all gone through but can use Chinese to explain the concept."

Fourth, the movies were not too long and had a variety of formats to help with understanding challenging dialogue. Some movies focused on one main grammar point while others focused on several. But all were "short, sweet, and simple in format" even though they "had a lot [of information] in it." Since they were short, the students were able to watch them a few times to try to thoroughly understand each one. Some movies included a video diary to introduce the background of the story which "was a nice mix up from the other types of movies."

Fifth, interesting approaches were applied in the use of grammar structures. For example, as noted above, common mistakes of non-native speakers were integrated in the movies and certain structures were used repetitively to emphasize and create comical effects. When the native Chinese speakers misunderstood the non-native speakers due to the mistakes, the conversation continued based on the misunderstanding until the non-native speaker realized the mistakes. This strategy, which highlighted linguistic and cultural misunderstandings, reinforced differences between the correct expressions and what could be misunderstood. One student said, "It was interesting and nice to see the character mix up her grammar, which draws the audience's attention to the correct grammar when the other character helps her." The students appreciated "how these videos address common mistakes and how native speakers would interpret them" because the conversations helped them "understand the difference between what the intended sentence was and what the mistake meant", and therefore helped them "learn which is right." The repetition was well received by the students as a way to reinforce their memory, giving "time to get the structure solidified in our heads."

Sixth, the movies have helped the students acquire new vocabularies, pragmatic usages of the language, and knowledge of Chinese culture. The intermediate-level students reported that they had learned "how to nicely correct what people say in Chinese if it is wrong," "how to complain about food," "how to ask for clarification," "how to review a restaurant," and "how to use different ways to express gratitude." Since the movies involved some cultural knowledge, such as celebrities in China, the students Googled those topics and learned more about Chinese pop culture.

There are some aspects that students did not like, e.g., distracting background noise, instances of low speaking volume, occasions where the camera failed to capture the faces of speakers, or echoes in parts of the movies. These problems caused some frustration, but some students realized that "it was more how people would actually talk in China." These technical problems could be eliminated with future edits. Table 3 presents a summary of what the students liked and disliked about the micro-movies.

Table 3

Students' Likes and Dislikes of the Micro-movies

Likes	Dislikes
1. The audiovisual format brought real life to learning	1. Background noise was distracting
2. Content was funny and entertaining	2. Characters spoke softly
3. Themes are aligned with chapter themes	3. Camera failed to capture faces of the speakers
4. Videos were short but challenging	4. Echoes occurred due to shooting in places too empty/large
5. The format was varied	
6. Commonly made mistakes by students were stressed	
7. Certain challenging structures were repeated	
8. Acquisition of new vocabulary was allowed	
9. Acquisition of pragmatic use of language was allowed	
10. Acquisition of culture was allowed	

7. Discussion

The findings show that students could benefit from both the pre-recorded instructional videos as and the micro-movies in the flipped/blended learning environment. This fining concurs with what the previous research results discovered in similar studies that focused on teaching specific grammar points (Moranski & Kim, 2016; Zhang, 2016, 2022b, 2022c, 2022d). In the process of using the instructional videos, students could approach using them differently and find a way that fits their own learning style or habit.

The designer of the instructional videos, however, can teach the students approaches for watching the videos more effectively by embedding learning strategies in the instructional videos. First, the most important grammar and vocabulary items should be stressed or highlighted so that students can easily identify and prioritize them. The overview page at the beginning of each video can support this process by explaining the learning objectives and highlighting the "must-know" items. Additionally, an explanation of what students should understand and memorize can be added at the end of each unit. Second, at the beginning of each video, learning strategies could be added. These could include instructions on careful reading, reviewing assigned sections of the textbook and vocabulary prior to video viewing, watching a meaningful chunk of information before taking notes, pausing the video to identify the meaning of the examples on their own before the instructor offers an explanation, speaking the sentences aloud while watching the video, and following all other instructions. These improvements will help learners avoid extraneous processing and enhance essential processing even better.

In terms of the perceptions of the videos and micro-movies, the student had their likes and dislikes. The overwhelming response from the students was positive, which means that the students enjoyed learning from these videos and movies. In addition, no difference in approach and in perception was found between the two groups of learners: beginning-level CFL learners and the intermediate-level CFL learners. This might be due to the considerations taken into the design to fit their proficiency level in terms of language (English and Chinese), the speaking speed, and the content.

Based on the feedback from the students, a few improvements could be implemented regarding the content of the videos. Most significantly, the designer/instructor should be mindful of what the students have learned, how learners could be affected by their native language, and how they could associate the new knowledge with their prior knowledge. With these factors in mind, it is easier to anticipate the questions that students might raise and provide answers and associative links in the video. Students also requested more extensive explanations of grammatical structures, using the break-sown method, and the use of more complicated examples. Improvements such as these would help with activation of their prior knowledge and demonstration of new knowledge. The improvement that could make to the micro-movies could be to make them more professional, for example, making the focus steadier and making sound clearer. See table 4 for improvements suggested for revising instructional videos.

Table 4

Improvements Needed for Videos

Learning strategy should be embedded to video	Improvement of video content
1. Stress important learning objectives.	1. Anticipate questions and explain them in the video.
2. Embed strategies for using the video.	2. Provide more extensive explanation of grammatical structures.
3. Embed strategies for note taking.	3. Use the break-down method more extensively when explaining structures.
	4. Use more complicated examples.
	5. Use more photos that depict real-life situations or contexts.
	6. Provide a more detailed explanation of characters for beginning students.

This exploratory borrowed the basic concepts of DBR, which focuses on refinement and continuous evolution of the design through iterative cycles through feedback from the students (Wang & Hannafin, 2005) and on developing theories in designing materials for flipped/blended language learning environments. Suggestions on improvement drawn from the previous cycle should help the future

iterative cycles produce better outcomes (Amiel & Reeves, 2008; Wang & Hannafin, 2005). As proposed in Plomp (2013), among others, tentative reusable design principles may be generated using DBR. The following discussion suggests tentative principles for designing reusable online learning materials that emerged from this study.

First, critical learner engagement can be achieved by adopting a variety of design formats, such as diverse color palettes and real photos, by making light comments and adding humor, by using short movies (Bergman & Sams, 2012), by requiring students to take notes (Ash, 2012), and by making the instructional videos interactive (Bergman & Sams, 2012). Second, though design-based theories and principles frequently assume that learners will use materials as expected or in a predictable way, this study indicates that while some students were successful in applying paradigms, others were unable to do so. Thus, embedding learning strategies, particularly demonstrating how students can use the materials effectively, is critical for those who need more guidance and structure in learning. Third, anticipating students' questions and challenges, and providing answers and support is crucial. As the learners use the online materials individually or in groups, they may become frustrated if questions accumulate or are not answered promptly. Course designers and instructors should be able to anticipate most, if not all, of the relevant questions for the learning activities and assignments based on their teaching experience, expertise, and understanding of the learners.

8. Conclusion

As some researchers have observed, there is a scarcity of pre-recorded materials in the field of foreign language teaching and learning despite the crucial importance of such materials to help students learn in a flipped/blended learning environment (Abeysekera & Dawson, 2015; Babiker, 2015; Cheng et al., 2019; Mayer & Moreno, 2003; Lo & Hew, 2017; Seery, 2015; Schmidt & Ralph, 2016; Vitta & Al-Hoorie, 2020; Zhang, 2017; 2022b, 2022c, 2022d; Akiran, 2014). Thus, the instructional design, development, and dissemination of these materials for the flipped/blended classroom represents an ongoing, critical need for language teaching and learning. This study demonstrates that it is feasible to make significant progress in realizing these goals. Particularly, this study shows that the materials, which were designed based on the First Principles of Instruction (Merrill, 2002), multimedia design principles (Mayer, 2009), and the essential conditions for learning grammatical forms (Nassaji & Foto, 2004), enhanced student learning in an enjoyable way.

The two types of pre-recorded materials, instructional videos and micro-movies, were beneficial to students as they prepared for the FTF meetings and by enhancing learning after the FTF meetings, respectively. These benefits include improved understanding of vocabulary and grammar, retention of information, progress in writing and listening skills, and heightened awareness of grammatical forms. In addition, the new words supplemented in the examples, used in the grammar explanations, and employed in the performances in the micro-movies have expanded students' vocabulary. They also acquired pragmatic language. Helping students with knowledge activation, demonstration, integration, and application, the two types of materials worked in tandem to enhance learners' ability to solve the real-world problem – communicating with people in the target language (Merrill, 2002).

This study is the first in the literature to examine the design and development of online components used for flipped/blended language learning and the students' perceptions of using them. As Vitta & Al-Hoorie (2020) called for research to examine "under what conditions a treatment is effective" in flipped/blended learning, this study shed light on designing flipped-learning in general and on designing pre-recorded materials for flipped/blended learning specifically. Furthermore, the strengths of this descriptive study include the adoption of DBR and the use of verbal think-aloud protocols in combination with other qualitative data collection methods to capture rich data.

However, the study also has several limitations. First, as a descriptive study, only self-reported qualitative data was used. While it is a productive first step in studying the design and perception of these

types of materials for flipped/blended learning, future research using quantitative data is still needed to fully examine the effectiveness of using pre-recorded audiovisual online materials. Second, the principles drawn from this application of DBR need to be tested in iterative cycles in the future to prove their validity and robustness. Third, we must be cautious about generalizing the findings to other settings. While the participants in this study represented diverse linguistic backgrounds, some groups, such as heritage learners, were not well represented. Moreover, this study only investigated materials designed for beginning- and intermediate-level learners. The results might not be applicable when designing similar formats and materials for advanced learners. In sum, future research is needed with other groups of learners within the context of their curriculum.

Acknowledgements

Appendix A.

Questionnaire for the instructional videos
There is no right or wrong answer. This won't be graded. Your honest opinion is appreciated.

Gender: M / F
Age: _____
Native language: _____
Other foreign languages you know: _____
Did you take online or blended courses before? Yes / No

1. How long did you spend watching the instructor-made videos and taking notes each week?
   _____ minutes/hours (circle the unit you use.)

2. When did you usually watch the instructional videos and take notes each week?
   What day of the week? _____
   what time of the day? _____
   where did you usually watch the tutorials and take notes? _____

3. Did you watch all the instructional videos for one dialogue at one time or did you finish watching them using a few smaller chunks of time? Please give some details.

4. How many times did you usually watch the instructional videos for each dialogue?
   0   b. 1   c. 2   d. 3   e. more than 3

5. List three things that you like the most about the instructional videos.

6. List three things that you do not like the most about the instructional videos.

7. What do you think the instructional videos can be improved? List four changes that should be made.

8. In the instructional videos, do you think there are enough examples for each grammar point? Yes/No

9. Are those examples useful for helping you understand and learn?

10. How can those examples be used better to help you understand the use of words/grammar points?

11. It is possible that the instructional videoss can include some short video clips in which native speakers perform the use of certain words and grammar points. Is it a good idea to add those short video clips in the tutorials, even though it means that the instructional videos will be much longer than they are now? Please explain.

12. In the instructional videos, the instructor summarized and grouped words of similar meaning together to help you review and learn better. Do you think that's beneficial for your learning? Or would you rather do it yourself so you can learn better?
Please explain.

13. In the instructional videos, the instructor gave out questions in Chinese that you were required to answer and write down your answer in your notebook. Do you think that's beneficial for your learning? Why or why not?

14. What do you think about color coding in the instructional videos? By color coding, I mean, different colors were used for different occasions such as review, culture knowledge, questions that you need to answer, etc.

15. What do you think about the images used in the instructional videos? Do they help you understand the use of words and grammars?

16. Is the mandatory note-taking when you watch the instructional videos helpful? Yes/No. Please explain.

17. What do you think about the course format (3 face-to-face meetings plus 1 online)?

18. Do you have any suggestions and comments on the course and the instructor?

Appendix B.

Verbal Protocol for Think-aloud

Thanks for coming to use the online component, aka, a grammar and vocabulary video, with me. Here is what you are going to do. Please use the video as you normally do after class for our class, that is, watch it and take notes, answer the embedded questions in the video, write down the answer in your notebook. While you do all those, I also want you to tell me what you are thinking, what you are doing, why you are doing it. That is, I want you to think out loud while you are doing those. Thinking aloud is to talk out loud what is on your mind. If you pause for a longer period of time, I will remind you of thinking aloud. If you have questions when you watch the videos about the content, you can think-out loud, ask me or

write down on your notebook. I will answer your questions, if any, in the end of our session. I will record this using Camtasia. Do you have any questions before we start?

Appendix C.

Questionnaire for the micro-movies

You have watched some short movies in order to complete the authentic learning project. I would like to get more feedback. Please be honest in answering the following questions.

Your age _____; **Gender** _____;   **# of years of learning Chinese** _____
Native language _____; **Other languages (except for English and Chinese) you speak:**

1. On a scale of 0 to 5 with 5 indicating the most positive, do you think the micro-movies is a good supplement to the course videos for you to learn grammar and vocab?
   0   1   2   3   4   5

2. Please explain your choice:

3. On a scale of 0 to 5 with 5 indicating the most positive, do you think that watching these short movies and completing the authentic learning project have helped you with your Chinese studies?
   0   1   2   3   4   5

4. On a scale of 0 to 5 with 5 indicating the most positive, did you enjoy watching the movies and completing the authentic learning project?
   0   1   2   3   4   5

5. Do you think watching the short movies and completing the requirements have helped you improve the following aspects of learning? Please On a scale of 0 to 5 with 0 indicating "no, I don't think so", and 5 "yes, it helped a lot."

Listening comprehension	0	1	2	3	4	5
Speaking ability	0	1	2	3	4	5
Understanding of grammar points	0	1	2	3	4	5
Understanding of how to use certain words	0	1	2	3	4	5
Understanding of how to use certain grammar	0	1	2	3	4	5
Vocabulary learning	0	1	2	3	4	5
Other _____	0	1	2	3	4	5

6. On average, how much time do you think you've spent on watching each movie, completing transcribing it, coming up with questions to ask, and typing out your thoughts about it and what you have learned from watching it? _____ minutes

7. What do you like the most about using the movies to learn?

8. What do you like the least about using the movies to learn?

9. Did you pay attention to the grammar utilized in the movies?

10. One of the requirements for the authentic learning project is to write down what you have learned by watching the movie. Do you think this has helped you become more aware of your learning? Why?

11. We watched the movies together in class after everyone finished authentic learning project.

    Do you like watching it together?

    Do you think it helped your understanding?

    To make it more effective, you have any suggestion on this?

12. If we make changes to this authentic learning project for the future students, what changes would you suggest that we make?

13. To improve your Chinese learning, what kind of materials do you want to suggest that the teacher develop or find to adopt? What specific skills or aspect of learning (such as listening, reading, writing, speaking, grammar, vocabulary, culture) do you expect that these materials will help you improve?

14. What have learned about watching short movies on your own? Do you have any future plan on learning Chinese on your own? If you do, what is your plan?

15. Other comments:

Appendix D.
The reflection (and assignments) on the micro-movies

In groups of 2-3 students, sit together, watch each micro-movie, and complete the following:

1. Watch the movie at least at normal speed once or twice as a group.
2. Answer the questions about the movies.
3. Transcribe each of them. Make sure to put the title before each transcript. Typed out the transcripts.
4. Write down your feedbacks about the video, including what your general thinking about each video, what you have learned from watching the video, what did not go well in the video, the challenging part or funny part, etc., and also write down the questions that you have about the videos.
5. Write down at least 5 things that you learned from watching the video(s)

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设计并制作多媒体影像资料用于翻转混合式学习：
一项探索性研究

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摘要

本研究旨在探讨在中文教学中，如何为反转学习和混合式教学设计并录制多媒体影像资料以帮助语法词汇学习。 翻转式学习在外语学习中广受欢迎，混合式教学因为它给学生提供便利，也是被广泛采用。 利用翻转、混合教学方式，可以将语法和词汇的学习和巩固所学内容需要的练习放到课堂之外，从而为面对面的互动练习留出更多时间。 然而，线上已有的资源中很难找到完全适合教学目标的语法词汇数据供学生课外使用。 本文采用探索性研究方法，对语法词汇多媒体影像资料的设计原则以及预先录制、其运用对学习的影响、学生如何有效使用等问题进行了调查。美国一所大学中，三十九位以中文为外语的初级和中级学生参与了本项研究。数据收集采用了问卷、学生反思、访谈和出声思维等方法。 研究结果表明，这些预先录制的多媒体影像材料加强了学生对语法和词汇的学习。 学生很享受使用过程，他们认为，使用这些数据对他们学习新知识点、提高听力、写字、语用能力，以及获得文化与交际技能都有很大帮助。 此外，他们也指出了需要改进的方面， 比如增加语法解释的深度，多利用复杂句式的例子，预测学生可能有的问题在影像资料中给出答案，将微电影做得更专业，等等。 基于以上研究结果，作者提出了三条设计原则。

关键词
多媒体设计；先期制作讲座；微电影；混合式学习；翻转式学习

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