

## An Investigation of the Design of a Four-stage Flipped Classroom in Mandarin Chinese (中文翻转教室四个阶段的设计与研究)

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**Abstract:** This paper aims to investigate the efficacy of a flipped classroom that was created for twenty novice learners in an intensive summer Chinese language program. The flipped classroom featured four-stage learning: watching videos, taking notes online while watching videos, responding to preview questions, and receiving instant feedback. Three-factor ANOVA, one-way ANOVA, and regression analyses were used to investigate how gender, level of Chinese, instructional topic, and note-taking affected students' learning. Learners also completed a questionnaire to elicit their reactions to the flipped classroom and feedback on the effect it had on their learning. Statistical analysis indicated that the scores differed significantly in instructional topics and that the number of notes taken significantly decreased from the beginning toward the end of the program. Additionally, a significant positive relationship was found between the number of notes taken and test scores. The results of the questionnaire at a 5-point Likert Scale showed that learners strongly recommended the four stages of flipped design despite a slight decrease in the second stage of learning through note-taking while watching videos. Limitations of the study and directions for future research are discussed at the end of the paper.

**摘要:** 本研究旨在探讨暑期初级中文密集项目中翻转教室之有效性以及其对学习之影响。本实验设计之翻转教室分为四个学习阶段, 依序为学生看教学视频, 进而一边看教学视频一边在网上做笔记, 再则回答理解问题, 最后收到立即性反馈。本研究采用三因子变异数分析、单因子变异数分析、以及回归分析, 以期探索性别, 语言水平, 教学主题, 网上笔记四个因素对学生学习的影响。除此之外, 本研究亦针对翻转教室设计了一个问卷, 以期了解学习者对翻转教室的反馈以及其对参与者学习的影响。统计分析显示, 学生的学习分数在不同教学主题间有显著的差异, 学生笔记次数的多寡自项目开始至终也明显递减。同时也发现, 笔记次数多寡与学习分数成正相关。李克量表问卷结果显示, 尽管翻转教室在第二个阶段一边看教学视频一边在网上做笔记的数值不如其它三个阶段高, 大多数学习者仍然普遍支持并推

荐此翻转教室四阶段的设计以及其未来在中文教学上的应用。本文最后也提出此研究的限制与未来研究方向。

**Keywords:** Blended learning, flipped classroom, flipped learning, teaching Chinese as a foreign language

**关键词:** 混成学习, 翻转教室, 翻转学习, 对外汉语教学

## 1. Introduction

Flipped learning, which originated from research in STEM fields, i.e., science, technology, engineering, and math (Berrett, 2012), has rapidly gained prominence and popularity in innovative higher education E-learning contexts. Disciplines such as physics (Deslauries, Schelew, & Wieman, 2011), engineering electronics and circuits (Biemiller, 2013), statistics (Strayer, 2007), and cinema and TV arts (Enfield, 2013) employ flipped learning. As the Internet continues to explode in the E-learning era, this model has taken hold in secondary education in language arts (Ullman, 2013; Moran, 2014), science (Bergman & Sams, 2012), and math (Fulton, 2013). This evolving pedagogical approach has been presented in several interchangeable terms: Inverted classroom (Lage, Platt, & Treglia, 2000), Just-in-time teaching (Novak, 2011), Flipped classroom (Bergmann & Sams, 2012a), or Inverted learning (Davis, 2013). Baker (2000), who required his communication students to read PowerPoint slides before class through an institutional new computer network, is accredited for conceptualizing the flipped classroom paradigm (Lage & Platt, 2000; Lage, Platt, & Treglia, 2000).

According to Graham's (2006) articulation of three levels of blends on a continuum of technology integration, flip learning enhances blends instead of enabling blends or transforming blends. It aims to provide "enhanced rather than equivalent experiences of traditional classroom teaching" (Hung, 2015) in terms of technology use in hybrid learning settings. It does not simply take place in "brick-and-mortar location" establishments (Staker & Horn, 2012) and is built on extant mobile technological tools that students frequently encounter. The acts of learning that have "traditionally taken place inside the classroom now take place outside the classroom and vice versa" (Lage, Platt, & Treglia, 2000, p. 32). In a flipped classroom, instructional order is reversed in a way that students typically view instructional videos or other types of materials before class and devote in-class time to applied learning activities and interactive higher-order thinking.

### 1.1 Advantages of flipped classrooms

Researchers have well-recognized the advantages that this option has brought into teaching and learning. Baker (2000) discovered that students had learned a great deal from their peers through collaborative activities. Fulton (2012) identified that instructors were able to allocate more time to individual students and implement the curriculum more effectively. Other positive effects from flipped classrooms include, but are not

limited to, creating inquiry and problem-based learning (Bergmann & Sams, 2012a), eliminating constant homework struggle (Strayer, 2007), and allowing students to catch up with class content in their absence (Herreid & Schiller, 2013). In short, educational proponents have faith in this paradigm shift that empowers them to reach “every student in every class every day” (Bergmann & Sams, 2012a, book title). Although teachers may feel unprepared to “wade into the digital muck of video creation” (Moran, 2014), this technologically reliant idea has unparalleled potential to revamp classroom environments and change how subjects are taught and learned (Bergmann & Sams, 2012a; Bergmann & Sams, 2012b; Fulton, 2012; Tucker, 2012). Its close linkage to theoretical understandings of active learning also “involves students in doing things and thinking about the things they are doing (Bonnell & Eison, 1991, p. 2).

## **1.2 Flipped classrooms in second language acquisition**

Nearly all empirical research on flipped classrooms has been conducted in STEM classrooms. Despite increasing focused attention to flipped learning, surprisingly there have been only a very limited number of studies on flip learning models in second language acquisition. The following literature review offers a small glimpse of what is available in post-secondary, but not secondary, educational settings.

Hung (2015) conducted a posttest-only quasi-experiment to investigate EFL learners’ flip learning experiences at a Taiwan university. The experimental design of the study divided students into a flip group with WebQuest learning, a semi-flip group featuring TED-ED viewing, and a non-flip group. The results confirmed the value of active learning and revealed that students in the flip and semi-flip classrooms attained more satisfactory learning outcomes, developed more positive learning attitudes, and devoted themselves more to the learning process than students in the non-flip group.

In his study on developing EFL writing skills through student-created digital videos, Engin (2014) made an attempt to transform passive “sit-and-get” learners into producers and consumers in an active peer learning process. Although student-generated materials and input tended to lower cognitive, linguistic, and cultural load that may be a barrier to language learning (Mercer, 2000), learners who were Arabic native speakers expressed their preference of a teacher’s explanation over receiving a peer’s input in the flip learning phase.

Mehring (2014) completed a qualitative study in an attempt to investigate how EFL learners who were native speakers of Japanese reacted to the flipped classroom. It was found that students greatly benefitted from “the greater student-centered and active learning environment, the added amount of time participants spent preparing for the face-to-face class, and the significantly enhanced authentic, communicative learning environment” (p. 86).

Hojnacki & Häusler-Gross (2014) compared language gains in four language skills through flip and non-flip sessions in elementary German in a US mid-west liberal arts college. They summarized that learning did take place in each of the two sessions.

Additionally, students who had flip experiences performed slightly better than those who did not in all language skills except for speaking. Despite the fact that no significant difference was reported in change between the two sessions because of small sample size, the survey showed that students who learned through the flipped classroom model were more motivated and held a positive attitude toward the flipped format and therefore recommended continued adoption of the flipped model in the future.

Salazar & Sinclair (2015) reported the findings of their empirical study on the development of lexical competence among elementary learners of Spanish at an American university. In their study, three types of class structures were under investigation: a non-flip class, a flipped class using Quizlet, and a flipped class using vocabulary video tutorials. The differences between the pre-post and post-test indicated that all three designs yielded observable gains that promoted differentiated instruction. Although a combination of Quizlet and videos was recommended, the authors reflected upon potential future improvements to add comprehension checks and a tactile and interactive platform for video tutorials.

The above limited studies on SLA coincidentally were completed at higher education institutions. Whether the findings and pedagogical implications of flip learning design work in foreign language classes at the secondary level remains unknown and deserves further exploration. This pioneering study demonstrates the very first attempt of its kind to investigate the design of an innovative flipped classroom model that involves four stages of learning in Mandarin Chinese among 9<sup>th</sup>-12<sup>th</sup> graders at the novice level.

## **2. Design of the four-stage flipped classroom in this study**

The creation and experiment of the flipped classroom began in the summer of 2014. The flipped classroom launched in the 2014 STARTALK program involved only two stages of learning before face-to-face instruction took place in class, i.e., watching videos and working on Google forms to check for understanding, the latter of which provided valuable insight for teachers to incorporate collective feedback into face-to-face instruction on the following day. It was then re-evaluated, modified, enriched, and expanded to a four-stage innovative model to constantly and systematically monitor learners' progress and ensure that flipped learning achieved its proximal effects before face-to-face learning began. Compared to the traditional flipped classroom model in which learners watch videos at home and then participate in activities in class, the flipped learning model specifically created for this program advanced its existing functionality by adding three critical components: note-taking, comprehension checks, and instant feedback, including scores, error corrections, and explanations for inaccurate items after students completed comprehension questions.

The four stages of the flipped classroom in the 2015 STARTALK program are as follows, described from learners' perspective:

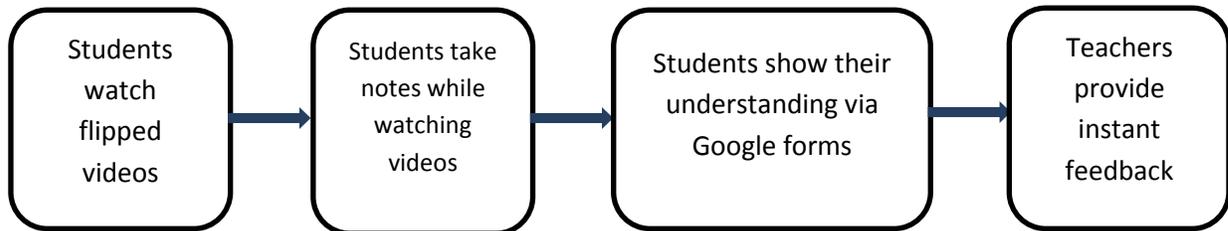
### Stage 1: Watching videos

Stage 2: Taking notes online while watching videos

Stage 3: Responding to preview questions

Stage 4: Receiving instant feedback

The four-stage flipped classroom model is highlighted below.



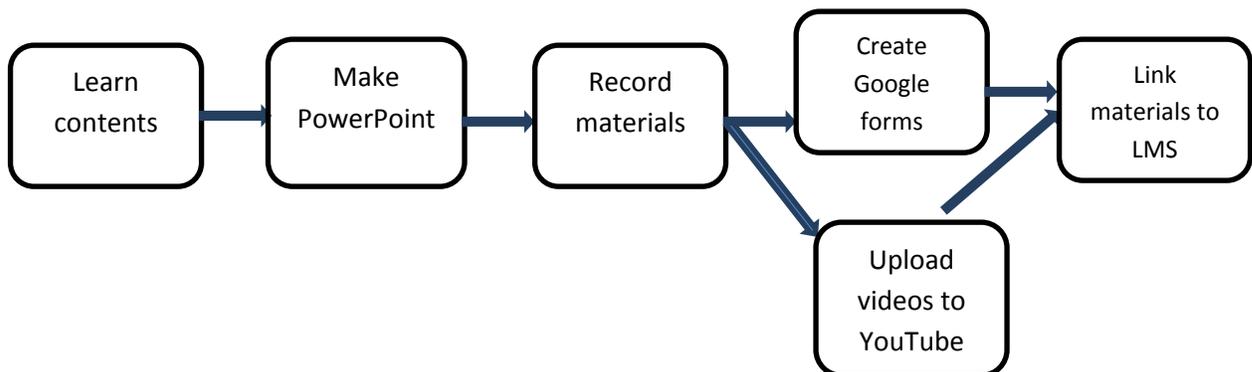
The four-stage model was meticulously laid out at both academic and technological levels. It was intended to be well-sequenced and structured, so each single stage was interconnected with its immediate next stage and the remaining three stages. It was collaboratively created by a technology specialist, four leading teachers of the STARTALK teacher and student programs, and a curriculum developer and key trainer. The pre-class flipped learning components were created to strongly enhance in-class face-to-face learning and support the fulfillment of curricular objectives as the ultimate goal. All materials were uploaded to the program website and well tested before the onset of the teacher and student program. The core instructional team worked tirelessly to ensure that the online operational system remained stable and well-run during the program. The twelve teacher trainees did not become involved in the creation of the flipped learning process. Upon their arrival at the program, the flipped learning online system was already completed and uploaded to the combination program website for the purpose of teacher development.

In total, twenty-two videos were pre-recorded for eight topics to be taught on eight days during the program. Six topics had three videos each, and two topics had two videos each. The videos were created in full alignment with curricular goals and program needs. Specifically, each video included essential learning materials, core sentence structures, and cultural references in a PowerPoint for screen recording. Each video lasted from one to less than three minutes. While a number of free screen recording tools were available online such as Ocam, QuickTime Player Pro, and Jing, the free downloadable version of “Screencast-O-Matic” was chosen to create program videos because of its accessibility on both the Macintosh and Windows operating systems.

After the videos were pre-recorded, daily Google forms and spreadsheets were then created to check for student comprehension through multiple-choice questions, ranging from six to 9 items for each topic. The Google forms and spreadsheets had the capacity to help educators collect, share, analyze, and graph data. A Google spreadsheet add-on was later installed to create a MCQ test, which automatically corrected and scored learners’ responses submitted online and sent along explanations for wrong items via email. Compared to other web tools such as Flubaroo, Zaption and EduCanon, the combination of Google forms and the MCQ script is free of cost, and its instant e-mail

feedback and explanatory notes well concluded the four-stage flipped learning process and sufficed for the purposes of this study.

Afterwards, pre-recorded videos were uploaded by the technology specialist to YouTube under the unlisted category and “1know.net,” an innovative online learning management system that enables instructors to collect data and monitor students’ progress. The 1Know Learning Management System (LMS) recorded all of students’ learning data, including the number of notes taken, video and unit learning duration, and video accessing records. The data trail allowed instructors to monitor the note-taking process and outcomes. Instructors were able to know when students took notes while watching the videos, what types of notes and how many notes students typed online, and whether the quantity of notes correlated with the score that students received through Google forms. To put it concisely, LMS generated a database through which instructors could monitor and analyze learners’ daily work and progress, and, most importantly, best prepare for face-to-face instruction the next day. The preparation workflow for teachers is as follows.



When students logged into the system, they would be able to see the 8-day assigned online tasks in order, the YouTube videos, and the Google forms on the central 1know platform. They accessed online materials all-at-once at any location that was most convenient for them. An orientation was held on the first day of the program to help students become familiar with the online system and successfully register for the course via the 1Know platform. During this 1Know orientation session, students practiced viewing the videos and taking notes at the same time. Students were also encouraged to post their questions as notes and highlight the questions in red, so their teacher could read their questions more easily. Before attending the program, it was assumed that students had developed note-taking skills in their own high schools. Therefore, what to write for online notes was not the focus of the training session and was open for them to decide. They were advised to write whatever they felt necessary and helpful for their own self-paced learning.

## 2.1 Research questions and method

The emergence of flipped learning in the STEM area has an increasing impact on foreign language education. More and more foreign language educators have adopted the

concept to create flipped classrooms for students to preview lessons before class, so in-class time can be secured for interactive and engaging discussions. But most flipped classrooms were created without sound research to support the design and instructional strategies (Hamden et al., 2013). More research is therefore needed to inform us of what type of flipped design works and does not work pedagogically.

As indicated earlier, while a very limited number of flipped learning studies in SLA have been situated in post-secondary settings, there is little research to inform us of how flipped learning complements face-to-face instruction to strengthen the learning process and outcomes in K-12 foreign language classes. Unlike the design of most flipped classrooms, this study makes a breakthrough to go beyond one stage of flipped learning and creates a four-stage learning process in order to systematically consolidate and monitor pre-class online learning, which is expected to strengthen face-to-face instruction in teaching Mandarin Chinese as a foreign language to high schoolers in a summer intensive program implemented at an American university.

This study aims to investigate how gender, learners' proficiency level (hereafter level), instructional topics (hereafter day), and note-taking affected students' learning after students went through the four-stage learning process: watching videos, taking notes online while watching videos, responding to preview questions, and receiving instant feedback.

The research questions include the following:

1. While students were watching videos, did gender, level, or topic affect their note-taking behavior?
2. After students went through the four-stage flipped learning, did gender, level, topic, or note-taking affect students' preview question scores?
3. Did students who watched videos score higher than students who did not watch videos?

In addition to the above research questions, the study also intended to explore students' reactions to the four-stage flipped design and their feedback. A questionnaire was developed according to a 5-point Likert Scale to help us understand students' reactions to the four-stage flipped learning and their comments and recommendations for future applications. The questionnaire was intended to gather information about students' input on their motivation level, the effects of flipped learning on their learning outcomes, the friendliness of technology use, and their recommendations for future applications of the four-stage flipped learning model to Chinese language courses or programs (See Appendix I). Learners were also encouraged to share any of their additional comments on the design of the flipped learning model and overall reflective learning experiences.

## **2.2 An overview of the program**

The 2015 program pilot-tested cutting-edge technology tools to create the flipped classroom and achieve proximal learning outcomes in an innovative blended learning

model. The daily routine of teachers' practicum closely followed a comprehensive cycle that was composed of pre-class preview, during-class learning, and after-class review to ensure closely monitored daily progress in alignment with learning objectives.

### **2.2.1 Student participants**

Students who participated in the study learned Mandarin Chinese in the Virginia STARTALK Chinese Student Academy in summer 2015. The program evolved from a half-day Chinese Language and Culture Immersion Program as part of the Virginia STARTALK Chinese Teacher Academy that was launched in 2008 through the STARTALK initiative in the US. The Virginia STARTALK Chinese student Academy (VSCSA) partnered with the Virginia STARTALK Chinese teacher Academy (VSCTA) to increase capacity for learning Mandarin Chinese in K-16 educational settings. The teacher to student ratio was 1:1 in 2015, and students frequently interacted with devoted teachers to satisfy their individual needs on a daily basis. The program strives to create a truly interactive, communicative, and innovative class featuring an integration of a wide array of authentic tasks and cutting-edge instructional technology.

Participants were 20 non-heritage learners who were 9<sup>th</sup>-12<sup>th</sup> grade high schoolers recruited from the commonwealth of Virginia and neighboring states in the US. There were 13 female students and 7 male students in the program, including five 9<sup>th</sup> graders, seven 10<sup>th</sup> graders, four 11<sup>th</sup> graders, and four 12<sup>th</sup> graders. Of the twenty students, seven students had prior learning experiences. One had learned Chinese for three months in a weekend Chinese school, four had completed Level I Chinese, one had completed Level II Chinese, and one had completed a Virtual Chinese course for 3 years. According to the pre-program survey and individual interviews, they were placed into two classes depending on their prior learning experiences, learning styles, age, and gender.

Of the twenty students who participated, two were not able to access the IKnow website. Therefore, only eighteen students watched the videos and completed the online preview questions daily. Among these eighteen students, eleven were female and seven were male. Eleven were novice students, and seven had studied Chinese before. Since the students were not strictly required to complete the assignments, some students missed one or two videos or did not complete the online quizzes. Two students did not watch the videos except on Day One, when all students watched the video in class, but they completed the daily quizzes.

### **2.2.2 Curriculum**

Twenty learners participated in the 10-day non-residential program from July 13<sup>th</sup> to July 23<sup>rd</sup> in 2015, excluding Sunday. The curriculum was created by a core instructional team consisting of four leading teachers of the teacher and student program, aided by a technology specialist's expertise in instructional technology and Chinese language instruction through 3-stages of backward design. Morning included three 50-minute slots when students learned through face-to-face instruction in regular classrooms. The target language was exclusively used in class, which allowed learners to gain

enriched immersion experiences. Afternoon sessions were reserved for students to complete technology-related tasks, review learned materials, and interact in cultural activities. English was mingled with Chinese in the afternoon sessions.

The program offered no credits to students. Total instructional time was 65 hours during the day program, and 10 hours for online flip learning and self-review at home. The targeted proficiency level was novice-mid according to ACTFL's proficiency guidelines, but performance level could reach up to novice-high on certain topics. The instructor exclusively used the target language in class, and encouraged learners to do likewise. Learners were enrolled in the virtual US-China Exchange Program to embark on an exciting trip to Beijing. The entire student program lasted for ten days but covered only eight topics on eight days, with the seventh day reserved for review and the last day for an end-of-program performance and closing ceremony.

Instructional topics included the following:

- Day 1: Greetings and self-introduction
- Day 2: Family
- Day 3: Dates and time
- Day 4: Hobbies
- Day 5: Visiting a Chinese family
- Day 6: At a Chinese restaurant
- Day 7: Review
- Day 8: Sightseeing in Beijing
- Day 9: Shopping
- Day 10: End-of-program performance and closing ceremony

### **2.2.3 Teachers**

Instructors were two leading teachers in the student program and 12 teacher trainees who were recruited nationwide to take a 3-credit graduate level course in teaching Chinese as a foreign language during the program. Of the twelve teacher trainees, ten were in-service teachers who taught in secondary or post-secondary educational settings in the US, and two were graduate students who were about to enter the job market to launch their teaching careers. Three teachers worked together to prepare for team-teaching, and a total of five groups of teachers rotated to complete their teaching practicum. The teachers prepared lesson plans according to STARTALK-endorsed principles for effective teaching and learning as follows, while taking into account program-specific curricular objectives on a daily basis.

- Implementing a standards-based and thematically organized curriculum
- Facilitating a learner-centered classroom
- Using target language and providing comprehensible input for instruction
- Integrating culture, content, and language in a world language classroom
- Adapting and using age-appropriate authentic materials
- Conducting performance-based assessment

The twelve teacher trainees went through a multi-faceted reflective comprehensive cycle that was carefully designed for them to fulfill practicum requirements. They worked closely with leading teachers in the teacher and student program to complete teaching practice and were systematically supervised by the leading teachers, the technology specialist, and the key trainer and program director before and during the program.

### **3. Discussion and results**

Whereas twenty students completed the questionnaire at the end of the program, only eighteen students fully participated in the four-stage flipped learning process from the beginning until the end of the program. Therefore the statistical analysis of the following first section is based on data collected from eighteen students. The discussion is divided into two sections. The first section focuses on statistical analysis of the factors potentially affecting students' preview questions and preview question scores. The second section summarizes the results of the questionnaire pertaining to students' input and comments on the design of the flipped learning classroom.

#### **3.1 Factors potentially affecting students' learning in the flipped classroom**

Scores on the daily comprehension questions, i.e., quiz scores, were used to indicate students' understanding of the videos. A statistical analysis was conducted to investigate whether the following factors played a significant role in students' scores and the number of notes they took: gender, level of student's prior Chinese knowledge, and the number of days into the program, i.e., 8 days with 8 different topics. The effect of note-taking on students' quiz scores was also considered.

##### **3.1.1 Score versus gender, Chinese level, and day**

A three-factor statistical analysis of variance (ANOVA) model was used to investigate the following research questions:

- Did female students score higher than male students?
- Did students who learned Chinese before score higher than novice students?
- Did the scores differ in eight days, i.e., eight topics?

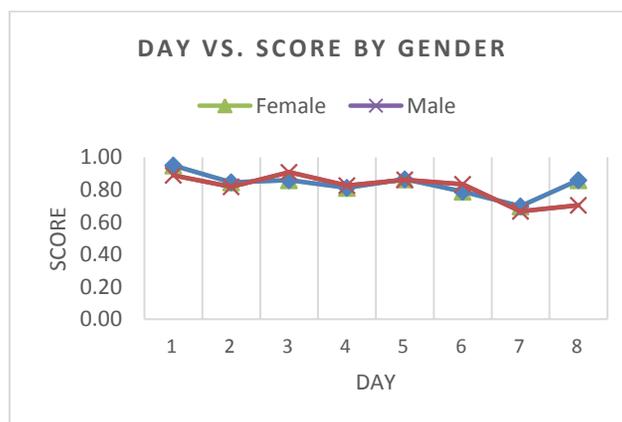
The three factors analyzed were gender, Chinese level, and day, with day as the repeated measurement.

Table 1 shows the results of the three-factor ANOVA on scores. The results indicated that students' scores did not show a significant difference based on gender, the level of students' prior Chinese knowledge, or the interaction between gender and level. However, the scores showed a significant difference on day ( $F(7, 98) = 4.17, p < 0.001$ ).

**Table 1: Results of the 3-factor (gender, level, day) ANOVA on scores with day as the repeated measurement**

<b>Tests of Hypotheses Using the ANOVA MS for ID (Gender*Level) as an Error Term</b>					
<b>Dependent Variable: Score</b>					
Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
Gender	1	0.00042861	0.00042861	0.00	0.9555
Level	1	0.18101010	0.18101010	1.37	0.2620
Gender*Level	1	0.11533924	0.11533924	0.87	0.3667
<b>Tests of Hypotheses Using the ANOVA MA for ID* day(Gender*Level) as an Error Term</b>					
<b>Dependent Variable: Score</b>					
Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
Day	7	0.44336667	0.06333810	4.17	0.0005
Gender*Day	7	0.07373690	0.01053384	0.69	0.6776
Level*Day	7	0.09677619	0.01382517	0.90	0.5023
Gender*Level*Day	7	0.09165201	0.01309314	0.86	0.5397

A plot of day versus average score by gender is shown in Figure 1, and a plot of day versus average score by level of Chinese is shown in Figure 2. Both figures reveal that the average scores throughout the eight days showed no significant difference based on gender or levels.

**Figure 1: Day versus Score by Gender**

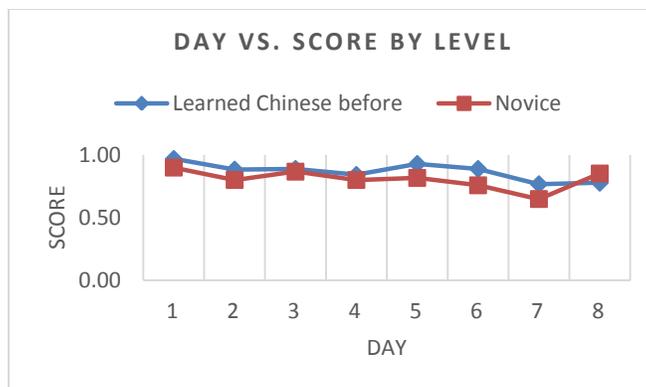


Figure 2: Day versus Score by Level

The results show that day is a significant factor in the scores of student performance. A one-factor repeated measurement ANOVA was then conducted for a detailed comparison of the scores among these eight days. The results were consistent with the 3-factor ANOVA in that there were significant effects for day on the scores ( $F(24, 119) = 7.35, p < 0.001$ ). The average score of Day 1 and the average score of Day 7 were significantly different.

The following figure, i.e., Figure 3, shows the average scores for the eight days.

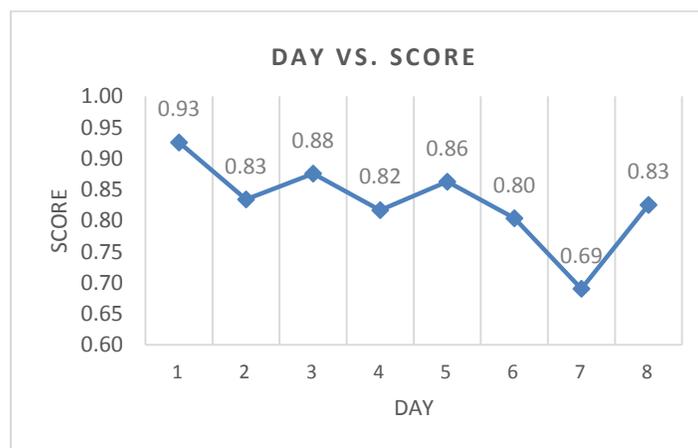


Figure 3: Day versus Score

The Day 1 score was higher than the other days. This might be due to the time that the quiz was taken. On the first day of the program, students received in-class instruction in the morning and then learned how to use the flipped classroom video platform during the afternoon lab time. They watched the videos and took the quiz after they were introduced to the 1Know website. Therefore, the scores reflected their understanding after the in-class instruction and video watching. The score from Day 7 was significantly lower than the scores on other days. This might be due to the higher difficulty level of the content associated with vocabulary and grammatical structures and the design of the quiz questions. For Day 7, students watched two flipped videos and answered six questions after watching the videos. However, two of the questions were answered correctly only 50% of the time. One of the questions was not clearly stated,

and the other question referred to grammar structure that was not explained in the video. Besides Day 7, the rest of the scores show no significant difference among the different days and topics. Therefore, excluding the human error in the question design on Day 7, gender, level of Chinese knowledge, and the day of each topic did not have a significant effect on quiz scores.

### 3.1.2 Note-taking versus gender, Chinese level, and day

Since gender, level, and day did not have a significant effect on students' scores, the effect of note-taking on students' scores was studied. First, how gender, level of prior Chinese knowledge, and day affected the number of notes students took while watching the videos was studied. A three-factor ANOVA model was used to investigate the following research questions:

- Did female students take more notes than male students?
- Did students who learned Chinese before take fewer notes than novice students?
- Did the number of notes taken change throughout the eight days (topics)?

The three factors analyzed were gender, Chinese level, and day, with day as the repeated measurement.

Among the eighteen students who took the quiz, two students' data were excluded from the data analysis since they watched only the first day's videos and did not watch the rest. Therefore, this statistical model included only the data from sixteen students. In total, there were 1,045 notes taken throughout the eight days of video watching. The notes can be categorized into the following three different types.

1. Repetition of video content  
Ninety percent of the notes (totally 941 notes) that students took repeated what they learned from the videos. This includes listing new vocabulary in Pinyin and English (for example: *da lanqiu = bball*), and summarizing the content they learned in the video (for example, *women jintian qu kan dian ying, hao ma? subject-time-verb-thing*).
2. Questions (94 notes)  
Nine percent of the notes (totally 94 notes) that students took were questions they had about the content. They were encouraged to ask questions and to highlight the questions in red so the teachers could see them more easily. Their questions included queries about language and grammar structure (for example, *In Chinese, do you ever conjugate verbs?*), and questions about culture (for example, *is it disrespectful to ask an adult their age?*).
3. Notes to self  
Only one percent of the notes (totally 10 notes) served as notes to themselves. They included a reminder (for example, *be careful of the pinyin*), and self-reflections (for example, *wo hen xi huan xue xi han yu*).

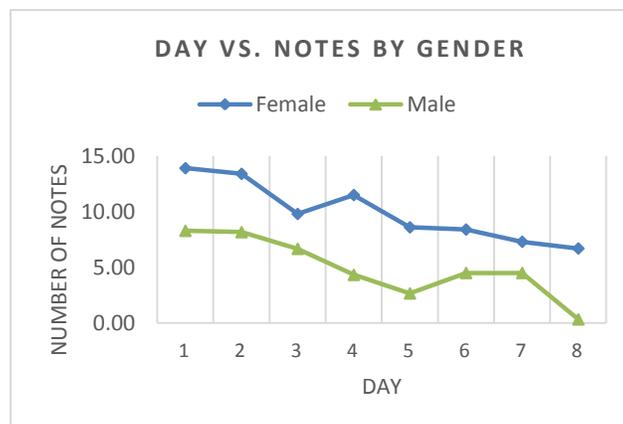
Although the quality of the notes might be a factor that affected how students learned Chinese language and culture, this study sorely focused on examining whether the quantity of note-taking affected students' learning outcomes. The quality of note-taking is beyond the scope of this study.

Table 2 shows the results of the three-factor ANOVA on note-taking. The results indicated that students' scores did not show a significant difference on gender, the level of students' prior Chinese knowledge, or the interaction between gender and level. However, the number of notes taken shows a significant difference on day ( $F(7, 84) = 5.74, p < 0.001$ ); thus there was a significant effect of day on the number of notes taken.

**Table 2: Results of the 3-factor (gender, level, day) ANOVA on number of notes taken with day as the repeated measurement**

<b>Tests of Hypotheses Using the ANOVA MS for ID(Gender*Level) as an Error Term</b>					
<b>Dependent Variable: Notes</b>					
Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
Gender	1	646.1519805	646.1519805	2.04	0.1786
Level	1	4.5893630	4.5893630	0.01	0.9063
Gender*Level	1	282.6019129	282.6019129	0.89	0.3641
<b>Tests of Hypotheses Using the ANOVA MA for ID* day(Gender*Level) as an Error Term</b>					
<b>Dependent Variable: Notes</b>					
Source	DF	ANOVA SS	Mean Square	F Value	Pr>F
Day	7	724.1919430	103.4559919	5.74	<.0001
Gender*Day	7	52.8686549	7.5526650	0.42	0.8880
Level*Day	7	123.3499991	17.6214284	0.98	0.4530
Gender*Level*Day	7	25.9886940	3.7126706	0.21	0.9833

A plot of day versus number of notes taken by gender is shown in Figure 4 below.



**Figure 4: Day versus Number of notes taken by Gender**

In Figure 4, the daily average number of notes taken by the female students was consistently higher than that of the male students. However, the results of ANOVA showed no significant difference between genders ( $F(1, 12)=2.04, p=0.17$ ). When looking at the averages over the entire eight days for females ( $M=9.87, SD= 2.17$ ) and males ( $M=5.21, SD=2.57$ ) and taking into account the standard deviations, there was no significant difference between the genders in terms of the average number of notes taken.

Figure 5 is the plot of day versus the number of notes taken by students with different levels of Chinese. The results of the analysis showed that the number of notes taken by the novice students ( $M=8.27, SD= 2.17$ ) and the number of notes taken by the students who had previously learned Chinese ( $M=7.88, SD=2.57$ ) were not significantly different.

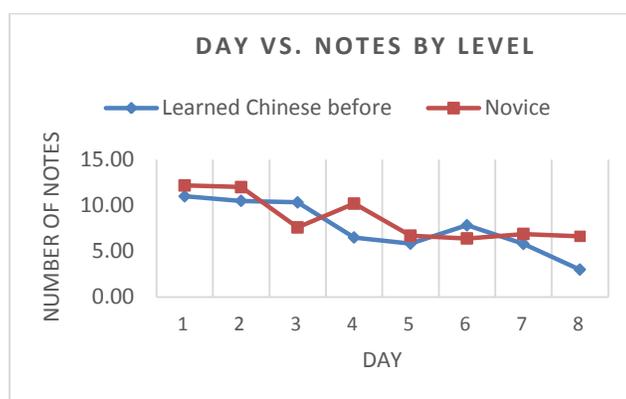


Figure 5: Day versus Number of notes taken by Level of Chinese

Figure 6 shows the average number of notes taken throughout the eight days. The number of notes decreases throughout the eight days. A one-factor (day) repeated measure ANOVA with number of notes as the dependent variable was conducted. The result was consistent with the results from the 3-factor ANOVA in that there was a statistically significant effect of day on the number of notes taken ( $F(22,105)=15.21, p<.001$ ). The decrease in the number of notes taken can be explained by the decreasing level of student motivation and energy level to take notes and increasing accumulative workload toward the end of the intensive program. Another factor must have something to do with the design of note-taking that is one-way in nature, lacking the instructor's interaction with students online. Although face-to-face feedback on students' note-taking was given as needed during the next day, daily encouraging feedback and responses to students' comments, regardless of type of notes, were not given online through two-way communication as a program feature.

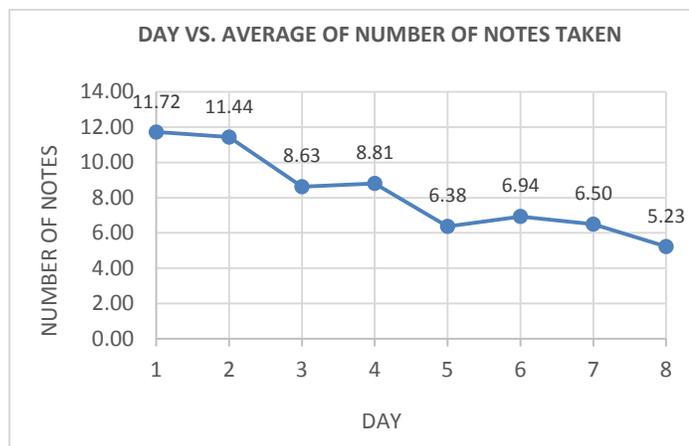


Figure 6: Day vs. Number of notes taken

### 3.1.3 Number of notes taken vs. score

Gender and level of prior Chinese knowledge did not show significant effects on quiz scores. A regression analysis on the average of individual students' scores and their average number of notes taken was used to investigate whether students who took more notes scored higher than students who took fewer notes, and whether there was a relationship between test scores and the number of notes taken. As indicated in Table 3, the results of the analysis showed that there was a significant positive relationship between the number of notes taken and score ( $F(1, 14)=4.69, p < .05$ ). The coefficient of linear fit slope is 0.00737, which showed that there is a positive relationship between the number of notes taken and score, with a significance level of .05. However, the effect on score is very small.

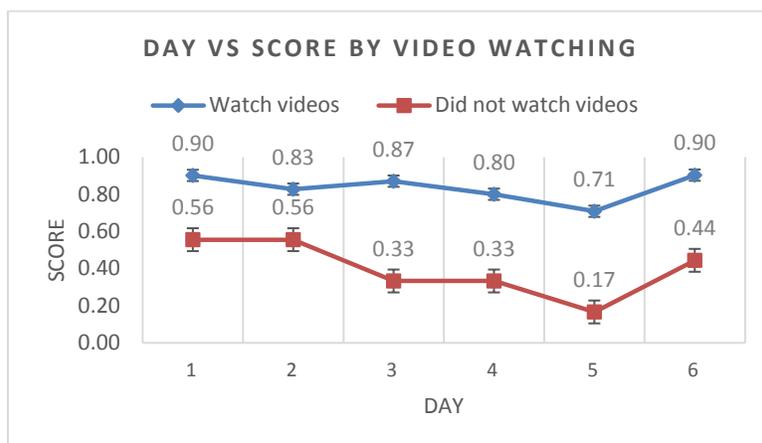
Table 3: Results of the regression analysis of the number of notes taken and quiz score

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Value
Model	1	0.03228833	0.032288	4.6938
Error	14	0.09630542	0.006879	Prob > F
C. Total	15	0.12859375		0.0480*
Parameter Estimates				
Term	Estimate	Std Error	T Ratio	Prob >  t
Intercept	0.7944662	0.034563	22.99	<.0001*
AvgNote	0.0073768	0.003405	2.17	0.0480*
Linear Fit				
AvgScore = 0.7944662 + 0.0073768 x AvgNote				

### 3.1.4 Watching videos or not versus score

There were two students who did not watch the flipped classroom videos at home but completed the quiz questions, except on Day 2. One of them had learned Chinese for

one year, and the other did not have any prior Chinese learning. To understand how these videos helped novice students learn, the scores of this novice student who did not watch videos were compared with the scores of the novice students who watched the videos. Figure 7 shows that the scores of the novice student who did not watch the videos ( $M=0.40$ ,  $SD= 0.15$ ) were significantly lower than the novice students who watched the videos ( $M=p.83$ ,  $SD= 0.074$ ).



**Figure 7: Day versus Score by video watching and no video watching**

The results of the statistical analysis showed that gender and level of Chinese knowledge did not have a significant effect on quiz scores or on the number of notes taken. However, day had significant effects on both scores and the number of notes taken. The effect of day on the scores might have been caused by the question design, which may have room for improvement. The effect of day on the number of notes taken was significant, but the reasons for the decrease in the number of notes taken needs further study. The regression test showed that there is a significant positive relationship between the number of notes taken and quiz scores. The students who took more notes scored higher on the quizzes; however, the impact on score was small. Students who did not have prior Chinese knowledge and watched the videos scored significantly higher than the novice student who did not watch the videos. This result indicated that watching flipped classroom videos did help students understand the content and perform better on the quizzes.

### 3.2 Results of the questionnaire on learners' input and comments

In addition to the above statistical analysis of the impact of gender, level, topic, and note-taking on students' learning, this study also conducted a questionnaire with items created based on a 5-point Likert Scale to gather learner participants' input on the effectiveness of the implementation of the four stages of flipped learning. The questionnaire looked into five categories of each stage of flipped design: time commitment, motivation, effects, technology use, and future recommendations.

As far as time commitment is concerned, when learners watched videos, they watched videos and took notes at the same time, so time was automatically calculated

based on the total time spent watching videos and taking notes. There was no mean indicative of time spent on watching videos only. On average, each learner spent 11.50 minutes watching videos and taking notes, 10.05 minutes responding to preview questions, and 6.10 minutes viewing instant feedback, amounting to 28.1 minutes for daily flipped learning at home. The time spent on completing flipped learning components seemed reasonable and manageable and did not appear overwhelming as learners were fully devoted to Chinese language learning, and no other subjects, in the summer.

The following table summarizes the means of the remaining four categories: motivation, effects, technology, and recommendations.

**Table 4: Means of 5-point Likert Scale on four Stages of flipped Learning**

Category	Watching videos	Watching videos/taking notes	Responding to preview questions	Viewing instant feedback
Motivation	4.15	3.45	4.15	4.25
Effects	4.55	3.30	4.40	4.45
Technology	4.65	3.95	4.50	4.50
Recommendations	4.65	3.65	4.30	4.60
Average	4.50	3.59	4.34	4.45

As the above table shows, all columns have means higher than 4 except for the second column on watching videos and taking notes, with the mean of each cell ranging from 3 to 4.

Looking at the figures vertically, the means from the highest to the lowest are represented in the following order: watching videos (4.50), viewing instant feedback (4.45), responding to preview questions (4.34), and watching videos and taking notes (3.59). The highest mean lies in watching videos, but surprisingly when it goes with note-taking, the means in four categories become the lowest. Responding to preview questions and viewing instant feedback had their means very close to the highest.

Horizontally, analyzing the means in four categories, motivation overall has slightly lower means, while effects, technology, and recommendations have higher means. Having said that, cells that represent motivation still have means higher than 4, except for the cell that represents watching videos and taking notes, as mentioned earlier. This indicates that learners well-recognized the effects and values of flipped learning and the friendliness of technology use, therefore highly recommending the future use of the four-stage flipped learning model. The only area that did not receive the highest recommendation is online note-taking that accompanies watching videos. Although learners affirmed the value of watching instructional videos as a before-class preview component, they did not hold the same high level of motivation when they were required to do note-taking while watching videos simultaneously. Similarly, learners did not hold the same high level of positive attitude toward note-taking as the effects of flipped learning and the friendliness of technology use.

The relatively low value of taking notes while watching videos is worth exploring and explaining. Apparently, learners' personal preference did not comply with the impact of note-taking on learning outcomes, as indicated in the statistical analysis discussed above.

As discussed in the previous section on statistical analysis, a significant positive relationship was found between the number of notes taken and the learning outcome, i.e., quiz score. This can be interpreted that the more notes taken, the better the score is. The results showed that note-taking does have a positive effect on absorbing video content, therefore enhancing language performance with more satisfactory learning results. It may be possible that 9-12<sup>th</sup> graders were not yet independent learners in online learning, and were unaware of the value of note-taking and its positive impact on their overall learning. For this group of learners, flipped learning is a brand new concept and experience. They had never watched videos and taken notes online simultaneously, so they were not accustomed to performing similar tasks at the same time. Another factor that may well explain why note-taking is not a welcome option is that the flipped learning process in this study was designed to be a one-way communication; no follow-ups or interactive features were added between the learner and instructor or among learners themselves. This led note-taking to be an individual task with interaction taking place between each learner and the online platform. It is admitted that note-taking has undisputable pedagogical value and its functionality cannot be ignored or under-stressed. It is hypothesized that if learners had received more training on note-taking and understood its positive effect before participating in flipped learning during the study, their input on this aspect might have differed. This hypothesis, however, will have to be verified through future studies.

Aside from the results summarized above based on a questionnaire at the 5-point Likert Scale, it is worthwhile discussing additional comments that some of the learners shared in the questionnaire. Most learners appreciated the opportunity to watch the short videos as the videos helped them prepare for the next class, gain an idea of upcoming content, and get ready for the full immersion class on the next day. One commented that learners can “get a head start by watching the video,” adding that these videos are informative and are great resources. One said positively that videos also helped explain grammatical use, and in terms of grammar, another expressed the need to add more grammar to the videos. Of all the added comments, one student who was not used to online learning expressed his frustration because “video content and vocabulary were not on student sheets.” The program actually offered a folder of study guides that included daily materials to be learned, and whether it is necessary to create handouts to accompany video content is a matter for flipped classroom instructors to consider further. According to comments collected in this study, this does not stand out as a critical issue.

Unlike mostly positive comments on learners' reactions to watching videos, feedback on note-taking was half positive and half slightly negative.

On the positive side, note-taking helped to “retain content” and “affirm knowledge and keep it fresh in mind.” Two learners expressed their appreciation of the

convenience of the technology tool that allowed the video to automatically pause when learners started taking notes. This surprisingly made another student frustrated, revealing completely the opposite response.

One student shared a very interesting observation about grammar covered in the videos. She pointed out that the videos sometimes discussed grammar, whereas in class the instructor rarely discussed it. This point was perceived by that particular student as a drawback, but it is indeed a proof of the successful handling of grammar that was taught through performance-based instruction with no English explanation at all. Apparently, this particular student expected the instructor to use English to explain and analyze grammatical structures, but this was not encouraged in a full immersion setting where only the target language could be used as a best practice.

Two students mentioned that it was unnecessary to take notes during videos without explicating reasons or a justification. One may have experienced technology glitches and could not get the note-taking software to work, and another found it was hard to access the notes online afterwards and preferred paper notes. This leaves the researchers to ponder upon the issue of whether online notes or traditional paper-and-pencil notes bring about more convenience and desirable outcomes. If notes were made readily accessible afterwards, then the objection could have been easily removed. Echoing this point of view, one student requested a physical paper with preview items on it to aid in watching the videos. Several others who provided additional comments unanimously shared positive feedback on preview questions. The preview questions not only showed learners the area where they needed to improve but also helped them check for understanding and retain knowledge. Besides, the tool used to access and respond to preview questions was easy to use, as added by one student.

Additional comments on receiving instant feedback were overwhelmingly positive. Time commitment to instant feedback was reasonable and manageable. The answer keys helped learners “learn grammar,” “see mistakes,” and “understand what to improve and why.” As further noted by three students, the process was “fast, useful, and efficient.” While one student agreed that links to email were good, another noted that “email feedback was less convenient; immediate feedback on the site would be better.” No one experienced any technology glitches while receiving instant feedback via email, and they just had to check emails.

Overall, the preview section really helped learners “feel prepared and ready for the next day, but without being overwhelming.” The value of watching videos is well-acknowledged by learners. Taking notes helped “make material sink in,” although several comments demonstrate a need for further thoughts about note-taking. Responding to preview questions helped to “get the best STARTALK experience possible,” and students wanted to retain receiving instant feedback in the future program.

### **3.3 Pedagogical implications and applications**

This study contributes to our understanding of effective flipped learning by creating a well-sequenced and structured four-stage flip learning process. Its applicability in secondary and post-secondary classrooms during the regular semester is perceived to have high interest for language teachers, supervisors, and administrators. The four-stage flipped learning model allows instructors to constantly and systematically monitor students' daily progress through a multi-functioned Iknow centralized online operational system that was created for the purpose of the study. Undoubtedly, the planning of each single stage is never an easy process. It takes full devotion among teaching and administrative staff on the team.

#### **3.3.1 Creating the first stage of flipped learning**

Most teachers tend to have reservations about the required time commitment to create instructional videos. Flipped learning actually engages students to be exposed to a wide variety of learning materials and does not necessarily require teachers to create videos at the expense of their own time. There are different types of materials that can be adopted and used for flipped learning with ease, such as YouTube videos, online films, podcasts, newspapers, TV news, audio files, and a large variety of authentic materials geared toward four language skills across three communicative modes. Watching videos is just one of many effective ways for pre-class preparation, but listening to sound files, reading an article, writing a brief email, or recording a short response are some examples of what students can do to prepare before class. As technology continues to grow and gain popularity, online resources have become more accessible, diversified, and versatile, and teachers do not need to work alone. Collaboration and professional exchanges save teachers time and help achieve mutual goals.

#### **3.3.2 Alternatives to the online platform for flipped learning**

Conceivably, creating the multi-functioned Iknow central system that was particularly developed for the purpose of this study is beyond what a foreign language teacher can do. Most schools may have limited personnel support, lack of expertise and knowledge, and budget constraints. A possible resolution to this situation is to use any online platform that is available and whatever tools teachers feel familiar with and confident about. In this regard, checking for understanding can be made possible, and it is highly recommended that comprehension be included in whatever format to ensure that learners do what they are expected to do and that learning does take place before class. Providing instant feedback, if not doable through technology, can be replaced by other convenient options that achieve similar evaluative and curricular goals, such as self-checking or a small-scale follow-up evaluation. Alternatives to the adoption of technology tools and for the three stages that follow video watching in order to achieve the same curricular objectives are crucial and of great interest to language teachers. But that is not the focus of this study and will be addressed in a separate paper.

### 3.3.3 Time allocation during regular semesters

The program was conducted in an intensive summer STARTALK combination program when student participants did not take any course other than learning Chinese, so they were able to fully concentrate on completing required work before and after class. The group of learners was selected from a large group of applicants, and recruited students were highly motivated, well-disciplined, and willing to put in their greatest effort to meet curricular standards. One may argue that while the flipped components work well in such an intensive summer program, they may not work well during regular semesters. As acknowledged by many Chinese language teachers who teach in high schools in the US, they are not allowed to give students too much homework after class and therefore have reservations about assigning preview work in accordance with school policies. This leads them to give little or no work for students to do before entering the classroom, and the result is that all materials have to be taught by the instructor in class, and what can be reasonably and readily self-learned before class is postponed to limited class time.

An allocation of less than 20 minutes for preview work prior to class time is indeed feasible and greatly beneficial to both teachers and students. At any rate, instructional videos are supposed to be as short as 1 to 2 minutes, and no more than 3 minutes. Adding questions for comprehension checks and instant feedback, but excluding note-taking, the preview exercise will not exceed 20 minutes and deplete too much of students' time at home. Wisely arranged, pre-class materials for self-paced flipped learning can be divided into several small segments as needed. To decrease the complexity level on technology, a two-step design that involves videos and comprehension questions may still fulfill pedagogical needs that instructors aim to achieve.

### 3.4 Conclusion

This study yields practical applications and potential for future research, but like many other studies on pedagogical innovation, it has perceivable limitations. The study had a small sample size at the novice level during a short, intensive summer program. To what extent the results of the study are applicable to other proficiency levels in different types of educational settings is unknown. Future studies should increase the sample size, extend to other proficiency levels, experiment in different courses and programs, and if feasible, include both control and experimental groups to make possible a comparison of students' performance in light of scores of pre-program and post-program tests and other aspects of analysis.

The pedagogical value of note-taking cannot be ignored despite the fact that students did not strongly favor it. Online note-taking accompanying video-watching is an area that deserves in-depth discussion. When learners move to the intermediate and advanced levels, the content of their note-taking may change. In this study, the major note type is the repetition of video content, which accounts for 90% of all notes, leaving 10% to be questions and reminders. The content of elementary Chinese is not composed of a wide range of vocabulary, and the complexity of syntactic structures, functions, and

pragmatic use is not as high as that at the intermediate and advanced levels. It is thus hypothesized that the composition and type of notes may alter in intermediate and advanced Chinese. This poses another interesting research question to study further.

Online note-taking in this study was designed to be a one-way flipped learning component, not a two-way communication. Assuming that learners benefit more from two-way interactive communication, tweaking online note-taking to two-way interactive learning may increase the level of engagement, but this would have become labor intensive and requires more time commitment from instructors or teaching assistants. It is assumed that one-on-one connections between individual students and the instructor will motivate students to work harder, and teachers will be better able to interact with students online. To what extent one-way or two-way note-taking affects learners' input and learning outcomes is another new area to explore in future studies.

Note-taking strategies are another domain to attend to as well. Although student participants attended an orientation provided by the technology specialist and the leading teacher of the student program, how to take notes to best retain content while watching videos was not the focus of the orientation. If students were well guided to learn effective note-taking strategies, such instruction could affect note-taking content. This, however, went beyond the scope of the study but deserves further exploration.

It is hoped that the same or revised flipped learning model in the study be duplicated, modified, and extended to different levels of Chinese language courses and different types of Chinese language programs domestically or abroad. Further studies with such experimental measurement can deepen our understanding of the effective design and implementation of flipped learning in Chinese as a foreign language across different proficiency levels.

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**D. Use of technology**

Comment on the friendliness of the technology tools that the program created for the following component.

12. Watching videos

1      2      3      4      5  
Least User Friendly      Very User Friendly

Additional comment:

13. Taking notes (iNote) while watching videos

1      2      3      4      5  
Least User Friendly      Very User Friendly

Additional comment:

14. Responding to comprehension questions

1      2      3      4      5  
Least User Friendly      Very User Friendly

Additional comment:

15. Receiving instant feedback on my responses to comprehension questions

1      2      3      4      5  
Least User Friendly      Very User Friendly

Additional comment:

**E. Recommendation**

Recommendation for the flipped classroom components in next year's STARTALK program

16. Watching videos

1      2      3      4      5  
Least recommended      Strongly recommended

Additional comment:

17. Taking notes while watching videos

1      2      3      4      5  
Least recommended      Strongly recommended

Additional comment:

18. Responding to comprehension questions

1      2      3      4      5  
Least recommended      Strongly recommended

Additional comment:

19. Receiving instant feedback on my responses to comprehension questions

1      2      3      4      5

Least recommended

Strongly recommended

Additional comment:

20. Please write 3-5 sentences to provide your overall comments and suggestions on the flipped classroom components.