ARTICLE



Mastery-based language learning outside class: Learning support in flipped classrooms

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Abstract

In the last five years or so, research has extensively explored the benefits and problems of flipped classrooms in helping improve the student learning experience. However, little attention has been given to the kinds of support that students would need in the process of mastering learning outside class. To address this gap in research and practice, the current study proposes and evaluates a learning support framework for mastery-based learning outside class that aims to respond to students' cognitive and affective needs and needs for developing appropriate learning strategies. The proposed framework was evaluated in a Chinese language course offered at an Australian university in Semester 1, 2016. This study focuses on the qualitative data collected through courses, such as screen captures of various learning support mechanisms, a student survey, and reflective journals from teachers. Our findings highlight the necessity, benefits, and challenges of offering learning support for mastery-based learning outside class in the flipped classroom context.

Keywords: Computer-Assisted Language Learning, Instructional Design, Language Learning Strategies, Learner Autonomy

Language(s) Learned in this Study: Mandarin Chinese

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Introduction

Since 2012, research and practice in flipped classrooms have grown exponentially. While the basic tenets of this approach have been widely accepted in higher education, some scholars hold a view that this approach has not been subjected to vigorous research in general (e.g., Abeysekera & Dawson, 2015). Grounded in active learning theories and a student-centered approach, this pedagogical model is also known as *flipped teaching*, *flipped learning*, and *flipped class*. In essence, a widely accepted and broad understanding of this approach dictates that instructional content (such as conceptual knowledge and theories) that used to be taught in lectures is now learned as homework by students outside class through video lectures and other resources. As a result, some of the precious in-class time can be used for more interactive, collaborative, and hands-on active learning through application of the content to problem-solving activities (for more discussions of this approach, see Abeysekera & Dawson, 2015; Chen, Wang, Kinshuk, & Chen, 2014; Hung, 2015; Liu, Ripley, & Lee, 2016). Although the flipped classroom approach can be traced back to the early 1990s (see King, 1993), enabling online technologies, such as streamlined videos, real-time tools, and tools for learning analytics, has given the approach a whole new life with more effective support for individualized and out-of-class learning.

Despite the fact that more studies on flipped classrooms have been reported in the STEM disciplines, we argue here that the flipped classroom model particularly suits competency-based learning, such as language learning. This is because the interactive and communicative nature of language learning requires both inclass and out-of-class time to gain fluency (Canale & Swain, 1980). Although many second language

acquisition models and approaches have been developed since the emergence of the presentation-practiceproduction (PPP) model in the mid-20th century (Criado, 2013), most conventional language classrooms are still characterized by the PPP model (Tedick & Walker, 2009). Presentations and practice often take up most of the in-class time, leaving little time for production. Flipped classrooms enable a major departure from this model in that it moves presentation and practice from the PPP model to a technology-mediated learning space outside the classroom, allowing more in-class time for learner production (Hamdan, McKnight, McKnight, & Arfstrom, 2013; Hsieh, Wu, & Marek, 2017) This means that if students are expected to produce output in class, they must master new linguistic rules and forms and become relatively fluent through self-practice before coming to class. Clearly, the flipped classroom model is a studentcentered approach that emphasizes the mastery, not just previewing, of basic instructional contents before class. In other words, students are required to become proficient in basic contents such as new grammar and new vocabulary before class so that they are then able to apply them to the completion of interactive and collaborative tasks in class. Thus, it would not be an exaggeration to say that mastery-based learning achieved before class lays the foundation for in-class success. However, does this happen as expected? Can we assume that if we provide video lectures and other online resources, students will learn assiduously by themselves with these resources and achieve the expected learning outcomes? What if the students do not learn before class or do not master the required content before class? In what ways can we support, monitor, and measure student learning outside class? The present study aims to explore these issues first by identifying gaps in the flipped classroom research and practice and then by proposing and evaluating a learning support framework for mastery-based learning outside class.

Flipped Classroom Practice and Research: Achievements and Gaps

A growing body of literature consistently reports the advantages of flipped classrooms in improving student learning (Herreid & Schiller, 2013; Hung, 2015; Hwang, Lai, & Wang, 2015). The most frequently mentioned advantages are: (a) more self-paced learning, (b) better preparation for class by students, (c) more individualized learning, (d) increased levels of student engagement, (e) seamless learning in and outside class, and (f) improved learning outcomes. On the other side of the coin, failures of the implementation of this approach have also been reported. For instance, a post on an online medical magazine (Perchik, 2014) discussed three factors leading to the failure of a particular use of flipped classrooms in a medical school: (a) the difficulty in managing a large class (i.e., 165 students), (b) the lack of meaningful discussion and significant dialogues in class, and (c) the teachers' unfamiliarity with technology. Herreid and Schiller (2013) also reported two major problems from a flipped classroom in STEM: student resistance to complete tasks before class, and for teachers, difficulty finding good quality videos and online resources. In fact, failing to learn before class has been identified as a major cause of failure of flipped teaching (Kim, Kim, Khera, & Getman, 2014).

In the past five years, various flipped classroom models have been proposed, such as the flipped mastery classroom model (Bergmann & Sams, 2012), the FLIPPED model (Chen et al., 2014), the flipped classroom design framework and nine design principles (Kim et al., 2014), and the seamless flipped learning model (Hwang et al., 2015). However, two major gaps still exist in the flipped classroom research and practice: the lack of research into how learners should be supported to master the required contents outside class, and the paucity of research on the use of the flipped classroom model in language learning.

Most of the publications on flipped classrooms have focused on learner perceptions and learning outcomes. Only a few have recognized the importance of support for learning outside class. Wang, Han, and Yang (2015) searched SCI, SSCI, CPCI-S citation indexes via Web of Science for all the articles, relating to blended learning or flipped classrooms published between 2013 and 2014 and found only 15% of the publications mentioned learning support. However, none of them focused on learning support. More recently, Abeysekera and Dawson (2015) proposed a theoretical flipped classroom model based on theories relating to self-determination and cognitive load. This model recognized the importance of engendering both intrinsic and extrinsic motivation and reducing cognitive load. Although they did not mention learning

support per se, their model aimed to create a learning environment that catered for individualized learning and the development of a sense of competence, relatedness, and autonomy. The ideas in their model also informed the framework proposed in our research.

We also conducted a literature search for publications relating to learning support in flipped classrooms. We searched the top five educational databases (i.e., Proquest, ERIC via Proquest, A+ Education via Informit, Sage, and Taylor & Francis Journals) on March 3, 2017 using keywords such as *learning support*, *support*, *flipped classroom*, and *blended learning*. Our search showed that, between 2012 and 2017, only 30 research articles referred to learning support in the flipped classroom or blended learning (see Figure 1 and Table 1). Of these references, technical support was the most frequently mentioned (N = 11), followed by social and community support (N = 6), pedagogical support (N = 4), perceptions of support (N = 4), support structures and approaches (N = 3), and academic support service (N = 2).

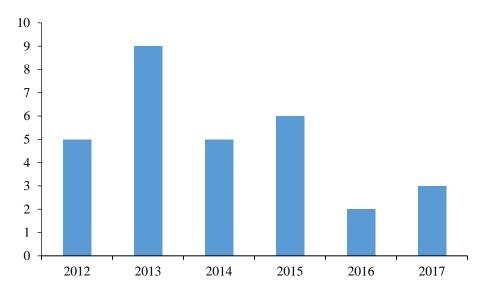


Figure 1. References to learning support in articles published between 2012 and 2017

Table 1. Categories of the References to Learning Support in Articles Published Between 2012 and 2017

Categories	Number of Articles
Technical Support	11
Social and Community Support	6
Pedagogical Support	4
Perceptions of Support	4
Support Approaches and Structures	3
Academic Support Services	2
Total	30

In addition, all but one of the 30 publications mentioned above are from STEM. The review corroborated Hung's point that "in the field of language education, little or no research to date has rigorously studied whether and how flipping the language classroom can enhance student learning" (2015, p. 83). Through a quasi-experimental design, Hung's research confirmed the effectiveness of flipped classrooms model reporting enhanced learning outcomes, improved learner attitude, and increased effort in the process of learning English as a foreign language. However, no detailed learning support was mentioned in the study.

Proposing a Learning Support Framework for the Flipped Classroom Model

In view of the above-mentioned gaps in the flipped classroom research and practice, we proposed a learning support framework, specifically catering to learning needs in mastery-based learning outside class (see Figure 2). It is grounded in mastery-based learning theories. Mastery-based learning gained much attention in the 1960s when work by Carroll (1963) and Keller (1968) became well known. Since then, many studies have been conducted to establish the effectiveness and limitations of this approach (see Kulik, Kulik, & Bangert-Drowns, 1990). Its basic tenets maintain that students must attain the prescribed level of mastery of prerequisite knowledge before they move on to the next level of learning. Mastery can be achieved given that each person be provided sufficient time and be allowed to work at their own pace (Bloom, 1981). Such learning is crucial to competency-based language learning (see Griffith & Lim, 2014). Although sound in theory, mastery-based learning, with its emphasis on individual achievements, has not been easily implemented in mainstream learning and teaching practices, as conventional educational systems operate in a one-size-fits-all manner. However, the advancements in technology and the rise of the flipped classroom model in the past few years have revitalized mastery-based learning, largely because advanced technology has made mastery-based learning a viable and sustainable option for students (see Motamedi & Sumrall, 2000). In fact, the flipped mastery model was first proposed by Bergmann and Sams (2012) in their landmark book, Flip your classroom: Reach every student in every class every day. Nevertheless, using technology to support mastery-based learning outside class in the flipped classroom model still has not received its due attention. The proposed learning support framework in this research aims to address this deficiency.

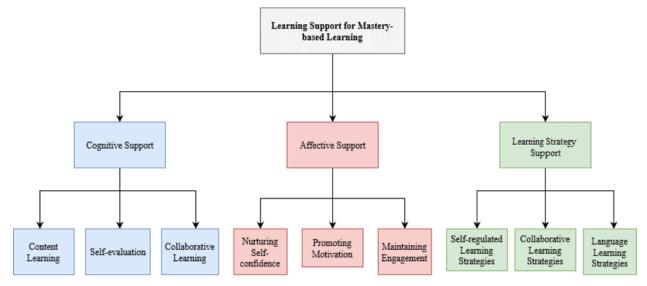


Figure 2. Proposed framework of learning support for mastery-based learning in flipped classrooms

As shown in Figure 2, the framework consists of three kinds of support: cognitive, affective, and learning strategy support. They were derived from flipped classroom literature and our own flipped language teaching practices. While being a generic framework that can be applied to any disciplines, the three kinds of support were deemed especially crucial to competency-based learning, such as language learning, as such learning requires more supported practice outside class. This research discussed and evaluated the proposed framework in reference to supporting learning in the context of technology-enhanced language learning.

Cognitive Support

In this framework, cognitive support is defined as the support for the learner to master required learning contents outside class. This is an enabling agent for the mastery of content, founded on the theories of

learning through interaction (Long, 1996), collaboration (Vygotsky, 1997), and reflection (Flavell, 1987). As shown in Figure 2, cognitive support consists of, but is not limited to, support for content learning, for self-evaluation, and for collaboration with peers to gain a deeper understanding of such learning. All these types of support can be offered synchronously, asynchronously, and semi-synchronously through technology mediated intervention.

In terms of support mechanisms, the flipped classroom literature indicates that pre-recorded video lectures are a necessity to support content learning outside class. These lectures, also known as mini-lectures, are a few minutes in duration and are used for content delivery and reinforcement of knowledge and understanding. Since data of students' watching the video lectures can be readily accessed online by the teacher before class, timely and tailored intervention can be offered to cater to students' individual needs.

Online quizzes, discussion forums, and live chats are the next most popular forms of support to help students self-evaluate their understanding and discuss with their peers and teachers after viewing the video lecture content. Teachers can join these discussions online and offer feedback synchronously and asynchronously. In language learning, customizable online games using game tools such as Quizlet and Kahoot! can support self-evaluation and reinforce the newly learned content, in a fun, interactive, and collaborative way.

Appropriate online resources such as e-textbooks, free YouTube lessons, and language learning apps can also be integrated in out-of-class learning as support mechanisms. Social media such as Skype, WeChat, and Facebook Messenger can be used to deliver short, specifically targeted content in the form of text, picture, audio, and video and to offer instant feedback. Another useful synchronous tool for support is videoconferencing-supported online classrooms such as Blackboard Collaborate and Adobe Connect where a teacher can support student group collaboration synchronously.

Affective Support

Affective support is defined here as a motivating agent for mastery. The effects of affective factors on second language acquisition have been extensively researched. The affective filter hypothesis was first proposed by Dulay and Burt (1977), and was subsequently enriched by various researchers. For example, Krashen (1988) argued that affective factors, such as lack of confidence and motivation or fear and anxiety, can elevate learners' affective filters, which inevitably hinders comprehensive language input and output. More recently, Abeysekera and Dawson (2015) argued that "the flipped classroom might improve student motivation if it creates a sense of competence, autonomy, and relatedness" (p. 4). Thus, affective support in the proposed framework aims to foster a trusting, encouraging, and relaxing learning atmosphere to promote learners' self-confidence, motivation, and engagement in out-of-class learning.

The potential of social media such as Twitter and Facebook to facilitate language learning has been confirmed in the L2 literature, especially in supporting the social and affective aspects of the learning process (e.g., Carpenter & Krutka, 2014; Tran, 2016). The benefits can be summed up as facilitating and improving engagement, motivation, and authentic interaction with native speakers of a language, peer support, and intercultural understanding (see Lantz-Andersson, Vigmo, & Bowen, 2013).

Learning Strategy Support

Learning strategy support acts as a mediating agent for mastery-based learning. It aims to scaffold learning how to learn and help students to take ownership of their learning. With a focus on mastery, the flipped classroom model should engender the development of a range of learning strategies including autonomous learning strategies for self-paced and self-regulated learning, collaborative learning strategies, and subject matter specific strategies, such as language learning strategies (e.g., memory and compensation strategies; see Oxford, 2001). It is vitally important for educators to consciously assist learners to develop these strategies so that they become effective learners. This kind of support can be offered both inside and outside the classroom through a variety of technologies such as social media. The effectiveness of social media for supporting self-regulated and self-paced learning has been widely recognized (e.g., Dabbagh & Kitsantas, 2012; Harrison, 2011; Kitsantas & Dabbagh, 2010).

In short, the three kinds of support are essential, but by no means exhaustive. The proposed framework underlines the combination of synchronous, asynchronous, and semi-synchronous support modes. We also recognize that these support types interact and complement one another. Being generic in nature, the proposed framework embraces flexibility for adaptability and applicability to any disciplinary areas.

Methodology

Background

The proposed framework was evaluated in a Chinese language course offered at an Australian university in Semester 1 of 2016. It was a first-year course with 95 students who had no prior knowledge of the target language and no experience with flipped classrooms. There were four contact hours each week allocated to learning one lesson from a textbook. In the traditional approach, the first two hours would be used to introduce new content such as grammar, vocabulary, and texts, and the last two hours to practice content in the lesson. To flip the class, in the very first lesson of the semester, we introduced the flipped classroom approach to the students and then negotiated a verbal learning contract that they would master the new vocabulary and grammar for each lesson before class, in return for more interactive, collaborative, and fun activities in class where they could apply the new content in real-life contexts. This meant that flipped classrooms availed the students of four hours, instead of two, for practicing and using the target language guided by the teacher. Figure 3 outlines the flipped classroom procedure.



Figure 3. Procedure of the flipped learning and teaching in our first year Chinese course

Technologies Used in the Course

Blackboard was used as the learning management platform in the university where students could access all course materials such as the pre-recorded mini lectures and the online quizzes. WeChat, as a supplementary tool, was utilized to support learning both in class and outside class. WeChat is the largest mobile social media app in China, integrating synchronous, asynchronous, and semi-synchronous functions into one platform. These functions include text messaging (in multi-languages including pinyin with tones in Chinese), hold-to-talk voice messaging, group text, translation function, and sharing of files, photographs, and videos, among others. It was also part of the Chinese culture that students could become immersed in. Its potential for supporting language learning has been reported by Wang, Fang, Han, and Chen (2016).

Research Questions

In the evaluation of the proposed framework, we sought to answer the following research questions:

- 1. In what ways can mastery-based learning outside class be supported?
- 2. How do students perceive their learning experiences in flipped learning?
- 3. What are the challenges in providing learning support as perceived by the teachers?

Data Collection

This study employed a design-based research methodology which emphasizes an iterative cycle of design, evaluation, and redevelopment of the proposed framework (Bell, 2004). While qualitative data and analysis dominated the research, a small amount of quantitative data was also used to support our qualitative discussions. There were two groups of participants: 95 tertiary students enrolled in the first year course and five teachers involved in the teaching of the flipped classes. Three sets of data were collected: 1) examples of learning support provided in the course, to answer research question 1, 2) learners' experiences and perspectives, to answer research question 2, and 3) teachers' reflection, to answer research question 3.

With regard to the first set of data, samples of various kinds of learning support mechanisms were collected from the course site and WeChat used in the course. These included screen captures and transcriptions of the recordings of WeChat interactions, and screen captures of online tools and resources.

The second set of data came from two surveys: the course evaluation (N=33) and a survey on student experiences in and perspectives of learning support provided through WeChat (N=53) (see Appendix A). Students' participation in both surveys was anonymous and voluntary, and was ethically approved by the university.

The third set of data was collected from five teachers in the form of reflective journals. Using a reflective journal instead of an interview allowed more time for the teachers to reflect more deeply on their experiences. To protect their identity, pseudonyms were used. All the teachers had varying degrees of experiences with flipped teaching, Yang for two years, Yi for two semesters, and Hang, Wan, and Ju for one semester, by the time they completed the journals. The journal was composed of four open questions focusing on: 1) challenges of implementing flipped classrooms, 2) perspectives of the importance to support students' mastery of the basic content outside class, 3) instances that indicate the success/effectiveness or failure of flipped classrooms, and 4) suggestions for improvement.

Data Analysis

In data analysis, we ensured that the data were triangulated whenever possible by consulting the pertinent literature and cross-checking and comparing with the different kinds of data collected. When reporting and interpreting findings, we focused on evaluation being interpretive, contextual, and authentic (Graham & Dziuban, 2008).

In the first set of data, cognitive, affective, and learning strategy support were examined and analyzed through screen captures of various support mechanisms in the course. The rationales and ways of using specific tools were discussed through authentic examples contained in the screen captures. The interaction routines shown on the WeChat screen captures were transcribed and translated into English if the original texts were in Chinese or in an audio format.

The first survey in the second set of data was treated as supplementary, focusing only on the percentages of students' responses to the five questions relating to their flipped learning experiences. For the second questionnaire, due to length constraint of the paper and the qualitative nature of the research, we concentrated on the analysis of students' responses to the three open questions in Part 3 of the WeChat survey. Following the conventions of content analysis (Krippendorff, 1989), two coders each went through the participants' answers three times to categorize and code the themes emerging from the responses. There was an agreement on 86% of ratings, with a kappa of 0.7.

The same content analysis process was repeated to categorize the themes and subthemes in the third set of data, from the teachers' reflective journals. The agreement on the ratings between the two raters reached 89%, resulting in a kappa of 0.8, indicating almost perfect agreement.

Results

This section presents and initially analyses the three sets of data mentioned above, in order to answer the three research questions. Part 1 presents data illustrating how the three types of support (i.e., cognitive, affective, and learning strategy) in the proposed framework were designed and offered to the students, to set the background for the attitudinal data from the students and teachers, in Parts 2 and 3, respectively.

Part 1. Examples of Learning Support from flipped classrooms

Cognitive Support

A range of support mechanisms were designed in the flipped course and employed to assist students' acquisition of new linguistic knowledge and skills outside class. The length of the article limits our focuses

on the following mechanisms: pre-recorded video lectures (Figure 4 and Figure 5), weekly online quizzes (Figure 6), WeChat tasks (Figure 7 and Figure 8) and other online tools and resources, such as Kahoot! and Quizlet (Figure 9 and Figure 10).

Support through two kinds of pre-recorded mini video lectures. Recorded using Echo360 personal capture, the first kind of mini lecture covers the explanation of new grammar and sentence structures. In each lesson, there were two to four video clips, lasting three to five minutes each. Students were required to watch and master the contents in the videos before class every week (see Figure 4).

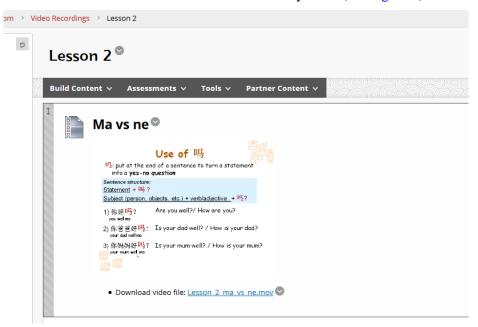


Figure 4. An example of a pre-recorded mini lecture for grammar learning

The second kind of video was the teacher's demonstration of Chinese character writing stroke by stroke on the screen while pronouncing the characters and explaining the meaning (see Figure 5).



Figure 5. An example of a pre-recorded video for character writing

Support through online quizzes. After watching the videos, students were expected to complete a quiz

designed to help them gain a deeper understanding and to evaluate their mastery of the video content (see Figure 6). Students received a mark and feedback for completing the quiz in each lesson.

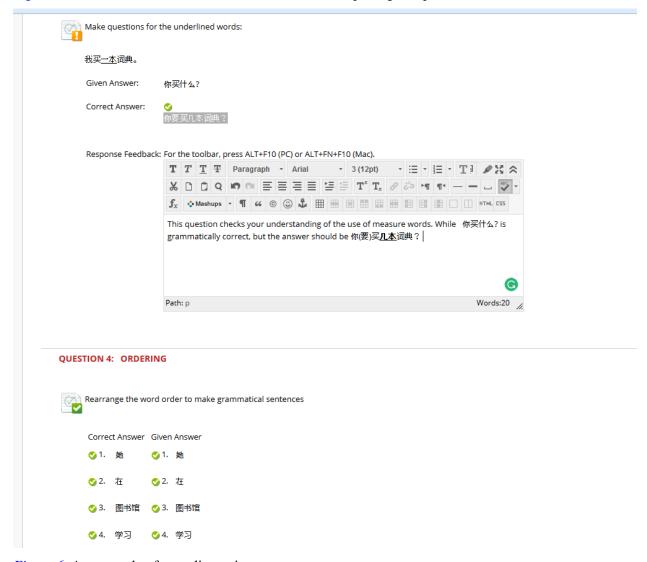


Figure 6. An example of an online quiz

Support through WeChat. Each Friday, we sent students a task via WeChat to evaluate their mastery of the new content for the week. The task could be a text or an audio recording summarizing the content of the lesson covered in the week. Students were required (a) to translate the text, (b) to listen to the recording and answer some questions, or (c) to transcribe the recording. These tasks extended teaching beyond the classroom and allowed the students to practice their listening and Chinese character typing and recognition skills at their own pace, as they could read or watch this content as many times as they wanted to. Figure 7 shows the task completion process in which the teacher provided immediate feedback to individual students' responses. A friendly and encouraging atmosphere emerged with the teacher using emoji of smiling faces and flowers in her feedback, and the student using an animated image to show her appreciations.

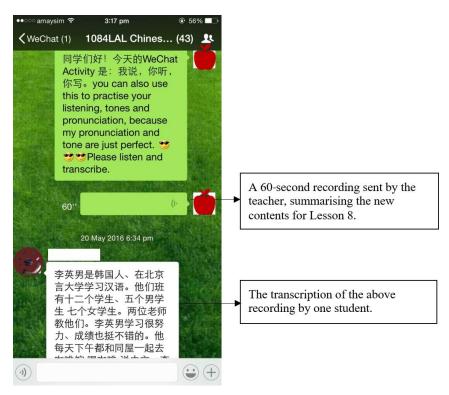


Figure 7. An example of an audio task via WeChat

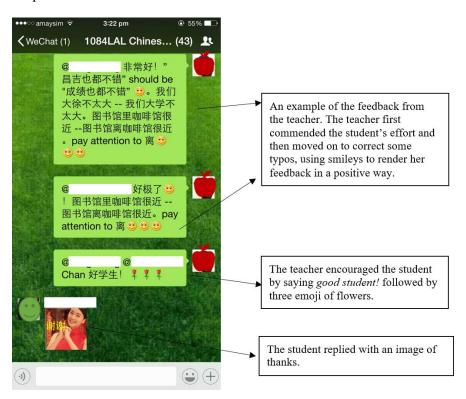


Figure 8. An example of feedback from the teacher

Support through Kahoot! Kahoot! is a free online game tool that allows users to create their own games on smartphones. We created a Kahoot! game for each lesson featuring multiple choice or fill-in-blank

questions with the purpose of checking students' mastery of sentence structures and usage. These games were played both in class and outside class. Figure 9 shows a game in which students competed to fill in blanks with the correct answers within the shortest time possible.



Figure 9. A sample Kahoot! game for practicing sentence structures

Support through Quizlet. Quizlet was used mainly for designing customized flashcards for Chinese character learning (see Figure 10). Students could use these flashcards anywhere and anytime on mobile devices to learn and revise characters with the help of pinyin and pronunciation.

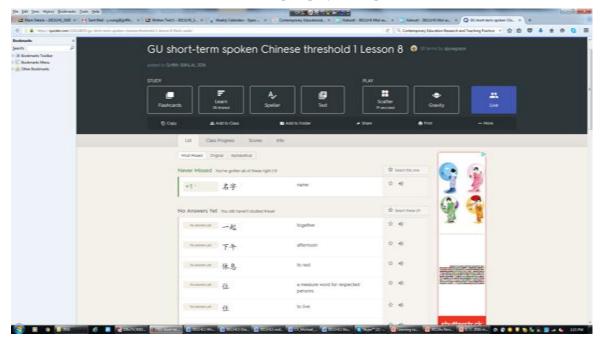


Figure 10. A sample Quizlet game for learning vocabulary in Lesson 8

Affective Support

Our affective support for outside-the-class learning was mostly realized through the use of social media, especially WeChat. Our findings indicated that its greatest pedagogical value lay in the timeliness in supporting students' affective needs outside class. Aided by its social interactive features, such as expressive emoji and file sharing, we were able to facilitate a friendly, positive, and trusting learning space outside class. This is where the students received just-in-time encouragement and appreciation of their work and efforts, as shown in Figure 8. As a result, a rapport between the teachers and students was established, which also extended to the physical classroom.

Figure 11 shows that the teacher's praise of "very well done!" was conveyed through both the text and emoji of three flowers and thumbs-up. This encouraging and motivating approach was spontaneous and to the point.



Figure 11. Examples of affective support through emoji and posts of learning resources

To maintain engagement, we regularly introduced resources about Chinese culture and language to students through WeChat, so that students could see the connection between classroom learning and the real world (see Figure 11). Figure 12 provides another example. On the day of the Chinese Dragon Boat festival, the teacher sent students a GIF of Zongzi (sticky rice wrapped in bamboo leaves), a traditional Chinese food for the festival, and asked what kind of festival the Dragon Boat Festival was. An ensuing discussion about this festival also occurred in class.



Figure 12. An example of introducing the Dragon Boat Festival

Learning Strategy Support

As this was a first-semester, first-year course, we focused our support on helping the students develop both metacognitive and cognitive strategies. With metacognitive strategies, we provided a study guide containing step-by-step instructions on how day-to-day learning should be managed to help the students establish a study routine (see Appendix B). We also discussed with students how fragmented time should be managed for learning; for example, listening to the pre-recorded video lectures while driving, and reading, listening to, or responding to the teacher's posts on WeChat while taking public transport. Regarding cognitive strategies, the teachers made a conscious effort to discuss and share specific strategies relating to language learning or Chinese learning whenever an opportunity arose. For example, a file containing seven tips for learning a foreign language was sent to the students via WeChat (see Figure 13).

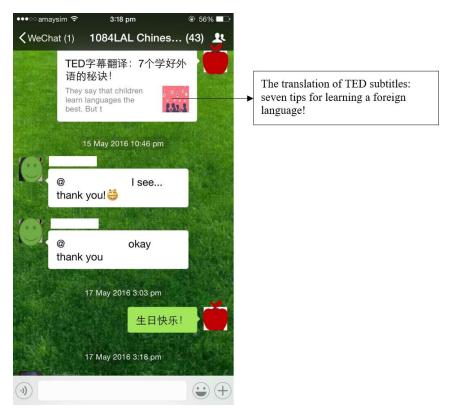


Figure 13. An example of learning strategy support

As shown in the above data, cognitive support was more pre-designed, while affective and learning strategy support was more spontaneously offered at the time of need.

Part 2. Student Evaluations

Data From the Course Evaluation

As shown in Figure 14, all respondents (100%) found that the course engaged them in learning (Q4) and 97% were satisfied with the quality of the course (Q6). With regard to the regular discussion on learning strategies (Q9) and the pre-recorded mini lectures on grammar (Q7), 88% of the respondents believed that they assisted their learning. The effectiveness of the flipped classrooms (Q8) was confirmed by 85% of the respondents, with four being neutral and one being negative. The overall positive results should be interpreted in reference to the 35% response rate when gauging the success of the flipped classroom approach. Another factor that should be taken into account is that the great majority of the students were in transition from high school to university, and none of them had had any previous experience with the flipped learning.

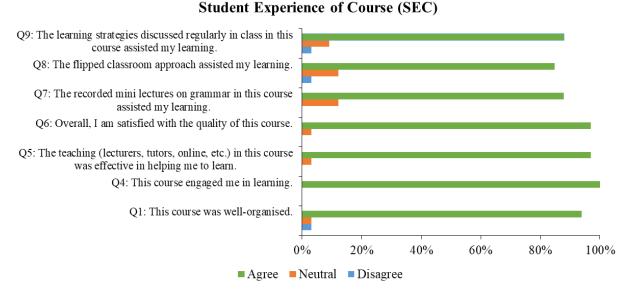


Figure 14. Student course evaluation, Semester 1, 2016

Data From the WeChat Survey

Regarding Q1 (i.e., What benefits you the most using WeChat?), three categories were identified: cognitive gains, affective gains, and WeChat technical affordances facilitating language learning (see Table 2).

Table 2. The Benefits of WeChat (Q1)

Category	Frequency	Subcategories
Cognitive	38	Facilitating Chinese character recognition and typing and sentence writing
Gains		Engendering more opportunities for listening practice
		Receiving timely feedback from the teachers
		Collaborating with peers
Affective	13	Receiving encouragements from the teachers
Gains		Learning from peers
		Timely connecting with peers and teachers
		Interacting with native speakers
Technical	15	The translation function
Affordances of WeChat		The audio function
		Chinese character and tone input function

Some of the comments regarding cognitive gains included:

Practising to type Chinese characters and to form sentences; it helps me remember the tones more when listening to the recordings (s7)

Receiving immediate response to character typing from teachers. (s26)

WeChat has allowed me to practice using the new words I have learnt in class. (s34)

In regard to affective support via WeChat, the students remarked:

It helped me connect to other classmates.... (s21)

...It helps me to keep engaging in the language. (s42)

Being able to talk to the teacher and classmates (s51)

I like the motivations from my tutors from WeChat. (s7)

Getting support from friends and teachers and being able to send voice memos to other people is a really good way to use my Chinese skills in practice. (\$36)

It promoted my interaction with my classmates. I can use WeChat with my Chinese friends also and practice Chinese with native speakers more. (s39)

Students appreciated some of the affordances of WeChat:

Using the translate feature to check if your sentence is correct. (s3)

Learning Chinese even outside of class. (s62)

As shown in Table 3, five categories emerged in answers to Q2 (i.e., What was the most difficult part in using WeChat?).

Table 3. Difficulties in Using WeChat (Q2)

Category	Frequency	Subcategory
Difficulty in Managing the	14	It was hard to keep up with the notifications.
Posts		It was hard to find the teacher's original posts when the volume of exchange was big.
		The group was too big.
Technical Issues	8	Outdated smartphones
		Difficulty in typing characters and tone marks
Character Recognition	7	Too many characters to choose from
		Frustration with unknown characters
Lack of Time for Completing	6	I was too busy to do the WeChat tasks
Tasks Outside the Class		Friday was not a good time for posting the tasks
Affective Factors	4	Feeling embarrassed when making mistakes
		Having difficulty keeping up with the rest of the class
		Forgetting to do the WeChat tasks
Total	39	

Q3 invited students' suggestions for improvement in using WeChat to support language learning. The 53 responses were roughly coded into three types: being positive with no suggestions, managing tasks, and no suggestions (see Table 4).

Category	Frequency	Example of Comments
Being Positive with No Suggestions	16	Nothing - concept works really well. (s38) Keep it up! (s54)
Managing Tasks 22		Make it graded so people can't ignore or skip the tasks. (s12) There should be multiple activities and students should attempt some of the activities. (s20)
		More outside activities before oral or written exams, really liked them :) (s23)
		Encourage more group discussions. (s34)Groups be organised into smaller class groups. (s1)
		Strict monitoring; a separate wechat for 'in' class and one for 'out' of class. (\$58)
No Suggestions	15	No idea No suggestion

Table 4. Summary of Suggestions From the Student Survey (Q3)

Part 3. Teachers' Perspectives

Challenges Encountered

Four challenges were reported in the teachers' reflective journals. First, all five teachers regarded ensuring students to learn before class as the greatest challenge in implementing flipped classrooms. Second, closely relating to this, was the challenge in managing in-class learning when some students could not perform while those who had learned before class would find the activities not challenging enough. The third challenge was to develop appropriate resources to support students in their self-learning. This was mainly because it was the first time for most of the teachers to conduct flipped teaching. The fourth challenge was the extra time needed for providing learning support outside class, especially when synchronous intervention was needed. Yi, one of the teachers, pointed out that it "certainly requires teachers' strong commitment outside class".

Importance of Learning Support for Out-of-Class, Mastery-Based Learning

Despite the challenges, all five teachers confirmed the importance of supporting mastery-based learning outside class. They viewed the importance from the following five areas of improvement they observed in student learning: (a) More in-class interactive and collaborative activities were accomplished as most students came to class much better prepared than students in previous years. (b) A better understanding of new content was observed. (c) Students became more self-disciplined as seen in better preparation for class. (d) Students were more engaged and motivated as lively interaction between the teachers and students occurred on WeChat and in class. (e) More Chinese (words and expressions not covered in the textbook) was used in the classroom by both the teachers and students. Below are some relevant comments from the teachers:

It [providing learning support] will save a lot of time for ...using the language, and students can form a basic idea of the target language by themselves and even summarize the rules of the target language, which is much better than be told in class. (Ju)

We constantly used emojis, shared any interesting and up-to-date news, and discussed headlines about China and Australia. This process created the best naturally contextual learning and teaching community that provided a supportive, warm, and caring environment. For adult learners, an encouraging sentence, such as "You are great!", "You did a wonderful job!" or "Amazing!" is always necessarily important to keep them motivated and engaged. (Yi)

This [learning support) enabled the teachers to use more Chinese in class. (Yang)

Success and Failure of Flipped Classrooms

Examples of success centered on the improvement of classroom interaction (Ju), increased self-confidence among students (Yi and Ju), and enhanced learning outcomes (Yang). According to Yang, she "observed that students who had learnt before class could produce more complex, fluent output, ask more specific questions and were more receptive to new input." This was echoed by all the other teachers. This feedback indicates that mastery-based learning, a crucial component in flipped classrooms, did occur before class with the learning support we offered, such as the mini lectures, online quizzes, and WeChat tasks. Yang was impressed to see "how well they [students] were at 'resultant complement' [a difficult grammatical item], which usually takes some time for students to pick up". Yang further explained:

Generally speaking, I observed better overall learning outcomes comparing to that in previous years. At the very least, students had learnt more of linguistic contents and more about the language and culture from interaction in class and through WeChat interaction and the use of other online resources such as Ouizlet and Kahoot and Chinese learning apps. (Yang)

In terms of examples of failure in implementing flipped classrooms, the most frequently mentioned was students' lack of preparation before class (Wan, Yang, and Yi). There were always a few students who came to class without preparation. As a result, they could not keep up with the classroom activities and felt frustrated. Yang observed that two students were reluctant to use WeChat or mobile phones for learning. Yang also recalled that at the beginning of the semester, one student complained: "I paid my fees and I am expected to be taught, not to learn by myself." However later in the semester, he was convinced by the pedagogical values of the flipped classroom and achieved distinction in the course. Ju brought our attention to the issue of the appropriate balance between the amount of content for in-class and outside-the-class learning by saying, "The amount of content may stop them from starting their self-learning."

Teachers' Suggestions for Provision of Learning Support

The following suggestions were gleaned from the teachers' responses to the last question in the reflective journal:

- Set up a systematic support structure, specifying how often, when and what the teachers should offer to support students. (Yang)
- Conduct team teaching with different teachers looking after different aspects of the support. (Yang)
- Students' preparation and performance should be graded and counted toward their final grades. (Ju and Yi)

Discussion

Cognitive Support

The use of a variety of cognitive support mechanisms enabled us to create a rich and engaging environment that effectively facilitated the mastery of learning outside class. For example, the pre-recorded video lectures proved to be effective in helping students learn basic linguistic elements (e.g., grammar and character writing), as reported by students in the course evaluation data (Q7) and reflected by teachers in their reflective journals. Customized, interactive, and engaging learning support was also offered through online quizzes and game tools. In addition, the data produced by students' engagement with these tools can be easily obtained and used to "inform in-class activity design in a timely manner, and flipped classroom educators can tailor activities and guidance to suit expertise levels of students in class" (Abeysekera & Dawson, 2015, p. 10). These resources and technology proved effective and user-friendly in helping reduce the cognitive load for students.

Ensuring the mastery of learning before class was identified as the greatest challenge for both the teachers and students. As a result, a recurring suggestion to address this challenge was to make mastery-based

learning outside class a part of the assessments for the course. This suggestion can be justified by the argument that, in flipped classrooms, mastery-based learning outside class lays the foundation for in-class learning and is a crucial and indispensable part of the whole learning process. Thus students' efforts in this regard should be rewarded and assessed in order to keep them extrinsically motivated, to say the least. This also leads to our conclusion that mastery-based learning outside class is, in every sense, a form of formal learning, not informal learning, as it focuses on the mastery of key content. This is distinct from the commonly held perception that learning outside class is informal.

Affective Support

Our affective support focused on fostering students' intrinsic motivation and confidence, which has been regarded as an important factor in learning success and which can be "systematically catalysed or undermined by parent and teacher practices" (Ryan & Deci, 2000, p. 55). Findings from this research indicate that just-in-time affective support can be offered through WeChat, because of its flexibility to reach students anytime and anywhere. In addition, its social features such as emoji and animated pictures not only enlivened our interaction with students, but also facilitated a relaxing and positive atmosphere resulting in the establishment of a rapport between the teachers and students. Lastly, interesting and informative leaning resources readily available on WeChat can be sent to students as a way to engage and motivate them. Hsieh et al. also reported that LINE, an app similar to WeChat, "provided a stimulating and realistic English learning environment" (2017, p. 11).

Learning Strategy Support

In this study, technologies were proven instrumental in catering to learners' needs of becoming effective learners. For example, by watching pre-recorded lectures, our students learned how to self-pace their learning; and through online quizzes and game tools, they developed strategies for self-evaluation of their progress. The WeChat tasks sent to students also assisted them in establishing a study routine, as they were notified of these tasks each Friday.

Our findings confirm the necessity of learning strategy training as determined by the self-mastery nature of the flipped classroom model. This is perhaps one of the most significant contributions of flipped classrooms to education. The importance of learning strategy training has been recognized by scholars, suggesting the integration of training modules into regular classes (Oxford, 2001) and explicitly raising the learner awareness of such training and extending the training outside class through the use of technology (Hedge, 2000). In our study, the fact that some students failed to learn before class indicates the necessity of helping students to become self-disciplined, especially at the very beginning of their learning. Student accountability and teacher intervention in student out-of-class learning was also highlighted by Hsieh et al. (2017). Unfortunately, there is still a void in both research and practice in terms of support for the development of learning strategies as far as flipped classrooms are concerned. Furthermore, our findings also indicate that learning strategy training should be ongoing and spontaneous, and that self-learning outside class provides a great venue for developing effective learners. In brief, we conclude that the three kinds of support that we provided to our students complemented one another, and together they contributed to the reduction of affective filters, the development of students' learning strategies, and the improved learning performance and outcomes.

Conclusion

This research proposes and evaluates a learning support framework for the facilitation of language student mastery-based learning outside class, in the context of flipped classrooms. Through a qualitative investigation, this study bridges a few gaps in the flipped classroom research and practice. First, it exposits the importance and potential of cognitive, affective, and learning strategy support development in managing mastery-based learning outside class. Second, it contributes to our understanding of various learners' perceptions of and needs for such support as well as the teachers' experiences with and perceptions of learning support in flipped language classrooms. Third, it examines the potential and challenges of

providing the kinds of learning support proposed in the framework. Last, but not least, this research has enriched the studies on the use of the flipped classroom model by drawing attention to the importance of learning support for mastery-based learning outside class.

We recognize the limitations of our research. First, the proposed framework is not overarching, and it only outlines the basic support types and categories. Although this ensures its flexibility and adaptability, the complicated nature of mastery-based learning inevitably requires learning support to be more learner- and task-specific, as well as more encompassing, than what we were able to discuss here. The second limitation lies in the evaluation of the framework. By the time of writing this paper, we were only able to evaluate the framework with one group of students in one semester. A longitudinal study is needed to see how the "wow factor" affects the perceptions of both the teacher and the learner. We also believe that the framework should be further enriched and improved in future flipped classroom practices and researched in other language and disciplinary learning contexts. This refining process becomes especially crucial when progress in technology, such as learning analytics and artificial intelligence, continues to open up new possibilities for us to more effectively support student learning.

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Appendix A. Survey: Using WeChat to Support Chinese Language Learning

Part 1. Background Information

1.1 Had y	ou used We	Chat before the start of the	ne proje	ct? Pleas	e Vyour answe	r.
	Yes	(Go to Question 1.2)		No	(Go to Part 2)	
1.2 I had ı	used WeCha	t for (Please Vyour an	swer)			
	both s	izing ng Chinese ocializing and learning ((Please specify)	Chinese			

Part 2. Perceived Usefulness

Please indicate your agreement with the following statements

Sta	ntements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	WeChat helps my Chinese learning.	1	2	3	4	5
2.	WeChat helps me to learn Chinese more efficiently.	1	2	3	4	5
3.	WeChat helps me to learn vocabulary better.	1	2	3	4	5
4.	With WeChat, I have used more Chinese than before.	1	2	3	4	5
5.	With WeChat, I have learned more Chinese sentences and phrases from my classmates and teachers.	1	2	3	4	5
6.	I like using WeChat to complete activities in class.	1	2	3	4	5
7.	I like using WeChat to complete activities outside class.	1	2	3	4	5
8.	Listening to the teacher's recordings on WeChat helps improve my listening.	1	2	3	4	5
9.	Listening to the teacher's recordings on WeChat helps improve my pronunciation and tones.	1	2	3	4	5
10.	The video (Sight) in WeChat is useful for learning character writing (e.g., stroke order).	1	2	3	4	5
11.	Typing characters on WeChat helps improve my character recognition.	1	2	3	4	5
12.	WeChat is a good place to post learning resources/tips to share with others.	1	2	3	4	5
13.	I receive instant feedback from the teacher on my WeChat activity.	1	2	3	4	5
14.	WeChat is a good way to interact with my teacher outside class.	1	2	3	4	5

Part 3. WeChat Acceptance

Please indicate your agreement with the following statements

Sta	atements	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	Learning Chinese using WeChat is enjoyable.	1	2	3	4	5
2.	WeChat can enhance my learning intention.	1	2	3	4	5
3.	I like making sentences using WeChat.	1	2	3	4	5

4.	I like interacting with my classmates using WeChat.	1	2	3	4	5
5.	I like sharing learning resources on WeChat.	1	2	3	4	5
6.	I enjoy reading the teacher's posts on WeChat.	1	2	3	4	5
7.	I enjoy reading my classmates' posts on WeChat.	1	2	3	4	5
8.	I enjoy listening to the recordings posted by the teacher on WeChat.	1	2	3	4	5
9.	I enjoy the support from others via WeChat.	1	2	3	4	5
10.	Smartphones with WeChat are good for learning.	1	2	3	4	5
11.	WeChat provides an effective environment for learning Chinese.	1	2	3	4	5
12.	Using WeChat is a valuable experience in learning Chinese.	1	2	3	4	5
13.	WeChat motivates me to learn Chinese.	1	2	3	4	5
14.	I enjoy using WeChat more in class than outside the class.	1	2	3	4	5
15.	I enjoy using WeChat more outside the class than in class.	1	2	3	4	5
16.	I will use WeChat in learning Chinese in the future.	1	2	3	4	5

Part 4. Open Questions

- 1. What benefits you the most using WeChat?
- 2. What was the most difficult part in using WeChat?
- 3. What would you suggest for improvement?

Appendix B. Students' Study Guide

Day	Time (hrs)	Activity
Saturday	1	Learn Pinyin with your CD
		Learn new words with Quizlet
Sunday	1	Listen to the finals and initials again and repeat after the speaker.
		Practice pinyin with the CD
		Complete exercises on pp. 17 and 18
		Watch the Videos for Character Writing to learn to write all the characters in this lesson. Other resources: http://www.yellowbridge.com or http://www.cchar.com/
Monday	1	Listen to the finals, initials, and pronunciation drills again as a revision.
		Review new words with Flashcards/Quizlet.
		Watch the mini videos on grammar for Lesson 3 as many times as needed
		Complete the online quiz

Tuesday	1	Listen to the new words again and repeat loudly after the speaker. Go to the Text on p.20. Listen and repeat (Note that the speakers will also say the substitution words in the box).
		Read the texts, one by one and try to figure out the meaning, referring to the video lectures on grammar.
		Listen to the texts, sentence by sentence. After each sentence, pause the CD and repeat what the speaker says. Go through the texts again by listening to the CD and repeating what the speaker says.
		Complete Comprehensive Exercises on page 21, and note down you questions/difficulties.
Wednesday	1	After class, do over the texts again. Write out the texts in English. Then close your text book. Try to translate them back into Chinese and compare your translation to the text.
Thursday	1	Listen to the texts on the CD again. This time, Listen to a sentence, pause, and try to predict what the next sentence will be.
		Complete the translation exercise for this week
Friday	1	Write yourself a test covering all content in lesson 3.
		Review Lessons 1 and 2
		Complete a WeChat activity

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