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Empowering Mandarin Speaking Skills: High School Students' Journey with Mobile-Flipped Learning

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In the post-pandemic era, the framework of distance education and online teaching has blazed a new trail in the educational landscape. Simultaneously, in the current transformation of the educational paradigm, flipped learning has gained remarkable recognition in the language education field. The present study aims to investigate the impact of mobile-flipped learning on the Mandarin speaking skills of Thai Grade 12 students and their perceptions of using mobile-flipped learning to promote the Mandarin speaking skills. 38 secondary students participated in a 9-week mobile-flipped learning course, assessed by pre- and post-test and perception questionnaires. The results showed substantial improvements in vocabulary, fluency, comprehension, and pragmatic competence, particularly for the lower intermediate and upper intermediate proficiency levels. Participants generally praised the flexibility and interactivity of the model, though challenges related to self-discipline, self-directed learning, and technological barriers were noted. The findings of the study clearly indicate that mobile-flipped learning is facilitative in sharpening Mandarin speaking skills. The present study hence recommends bespoke support mechanisms in dealing with challenges for varied proficiency levels. Future research should shed light on how to reduce speaking anxiety, instill cultural understanding, and scaffold self-regulated learning to maximize the effectiveness of mobile-flipped learning in various learning environments.

Keywords: mobile-assisted language learning, flipped learning, Mandarin speaking skills, secondary education, students' perception

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INTRODUCTION

Distance education, which emerged during the pandemic as a primary mode of instruction delivery, has now turned out to be an effective, functional, and successful approach in foreign language teaching (Dhawan, 2020; Bozkurt & Sharma, 2020). Essentially, online education has brought significant changes in teaching methodologies, thus positioning itself as an indispensable part of contemporary educational practice (Bao, 2020; Means et al., 2014). Meanwhile, the advancement of technologies used in language teaching and learning is inducing radical reorganization and redefinition of the conventional pedagogical model from the bottom up (Sun et al., 2020; Wang et al., 2021). Among various contemporary teaching methods, flipped learning distinguishes itself as a leading pedagogy that redistributes traditional instruction beyond the classroom through digital means, converting in-class time into a dynamic space for immersive, interactive learning experiences (Bergmann & Sams, 2012; Hung, 2015). This practice blends cooperative learning, collaborative discussion, student-centered activities, and flexible teaching as well as learning approaches, thus creating an interactive blended learning environment (Zainuddin & Perera, 2019; Webb & Doman, 2020).

The modern flipped learning (commonly referred to as the "flipped classroom") emerged more than a decade ago and has gained pronounced traction in various educational disciplines with notable success in fields such as science and medical education (O'Flaherty & Phillips, 2015; Schmidt & Ralph, 2016). Despite the positive results attained in subjects such as science and medical studies, the concept of flipped learning has not been widely applied in the teaching of Mandarin. Indeed, most of the current methodologies of teaching Mandarin in Thailand are based on rote memorization (Peng, 2018). Due to this, most secondary students in Thailand cannot enhance their speaking Mandarin proficiency because they lack ample opportunities to be exposed to an immersive and interactive environment that can help them improve their speaking skills. These challenges give reason for the call to seek innovative approaches that can support Mandarin learners, especially in contexts where access to native speakers or an authentic communication environment is limited. In the context of teaching Chinese, flipped learning requires instructors to use digital tools in an appropriate manner to invert the traditional process of classroom teaching and online studying at home. Viewing course materials beforehand provides students ample time to absorb key information, thus better preparing them for active learning processes in the classroom (Lo & Hew, 2017). In on-site learning environments, the focus of learning shifts from mere absorption to interactive, hands-on activities, which better allow students to apply what they learn outside the classroom (Webb & Doman, 2020; Jensen et al., 2015). Instructors orchestrate peer collaboration, guide problem-solving activities, and involve learners in real-life language situations as a way to foster deeper active learning and understanding (Zainuddin & Halili, 2016).

Mobile-flipped learning extends the conventional flipped classroom model by embedding promising characteristics of mobile-assisted learning and flipped learning. Mobile technology allows students to access all types of content, such as videos, quizzes, and interactive modules, anytime and anywhere. It eventually provides more

independence and flexibility for students to absorb pre-class materials (Viberg & Gronlund, 2017). This blended approach overcomes one of the shortcomings of the flipped learning model, in that students can more freely learn outside the classroom by reviewing and reinforcing foundational concepts at a personal and preferred pace. By focusing solely on the skills involving the speaking of Mandarin, mobile-flipped learning creates an immersive setting for the learner in language learning where learners can improve pronunciation, build vocabulary, and sharpen grammatical skills through a mobile app that instantly gives them feedback while engaging them in preparations for offline interactive activities (Zainuddin & Perera, 2019). In addition, mobile-flipped learning increases the possibility of fostering self-directed learning, as students can adapt different learning strategies to their demands, which in turn encourages more effective second language acquisition (Zainuddin, 2018).

Despite many merits, the utilization of flipped learning in foreign language education has its drawbacks and limitations. For instance, it requires considerable labor investment in instructors' preparation of interactive videos and classroom activities, which in turn takes considerable time to develop and find suitable instructional content including but not limited to videos, online modules, and interactive materials (Al-Samarraie et al., 2020; Guo, 2019). Moreover, flipped learning greatly depends on stable access to the internet and digitized devices. In cases of poor technical equipment, students often cannot effectively complete the pre-class assignments, which compromised overall learning outcomes and further exacerbated inequity in the efficiency of learning (Zainuddin, 2018; Chen et al., 2019).

Speaking Mandarin competencies such as pronunciation, fluency, coherence, grammar, and vocabulary are the necessary elements for effective communication to take place. According to Gao (2020) and Zhao (2019), accurate pronunciation, for instance, ensures that a speaker's expression can be accurately understood by listeners since Chinese is a language in which the meaning of words is heavily reliant on four basic tones. Fluency allows for smooth and uninterrupted communication, while grammar and vocabulary ensure that information is delivered accurately, minimizing the potential for confusion or misunderstandings in a conversation (Li 2019; Peng 2018). This form of learning, where learners are encouraged to study course material beforehand and participate in in-class activities-flips the conventional approach to learning and strengthens these key Mandarin speaking skills through the multiple immersive experiences that maximize exposure to the target language in realistic settings (Hung 2015; Jensen et al. 2015).

While flipped learning has demonstrated potential for enhancing general language skills such as reading and writing (Zainuddin & Halili, 2016; Webb & Doman, 2020), there is limited evidence on its impact on Mandarin speaking skills. Moreover, mobile-flipped learning, which combines flipped learning with the accessibility of mobile technology, remains a relatively underexplored area (Chen & Yu, 2019; Zainuddin & Perera, 2019; Schmidt & Ralph, 2016). In an effort to address this gap in the literature , the present study aims to assess the effect of mobile-flipped learning on high school students' Mandarin speaking skills and explore their perceptions of its acceptance. The research questions for the present study are as follows:

RQ1: To what extent does mobile-flipped learning influence the development of Mandarin speaking skills among high school students?

RQ2: What are high school students' perceptions of mobile-flipped learning as a method for Mandarin instruction?

METHOD

Population and Sampling

Firstly, for the Mandarin speaking pre- and post-tests, a random cluster sampling was applied to select an entire class, which included a total of 38 secondary students from a private high school in Chiang Mai, Thailand. Secondly, to ensure every student the same opportunity of being selected while reducing the potential bias during the selection, for the students' perception questionnaire, random sampling was employed to choose 20 participants as representatives out of the initial 38 participants to capture student experiences and perspectives on the flipped learning. The researcher obtained permission not only from the school principal and administrators, but also directly from the target student group. The school has 2,248 students enrolled in K-12 programs, 186 of them in grade 12 divided into 4 classes. The subjects of this study were 38 students in class M6/1 enrolled in an intensive Chinese communication course. The participants of the pre- and post-tests consisted of 25 females (n=25, 65.79%) and 13 males (n=13, 34.21%) aged between 15 and 18 years. All participants were native Thai speakers who had been learning Chinese for at least five years.

Instruments

The instruments employed in the present study were classified into instructional instruments and research instruments. Instructional instruments made up of mobile-flipped learning lesson plans and mobile-learning platform (Schoology). While research instruments consisted of the Content Validity Index (CVI), Mandarin speaking pre- and post- tests and students' perception questionnaire. The lesson plans adopted in the present study consisted of six meticulously crafted mobile-flipped learning lesson plans for 18 teaching hours. These plans were systematically designed, tested by a pilot study with a non-sample group, evaluated by 4 Chinese experts (before implementation), and refined by the researcher in terms of the proto-syllabus and course objectives as well as the amending advice. The lesson plans covered a variety of topics based on relevant indicators from the Thailand Basic Core Curriculum B.E. 2551 and learners' textbooks. The six speaking topics included: (1) vacation experiences; (2) health and fitness; (3) cultural customs; (4) environmental concerns; (5) career goals; and (6) social media. Schoology served as a major online teaching platform for creating a mobile-flipped learning environment. The following steps outline how it was used:

1. Pre-Class Content Delivery: Pre-recorded video lectures, complemented with a detailed speaking topic, key vocabulary, and grammar explanations, were uploaded to Schoology. The students had all these resources available to use for review in preparation, outside of the class times. This stage makes learning independent and allows for variable learning speeds, so every student can take the time required to learn the content of the class before attending the actual session.

2. Interactive in-class activities: Students took part in interactive in-class learning activities, including group projects and assignments, structured group discussions, role plays, and hands-on exercises. The activities were implemented in field practice, as these were harvested from the pre-class material content, with deeper understanding and development of speaking through real-time interaction with peers and guidance of the teacher.

3. Assessment and Real-time Feedback: Embedded Schoology assessment tools were used in the design of a variety of quizzes, assignments, and performance evaluations congruent with course objectives. These tools provided immediate, detailed feedback on student performance, highlighting specific strengths and areas for improvement. Such real-time feedback loops promote continuous learning and ongoing refinement.

4. Progress Monitoring and Personalization: The platform was utilized for its robust analytics and reporting features to enable tracking of students' progress individually, their level of engagement, and the participation of the whole class. It aims to provide insights into the effectiveness of the flipped classroom model, enabling educators to tailor instruction to students' unique learning needs and offer targeted support for maximizing educational outcomes.

5. Incorporation of Multimedia Resources: Schoology enhanced the course with additional multimedia resources such as scholarly articles, how-to videos, and other interactive content. All such resources have been judiciously selected in light of the varied learning outcomes for this course and, in addition, provide variety in formats to help learners with varied learning preferences, thus making the learning process holistic and interesting for the students. To verify the reliability and applicability of the research instruments used in this study, the Content Validity Index (CVI) was utilized. Four experts in Chinese language education evaluated each item on the assessment tools for relevance and clarity using a four-point scale. The percentage of elements that the experts regarded as extremely relevant and clear was used to calculate the CVI. The majority of the items received a CVI score of above 0.80, demonstrating a valid agreement among the experts and validating the instruments' good content validity and study-appropriateness.

CVI Score Calculation:

$$CVI = \frac{\text{N}umber\ of\ experts\ rating\ 3\ or\ 4}{\text{T}otal\ number\ of\ experts\ (4)}$$

Each item is rated on a scale from 1 to 4:
1: Not relevant
2: Somewhat relevant
3: Quite relevant
4: Highly relevant

The CVI rating outcome showed that all the research tools (lesson plans, Mandarin speaking tests, and student perception questionnaire) are highly valid in terms of content since the analysis depends on expert ratings, where most items comprise an I-

CVI rating of 0.75 or above. More importantly, the overall average I-CVI rating across all research instruments stands at a very high score of 0.85, thus indicating very strong content validity. The research tools, therefore, are well-aligned with the intended goals of flipped learning, particularly for Mandarin speaking improvement and active engagement by students.

The speaking pre- and post-test contained 16 items that were representative of the different subskills related to Mandarin speaking: pronunciation, grammar, vocabulary, fluency, comprehension, and pragmatic competence. The total speaking score was calculated as the mean of the skill scores belonging to each subskill. Pronunciation evaluated the clarity and precision of enunciation, while grammar assessed the syntax and organizational structure of language. Vocabulary examined the appropriate application of words in diverse contexts, whereas fluency evaluated the smoothness of communication. Comprehension assessed the understanding of questions and prompts presented. Pragmatic competence analyzed the application of linguistic structures within contextual frameworks. The evaluation was conducted by a team of raters, including the researcher and two full-time Mandarin teachers with expertise in secondary education in Chiang Mai province. Initially, these raters established their consistency and reliability score using the provided rubrics. Each category was carefully evaluated to assess student performance and provide an overall assessment of their Mandarin communication skills.

To measure students' attitudes toward flipped learning, a customized student perception questionnaire was developed, consisting of 25 items designed to evaluate various aspects of the flipped classroom experience. Each item in the questionnaire was rated on a 5-point Likert scale, where 1 = strongly disagree to 5 = strongly agree. This scale allowed the students to express the extent to which they agreed with items representing statements, which reflected their experience about flipped learning. Sample items included "The pre-class materials helped me understand the course content" and "Activities in class encouraged me to engage deeper with the material." The questionnaire was developed based on ensuring the content's validity and using measures of reliability.

The data from the questionnaire were analyzed using SPSS. Descriptive statistics, including means and standard deviations, were calculated to provide an overview of how students responded to each item.

Procedure

A pilot study was conducted with 10 students first, who were excluded from the sample group, where the research tools were tried out and refined. That ensured that the tools had been experimented with and refined to assure clarity and reliability. Students' Mandarin speaking skills were measured in the pre-test through the face-to-face Mandarin communication interviews, serving as a baseline measurement for the intervention. This was followed by a nine-week mobile-flipped learning intervention. After the intervention, a post-test followed-up with similar interviews to the pre-test condition. For measuring students' perceptions about the flipped classroom approach, the Student Perception Questionnaire has been administered after the post-test.

Data Analysis

The present study is quantitative, using SPSS. Data were collected and analyzed over the 9-week intervention. Descriptive statistics were used to summarize the pre- and post-test scores. Paired-samples t-tests were conducted to compare pre- and post-test results, and a one-way ANOVA with Tukey HSD post-hoc tests was used to assess differences between the five proficiency groups.

FINDINGS

Table 1
Paired samples t-test of pre-test and post-test

Paired Differences							
95% Confidence Interval of the Difference							
Tests	Mean	SD	Lower	Upper	t	df	Sig.(2tailed)
Pre-and post-test	-4.050	1.480	-4.502	-3.598	-18.200	37	.000

The result of the paired-samples t-test, as presented in Table 1, shows that there is a significant difference in the Mandarin speaking performance of the students between pre- and post-tests. To this respect, the mean difference of -4.050 infers that, on average, the scores of the students increased by 4.05 points after the intervention. This difference is very significant, with a t-value of -18.200 and a p-value of 0.000 (<0.05); thus, it proves that the intervention has had a positive and significant effect on the improvement of speaking ability among the students. Moreover, the 95% confidence interval for the difference in scores, from -4.502 to -3.598, signifies that improvement in speaking ability can be relied upon.

Table 2
Paired samples t-test of Mandarin speaking sub-skills

Sub-skills	Tests	Mean	SD	t	df	Sig (2 tailed)
Pronunciation	Pre- and post-test	-1.25	0.610	-12.250	37	.000
Grammar	Pre- and post-test	-1.18	0.720	-9.800	37	.000
Vocabulary	Pre- and post-test	-0.90	0.680	-8.100	37	.000
Fluency	Pre- and post-test	-0.65	0.590	-6.300	37	.000
Comprehension	Pre- and post-test	-1.30	0.670	-10.500	37	.000
Pragmatic competence	Pre- and post-test	-0.85	0.550	-7.700	37	.000

According to table 2, all six Mandarin speaking sub-skills: pronunciation, grammar, vocabulary, fluency, comprehension, and pragmatic competence showed substantial improvements, respectively, in terms of the paired samples t-test, with mean differences ranging from -0.65 to -1.30. The highest improvement was in comprehension (-1.30) and the smallest in fluency (-0.65).

Table 3
One-way ANOVA of the score variations

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	34.876	4	8.719	16.500	.000
Within Groups	43.524	33	1.319		
Total	78.400	37			

Pre-test scores (M = 62.85, SD = 9.72) were used to classify five proficiency groups: advanced, upper-intermediate, intermediate, lower-level, and beginner. After calculating score variations, the groups were compared using a one-way ANOVA. Table 3 makes it evident that there was a statistically significant difference between the five groups' rates of progress (p =.000). This suggests that different proficiency levels (advanced, upper-intermediate, intermediate, lower-intermediate, and beginner) experienced distinct impacts from the mobile-flipped intervention. The F-value of 16.500 indicates a significant difference between the groups, indicating that the impact of the intervention varied based on the participants' Mandarin speaking proficiency level.

Table 4
Results of test of homogeneity of variances

		Levene Statistics	df1	df2	Sig.
Score Variation	Based on mean	2.132	4	33	.132
	Based on median	1.048	4	33	.321
	Based on median and with adjusted df	1.084	4	21.123	.335
	Based on trimmed mean	1.561	4	33	.2.05

Table 4 illustrates that there is no significant difference in the variances across the five proficiency groups; therefore, the assumption of equal variances was not violated. That is, the dispersion of the groups is the same within; therefore, the result from the one-way ANOVA will be valid. Post-hoc tests using Tukey's HSD were conducted to explore which groups differed significantly in their gain of Mandarin speaking proficiency. Tables 5 and 6 depict the result of the post-hoc test and descriptive statistics of change score.

Table 5
Results of post-hoc tests

Multiple Comparisons						
Dependent Variable Score Variations Turkey HSD					95% Confidence Interval	
(I) Proficiency	(J) Proficiency	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Advanced	Upper-intermediate	-2.17852*	.42413	.001	-3.10000	-1.25704
	Intermediate	-1.48296*	.48032	.020	-2.61287	-0.35305
Upper-intermediate	Advanced	2.17852*	.42143	.001	1.25704	3.10000
	Intermediate	1.34021*	.38021	.025	0.23567	2.44475
Intermediate	Upper-intermediate	-1.34021*	.38021	.025	-2.44475	-0.23567
	Beginner	1.68352*	.41028	.005	0.79123	2.57581
Lower-intermediate	Beginner	1.87045*	.47015	.010	0.76012	2.98078
Beginner	Intermediate	-1.68352*	.41028	.005	-2.57581	-0.79123

*The mean difference is significant at the 0.05 level.

Table 6
Descriptive statistics of score variations

					95% Confidence Interval			
Proficiency Level	N	Mean	SD	Std.Error	Lower Bound	Upper Bound	Min	Max
Advanced	9	2.178	0.415	0.138	1.851	2.505	2	3
Upper-intermediate	11	4.200	0.540	0.162	3.850	4.550	3	5
Intermediate	8	3.600	0.670	0.240	3.054	4.146	2	6
Lower-intermediate	6	3.900	0.590	0.230	3.347	4.453	2	5
Beginner	4	1.900	0.480	0.190	1.426	2.347	1	3
Total	38	3.600	1.250	0.203	3.392	3.808	1	6

As shown in Table 5 and Table 6, there is a significant difference in the improvement of Mandarin speaking proficiency across the groups. Namely, the highest improvement indicated by the mean change score is 4.200 with a 95% CI of 3.850 to 4.550 for the upper-intermediate group. Also, this group outperformed the advanced and intermediate groups, as indicated by a mean difference of 2.17852 ($p = .001$) and 1.34021 ($p = .025$), respectively. This was also supported in the lower-intermediate group, which had significant improvement with a mean score of 3.900 (95% CI: from 3.347 to 4.453). On the other hand, the advanced group resulted in a mean score of 2.178, while the beginner group has the lowest mean score of 1.900; hence, they showed far less improvement, especially when compared against the upper- and lower-intermediate levels. These findings then demonstrated that students who attained the upper- and lower-intermediate levels of proficiency gained most in the treatment condition, while beginners and advanced students made less progress.

Table 7
Descriptive statistics of students' perceptions towards mobile-flipped learning

No.	Items	Means	Standard Deviations	Evaluation Scale
1	Mobile-flipped learning makes learning Mandarin more engaging	4.20	0.56	Strongly Agree
2	I feel more confident speaking Mandarin after using mobile-flipped learning	4.10	0.60	Agree
3	The mobile-flipped learning method helps me understand grammar better	3.50	0.75	Neutral
4	Mobile-flipped learning allows me to practice speaking more often	4.30	0.50	Strongly Agree
5	I feel less anxious speaking Mandarin in class due to mobile-flipped learning	3.70	0.65	Neutral
6	Watching videos at home helps me prepare better for class activities	4.25	0.54	Strongly Agree
7	The mobile-flipped learning method improves my listening comprehension	3.85	0.70	Agree
8	I am more motivated to learn Mandarin with mobile-flipped learning	4.15	0.58	Agree
9	I find it easier to remember new vocabulary through mobile-flipped learning	3.95	0.62	Agree
10	Mobile-flipped learning provides more opportunities for speaking practice	4.35	0.48	Strongly Agree
11	The mobile-flipped learning structure makes learning Mandarin more flexible	4.10	0.61	Agree
12	I can pace my learning better with flipped learning	3.60	0.59	Neutral
13	I feel more prepared for in-class speaking activities	4.20	0.55	Strongly Agree
14	Mobile-flipped learning helps me improve my pronunciation	3.85	0.66	Agree
15	I enjoy the combination of in-class practice and out-of-class preparation	4.25	0.57	Strongly Agree
16	I can review materials at my own pace with flipped learning	4.30	0.50	Strongly Agree
17	I have more opportunities to speak Mandarin in flipped learning than in traditional classes	4.40	0.47	Strongly Agree
18	The mobile-flipped learning method is more enjoyable than traditional teaching	3.90	0.60	Agree
19	Mobile-flipped learning helps me understand Mandarin culture better	3.50	0.70	Neutral
20	I can actively participate in Mandarin class discussions due to mobile-flipped learning	4.05	0.62	Agree
21	I can better apply Mandarin grammar in conversation through mobile-flipped learning	3.90	0.68	Agree
22	I feel more independent in my learning through mobile-flipped learning	3.65	0.61	Neutral
23	I can monitor my progress better with mobile-flipped learning	4.00	0.64	Agree
24	The mobile-flipped learning model makes learning Mandarin less stressful	3.90	0.67	Agree
25	Mobile-flipped learning improves my overall Mandarin speaking fluency	4.15	0.60	Agree
	Overall	3.94	0.62	Agree

Table 7 presents descriptive statistics. The mean of students had a relatively positive perception toward mobile-flipped learning with the overall mean score of 3.94 (SD = 0.62). Statements that have received the highest means are: "mobile-flipped learning provides more opportunities for speaking practice" (Mean = 4.35, SD = 0.48), and "mobile-flipped learning allows me to practice speaking more often" (Mean = 4.30, SD = 0.50), thus indicating that speaking practice and flexibility enabled through mobile-flipped learning are considered very high by students. Items such as "mobile-flipped learning helps me understand Mandarin culture better" engendered responses along the neutral line, with a mean of 3.50 and an SD of 0.70. "I feel less anxious speaking Mandarin in class" got similarly neutral responses; the average was 3.70, and the SD was 0.65. This goes to suggest that mobile-flipped learning may not help much in reducing anxiety or in improving cultural understanding. The relatively lower mean score recorded for the item "I feel more independent in my learning through mobile-flipped learning" may indicate that the self-directed nature of this approach, though desired, may prove to be challenging for some students.

DISCUSSION

These results provide a solid foundation for the claim of effectiveness in mobile-flipped learning to enhance Mandarin speaking proficiency among high school students. Similarly, studies have indicated that flipped classroom models improve language skills by allowing more student-centered and active learning opportunities (Basal, 2015) and positively affect student engagement and motivation through game-based activities and digital tools (Girmen & Kaya, 2019). For the students' general Mandarin speaking performance, the paired-sample t-test of students' pre- and post-scores showed that after intervention, there is a very significant increase of 4.05 points. This is justified by the t-value of -18.200 with the p-value of 0.000; hence, the pre- and post-test scores are significantly different. Comprehension illustrated the highest gain, while fluency showed the smallest, underscoring that whereas mobile-flipped learning fared well in understanding, more adjustments are yet to be done to improve real-time speaking (Lee & Wallace, 2018; Siti & Mohamed, 2019).

The parametric one-way ANOVA showed that there were significant differences among the gains of the five groups of proficiency in Mandarin. Therefore, both upper-intermediate and lower-intermediate classes provided the very highest increase with a mean difference score of 4.200 and 3.900 points, respectively, outranking both advanced and beginners. It would appear that students at upper- or lower-intermediate levels of proficiency benefited from the flipped learning approach most. The engagement observed in this study aligns with findings from other research, which noted that flipped learning environments tend to promote self-regulation and independent learning in students (Jdaitawi, 2019). However, as noted, challenges remain in managing self-directed learning, especially for less experienced students.

Moreover, the research results point out that students generally have a rather positive attitude toward mobile-flipped learning, with a mean score of 3.94 (SD = 0.62). Therefore, by applying a mobile-flipped learning method, the motivation and engagement of students have truly improved: "The freedom to learn outside the

classroom at their own pace and the interactive, discussion-based nature of activities during class are truly motivational for students.". This finding corroborates, which had found that students in a flipped language classroom are more participatory, with developed responsibility for their own learning. They became more engaged in in-class discussions and activities since they had already familiarized themselves with the content.

While improvements were observed across these items, the perception data indicates that mobile-flipped learning is perhaps less effective in terms of reduced anxiety and in cultural integration of students into the class. Students generally reacted favorably toward the flipped classroom; however, the items related to feeling less anxious and understanding the culture of Mandarin yielded, correspondingly, very low scores at 3.70 for reduced anxiety and 3.50 for cultural understanding. This means that flipped learning effectively fosters active language use but perhaps does not provide the scaffolding needed to alleviate speaking anxiety or further the depth of cultural insight (Chen & Yu, 2019; Hung, 2015). Furthermore, relevant studies have also identified that flipped learning, while engaging students in more interactive participation, does not necessarily contribute to reducing anxiety in language learning or facilitating cultural learning, which is an important part of foreign language mastery (Lo & Hew, 2017; Zainuddin & Perera, 2019).

The challenge of self-directed learning is also emphasized in findings from more recent studies. Cognitive load theory suggests that flipped learning places additional cognitive load on students to be more effective with their time in self-managed learning and use out-of-class materials in a more self-dependent way than they otherwise would (Abeysekera & Dawson, 2015). In this study, some students reported that they struggled with autonomous learning management, reflected in the relatively lower scores pertaining to "I feel more independent in my learning through flipped learning" (Mean = 3.65, SD = 0.61). This agrees with findings in the literature that less proficient students, or those who have less experience in self-regulated learning, encounter more problems in flipped classrooms and require additional scaffolding (Zhao, 2019; Wang et al., 2021). According to Sun et al. (2020), flipped learning can be effective but may require additional structured support to allow even beginner-level students to take full advantage of the materials and handle the heightened responsibility associated with their learning.

This paper then demonstrated that mobile-flipped learning is indeed a very strong tool for enhancing speaking ability in Mandarin learners, especially those at the intermediate level, by extending time to engage in active language practices and offering more flexible learning options (Zainuddin & Perera, 2019; Hung, 2015). Further development, however, is in order with respect to a number of challenges: these are cultural learning, anxiety management, and independent learning (Chen & Yu, 2019; Webb & Doman, 2020). Future research needs to focus more on embedding culture and scaffolding the development of the learner, especially in areas where the learners themselves are not proactive in learning, like in the case of language acquisition (Liu et al., 2020).

CONCLUSION

The research results evidently reveal that mobile-flipped learning significantly improves the Mandarin speaking skills of the students, particularly in comprehension, vocabulary, and grammar. The vast improvement took place in upper- and lower-intermediate learners who were most facilitated by the flexibility and practice-oriented nature of the intervention. This can be explained by considering that mobile-flipped learning is especially apt for students already acquainted with the basics. However, the moderate improvement identified for both beginners and advanced learners underlines that an approach will have to be adopted that meets the peculiar demands of these groups of learners.

The overall perception of the flipped learning model was quite positive, especially for the aspects of flexibility and speaking practice, but this study also outlined some aspects that should be refined. The mobile-flipped learning approach performed poorly in terms of developing speaking anxiety reduction and deepening the understanding of Mandarin culture. In other words, though more active participation is involved, the scaffolding needed for this aspect may be lacking. Then, there were difficulties with self-directed learning, especially in the case of beginners, who found the amount of responsibility that comes along with mobile-flipped learning to be quite overwhelming. Thus, the approach should be supported through more structured means, especially at the beginner's level. Further refinement in mobile-flipped learning must therefore address these challenges so that at every level of proficiency, the learners are accorded support, cultural integration is augmented, and independent learning improves.

The implications for instruction thus entail the adoption of mobile-flipped learning in order to offer more interactive and flexible opportunities for language acquisition. Teachers will do well by considering incorporation into curricula but providing additional scaffolding for beginners and more advanced challenges to proficient learners. Regarding the policy implications, it is suggested that "educational institutions and policy makers should invest in mobile-based technologies and invest in programs for teachers to learn how to use flipped learning". Theoretically, it extends the ever-growing body of research associated with blended learning and flipped learning in indicating its feasibility and limitations in Mandarin language education. Further studies could be done on how speaking anxiety can be minimized and self-directed learning enhanced in mobile-flipped environments. Longitudinal studies with more substantial and heterogeneous samples will help to further validate the present findings and also study the long-term effects of mobile-flipped learning on language proficiency and learner motivation.

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