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Implementing the flipped classroom approach in primary English classrooms in China

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Abstract

The present study was conducted to investigate the use of a flipped classroom in primary EFL classrooms in China. It is quasi-experimental research examining flipped and non-flipped classrooms in teaching English vowel letters in a primary school in China. Specifically, the researchers aimed at finding out the participating students' and teachers' perceptions towards the flipped classroom approach, whether it could be an approach for making students more engaged in their learning, and if it could enhance students' learning. Four classes of Primary 4 students (the flipped classroom approach was adopted in two classes and a traditional teacher-instructed method was used in the other two classes) were involved. Students in the two flipped classes learnt the English vowel letters by watching lecture videos before face-to-face lessons. On the other hand, students in the two non-flipped classes learnt the five vowel letters through a teacher-instructed approach in face-to-face lessons. Before the implementation of the study, a pre-test was administered to the students to find out their background knowledge. At the end of the study, a post-test was conducted to see if there was any gain in the scores obtained by the students. Qualitative data were also collected by eliciting opinions about the flipped classroom approach from the participating students and teachers. Implications for teaching and further research are drawn at the end of this paper.

Keywords Flipped classroom · Teacher-instructed teaching · English language · Primary school · Pronunciation · China

1 Introduction

Since the release of the Outline of China's National Plan for Medium- and Long-term Education Reform and Development (2010–2020) in 2010, China

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has paid more and more attention to the informatization of education and promoting effective classrooms with technological innovation (He 2011). Even though much effort has been put on to meet the requirements of curriculum reform, the results are still not satisfactory. One possible reason is that the curriculum reform is advancing in a top-down manner. Although the policymakers in China have studied a lot of teaching ideas, they lack practical teaching experience and teachers are only implementers who simply implement policies (Li et al. 2013). The flipped classroom approach (or flipped classroom model) is a bottom-up education model initiated by front-line teachers. Therefore, the emergence of a flipped classroom has brought a new idea to modern classroom teaching and contributed to the reform of education in China. It comes into being in line with the trend and complies with the background of education informatization in China, injecting fresh vitality into the development of education informatization.

Moreover, with the continuous update of information, technology and teaching concepts, the flipped classroom has become a hot topic in the education field in China. It breaks the traditional teaching model and has injected new vitality into the teaching reform (Chen and Zhao 2014). In fact, the younger generation nowadays has grown up with technology and they get in touch with technology from time to time. Therefore, in education, the traditional approach which emphasises teacher-centred instruction and content regurgitation may not be appropriate for today's learners, who are 'digital natives' (Prensky 2005). This makes technology play an important role in school settings (D'Angelo and Woosley 2007; Zhang 2015). The present study was conducted to investigate the use of a flipped classroom in teaching English vowel letters in primary EFL classrooms in China. Based on the purpose of the study, the following research questions were answered:

1. What are students' perceptions of the flipped classroom approach?
2. How much effort do students put on watching the lesson videos before attending face-to-face lessons?
3. Do students have a significant gain in the knowledge of the lesson topic taught through a flipped classroom?
4. Do students in the flipped classes learn significantly better than those students in the non-flipped classes?
5. What are teachers' perceptions towards the flipped classroom approach?

Before introducing the methodology adopted in this study, the term 'flipped classroom' needs to be defined and previous studies on the use of the flipped classroom approach have to be reviewed.

2 Literature review

2.1 What is a flipped classroom?

The term 'flipped classroom' is rather new, but the concept is not, and there are different interpretations of how a classroom is 'flipped' (Tobin and Honeycutt 2019). The most

common way of interpreting a flipped classroom is that learning processes taking place in a classroom are inverted to a learner's home (Herreid and Schiller 2013).

More specifically, a flipped classroom is a pedagogical method which mostly consists of video lectures (preferably 10–15 min long and the videos are usually pre-recorded by teachers themselves, but can also be those which are available from the Internet) that students watch at their own time and pace before attending classes in which they engage in group tasks or the teachers answer students' questions about the lesson contents (Stone 2012). It reverses the traditional teaching approach in which students just listen to their teachers during classes (Wong and Chu 2014) but have interactive and collaborative activities with peers outside of classes (Mok 2014; Shimamoto 2012; Talbert 2012).

2.2 Benefits of the use of the flipped classroom approach

The flipped classroom approach has been implemented in different subject areas (see, for example, Gaughan 2014) because of its numerous potential benefits.

One of the major benefits of the use of the flipped classroom approach is that there is an increased level of student motivation in learning (Nouri 2016; Wong and Chu 2014). Students usually find that a flipped classroom is more interesting than a traditional classroom (Zainuddin and Attaran 2016). They are better prepared to class (Musib 2014) when they are given video lectures than when they are given textbook readings (De Grazia et al. 2012). Similarly, Leis et al. (2015) found that students spent significantly more time on preparing for class when using the flipped classroom, compared with being taught with a traditional method. However, if the videos are not produced with high quality, students' interests to watch the videos may decrease (Yang 2014; Zainuddin and Attaran 2016). Because of becoming more motivated and spending more time on learning, students learn better from a flipped classroom than a traditional teaching method (Wong and Chu 2014).

Relatedly, the flipped classroom approach can benefit students' subject knowledge learning. For example, in his study of using a flipped classroom in the Integrated Humanities subject, Kong (2014) found that students (107 students from four Secondary 1 classes) had statistically significant gain in domain knowledge (information literacy competency and critical thinking skills).

Another benefit of a flipped classroom is that students can have autonomy in their learning because of the availability of pre-recorded lesson videos. It is particularly important for slow learners or low achievers because they can pause, rewind or fast-forward the video (Nouri 2016), and can watch the online videos again and again until they have mastered the lesson content (Mok 2014; Musib 2014). In other words, as students can have more opportunities to learn independently (Mehring 2018), the flipped classroom approach can promote students' deeper understanding of subject knowledge, and make them be successful in learning (McLaughlin et al. 2014; Yang 2014).

Using the flipped classroom approach can also encourage students' reflection. Students need to reflect on the connection between the course materials they have prepared before the lessons and the activities conducted in classes (Roehl et al. 2013; Vaughan 2014) and therefore, their reflective abilities can be developed.

One more benefit of a flipped classroom is related to the development of generic skills. Through interacting with teachers or peers, or working on group tasks, students'

communication and collaboration skills (as examples of generic skills) can be developed (McLaughlin et al. 2014). In an English language classroom, interaction and collaboration among students can also facilitate their language learning (Mehring 2016).

2.3 Using the flipped classroom approach in English as a second/foreign language (ESL/EFL) classrooms

Since there are many advantages of flipping a classroom as reviewed above, more research related to incorporating the flipped classroom approach into ESL/EFL classrooms can be found after 2014 (Turan and Akdag-Cimen 2019). Reviewing previous studies on implementing the flipped classroom approach in English language, it can be found that the flipped classroom was adopted in teaching writing (Ahmed 2016; Leis et al. 2015; Nie 2015), reading comprehension (Huang and Hong 2016), grammar (Yang 2017), and oral (Wang and Liu 2018; Zuo 2016) or pronunciation (Zhang 2018; Zhang et al. 2016) at colleges or universities (see, e.g., Doman and Webb 2016; Lee and Wallace 2018) or in secondary schools (Huang and Hong 2016; Yang 2017). The findings of these studies are elaborated as follows:

First of all, students' perceptions of the use of a flipped classroom are usually positive. In Lee and Wallace's (2018) study of flipped and non-flipped classrooms in English 1 (i.e. intermediate-level) classes for university students in Korea, it was revealed that most students (36 out of 40) thought that flipping the classroom is an effective way of learning English. Yang's (2017) study of adopting the flipped classroom approach in the English subject in two Secondary 2 classes in a Hong Kong school also shows similar results in which more than half of the students (56.9%) found that learning is more interesting with the use of the flipped classroom approach.

When comparing flipped and non-flipped classrooms, it can be found that there are differences in students' attitudes towards the flipped classroom and the traditional teacher-centered instruction without flipping the classroom, and the two modes of teaching can produce different outcomes. In an investigation of Chinese EFL students at a university in Macau in their enrollment of an English course, Doman and Webb (2016) found that students in the flipped classroom had more positive learning experiences than those in the non-flipped classroom, as students could learn the course contents better through watching the online videos.

Also, compared with using a traditional teaching method, students can learn better in a flipped classroom. First, Lee and Wallace's (2018) study shows that students in flipped classrooms gained higher mean scores than those students in non-flipped classrooms because they could have a better understanding of the subject contents than those in the non-flipped classroom. When integrating the flipped classroom approach to teach EFL university students writing skills, Ahmed (2016) found that the results of the experimental group (in which students watched lesson videos before attending classes) were statistically significantly better than the control group (in which students were taught by traditional instruction) in the post-test of writing in terms of ideas and contents, organisation, voice, and style. Huang and Hong (2016), in their study conducted in a senior high school in Taiwan, also found that students from the experimental group in which they watched videos about six different English reading strategies before face-to-face lessons performed significantly better than the control group in the reading comprehension post-test.

There are some other benefits brought by the use of the flipped classroom approach. Basal (2015) conducted a study in which a flipped classroom was implemented in the Advanced Reading and Writing II course for first-year preservice English teachers in a university in Turkey. From this study, it was revealed that watching lecture videos had the following benefits: students could learn at their own pace, prepare for the lesson in advance, and have more participation in lessons.

On the other hand, contradictory results can be found regarding the benefits of adopting a flipped classroom approach. Chuang et al. (2018), in their analysis of the benefit of a flipped classroom in the Applied English for Vocational Education course for EFL university students in Taiwan, found that learners who can benefit most from the flipped classroom approach are those who have a high level of motivation in achieving successes in language learning. In this aspect, Yang (2017) also found a similar result in her research of the use of the flipped classroom in teaching a grammatical item in two secondary English classes in Hong Kong, in which only those students who have stronger motivation to learn English gained more significantly in their subject knowledge.

2.4 Using the flipped classroom approach in teaching English pronunciation

Reviewing previous research, it can be found that the studies related to using the flipped classroom approach to teach English pronunciation are scarce. They were all conducted in university settings. Zhang et al.'s (2016) study of using the flipped classroom in an English pronunciation course for university freshmen in China shows that students from the class taught with the flipped classroom mode performed better (the mean score is 3.75 marks higher) than those from the class taught with the traditional teaching mode in their final exam. In another study, an experimental study conducted by Zhang (2018) involving three classes of English-major freshmen in China, it can be found that students' pronunciation improved significantly after using the flipped classroom approach.

Based on the previous studies reviewed above and the best knowledge of the researchers, it can be discovered that the use of the flipped classroom approach for teaching pronunciation in primary English classrooms in China has never been investigated. Thus, the present study was conducted to fill the research gap by focusing on pronunciation because pronunciation is often an area that is ignored in English language teaching (Dixon 2018). Also, the vowel letters ('a', 'e', 'i', 'o', 'u') were focused on in this study because of their great importance as all English words have vowel letters in them.

3 Methodology

The current study is quasi-experimental research examining flipped and non-flipped classrooms in teaching the five vowel letters in a primary school in China. Specifically, the researchers aimed at finding out the participating students' and teachers' perceptions towards a flipped classroom, whether the flipped classroom could be an approach for making students more engaged in their learning, and if it could enhance students' learning. The details of this study are presented below.

3.1 Participants

Four classes (two classes in which the flipped classroom approach was adopted, whereas in the other two classes, a traditional teacher-instructed method was used) of Primary 4 students aged 9–10 from a primary school in Hangzhou (a city of Zhejiang Province in China) were involved. A total of 189 students comprising 94 students (50 males and 44 females) from the two flipped classes and 95 students (49 males and 46 females) from the two non-flipped classes participated in this study. They were all informed of the research purpose by the researchers before conducting the study and their participation was voluntary. The four classes were taught by two female teachers (each of them taught one flipped class and one non-flipped class) who had been teaching English as a foreign language (EFL) for 2 years and 17 years respectively when the study was conducted.

3.2 Procedure

The four classes were randomly assigned as flipped and non-flipped classes as students in these four classes had similar levels of English proficiency (as evidenced from their similar results in the pre-test in terms of the highest, lowest and average scores obtained in each class). In the two flipped classes, instead of expecting the students, who were in their first year of studying EFL, to learn all the five vowel letters by themselves using the flipped classroom approach, they learned the ‘e’, ‘o’ and ‘u’ sounds by watching lesson videos prior to face-to-face lessons, but learned the ‘a’ and ‘i’ sounds from a teacher-instructed method. When learning the ‘e’, ‘o’ and ‘u’ sounds, students had to watch 3–4 videos (refer to Appendix 1 for the videos selected) which were selected from YouTube (the duration of each video is not more than 4 min to keep their attention to watch it) about each of these sounds. On the other hand, students in the two non-flipped classes learned all the five vowel letters through a teacher-instructed approach in face-to-face lessons.

The study was conducted during the period of September 2018–January 2019. In the first lesson of the implementation period, a pre-test (comprising 20 multiple-choice questions about the five vowel sounds) was administered to the students to find out how much background knowledge the students had before they received the teaching of the five sounds. To find out the amount of effort students from the two flipped classes put on watching the lesson videos prior to face-to-face lessons, the students were asked to keep a record of the number of times they watched each video and the time duration (in terms of the number of minutes) they spent on watching each video in their learning logs, which were collected by their teachers at the end of the implementation stage. In the last lesson of the implementation period, a post-test (with the same question items as the pre-test) was given to the students to see if there was any gain in the scores obtained by the students (refer to Appendix 2 for the test). The students in the two flipped classes were also asked to complete a questionnaire to seek their opinions about the use of the flipped classroom, and they were assured of their anonymity. Adapted from Yang’s (2017) study, there are five items in the questionnaire (these items can be found when presenting the data in the Results section). Except for Item 4 in which the respondents could choose what they felt about flipped classroom experience, all items of the questionnaire are in a 4-point Likert scale, ranging from ‘Strongly agree’ to ‘Strongly disagree’ (4 = ‘Strongly agree’; 3 = ‘Agree’; 2 = ‘Disagree’; 1 = ‘Strongly

disagree'). A 'Neutral' option was avoided because Busch (1993, p. 735) mentions that "neutrality can lead to indecisive data". Also, eight students from the two flipped classes (two male and two female students from each class) were invited on a voluntary basis and the two teachers were asked to attend an interview to find out their perceptions towards the flipped classroom approach.

3.3 Data collection and data analysis

Considering the importance of collecting data by using different methods to achieve triangulation and enhance credibility (Lee 2005; McMillan 2000), both quantitative and qualitative data were collected in this study. First, the quantitative data were collected by asking students to complete a questionnaire at the end of the study to find out their perceptions towards the use of the flipped classroom approach. The method of descriptive statistical analysis was used to analyse the questionnaire data. After that, qualitative data were collected from the eight students and the two teachers teaching the flipped classes by having semi-structured interviews with them to collect their opinions about the flipped classroom approach. The interviews were audio recorded and then transcribed.

The data of the interviews were analysed by using qualitative content analysis (Flick 2002). Through reading the interview transcripts repeatedly, certain categories that were relevant to the aims of this study emerged. The data were then summarised in a systematic way (Seliger and Shohamy 1989). To examine whether the use of a flipped classroom could make students have a significant gain in the knowledge of the lesson topic, a paired sample t-test was used to compare two means (Kent State University 2014) (i.e. mean scores of students' pre- and post-tests, comprising 20 multiple-choice questions in which students had to choose one word that is different from the other three options in an item in terms of its vowel sound) and performed by using SPSS. An independent samples t-test was also used to compare the mean scores of flipped and non-flipped classes to find out if students in the flipped classrooms learned significantly better than those students in the non-flipped classes.

4 Results

In this section, the findings of the study are presented based on the sequence of the research questions.

4.1 Students' perceptions towards the flipped classroom approach

The first research question is to find out students' perceptions towards a flipped classroom. Based on the findings collected from the end-of-research questionnaire and the follow-up interview, it can be found that the students in the two flipped classes were generally positive towards the flipped classroom approach.

Firstly, regarding Item 1 of the questionnaire "I have fully understood the contents of the topic via flipped classroom activities", most students (95.79%) from the two flipped classes strongly agreed and agreed with the statement. Only a very small percentage of them (4.21%) strongly disagreed and disagreed with it. For Item 2, "I have developed self-management skills via flipped classroom activities", similar results were obtained. A

Table 1 Students' feelings about their flipped classroom experience

Students' feelings about flipped classroom experience	Number of counts	Percentage
A. Can learn on my own pace	72	27.5%
B. Can learn at my own time schedule	61	23.3%
C. Learning has become more interesting	70	26.7%
D. Learning is more interactive	43	16.4%
E. Learning has become more difficult	7	2.7%
F. Feel helpless	3	1.1%
G. Less motivated to learn	2	0.8%
H. Heavy workload	4	1.5%

majority of the students (91.58%) strongly agreed and agreed with the statement, but only 8.42% of them expressed (strong) disagreement with the item. In Item 3, the results obtained are similar to Items 1 and 2. In this item ("I have developed self-study skills via flipped classroom activities"), 94.74% of the respondents strongly agreed and agreed with the statement (62.11% and 32.63% respectively). Only the remaining small percentages of them (1.05% and 4.21% respectively) strongly disagreed and disagreed with the item. Then in Item 4, respondents were asked to choose their feelings about the flipped classroom experience. Here, the positive feelings (options A to D) were chosen more frequently than the negative feelings (options E to H) (see Table 1 below for details).

Lastly, because of the students' positive feelings towards the flipped classroom approach, most of them strongly agreed and agreed with Item 5 that "Teacher should use the flipped classroom approach when teaching other topics in future" (73.21% strongly agreed and 21.51% agreed), but only 5.38% of them strongly disagreed and disagreed with the item (see Table 2 for details of the questionnaire results).

Students' positive feelings towards a flipped classroom can also be found in their responses in the interview. Three participants (Student A, Student F, and Student G) mentioned the benefit of watching videos beforehand helped them to pronounce the sounds more accurately because of the repetition of the sounds in the videos. In other words, the flipped classroom approach is useful for them in learning phonics (as

Table 2 Summary of the questionnaire findings

Questionnaire Items	SA	A	D	SD	M	*SD
1. I have fully understood the contents of the topic via flipped classroom activities.	62 (65.26%)	29 (30.53%)	1 (1.05%)	3 (3.16%)	3.47	0.91
2. I have developed self-management skills via flipped classroom activities.	59 (62.11%)	28 (29.47%)	7 (7.37%)	1 (1.05%)	3.42	0.91
3. I have developed self-study skills via flipped classroom activities.	59 (62.11%)	31 (32.63%)	4 (4.21%)	1 (1.05%)	3.47	0.88
5. Teacher should use the flipped classroom approach when teaching other topics in future.	68 (73.21%)	20 (21.51%)	4 (4.30%)	1 (1.08%)	3.48	1.01

SA = Strongly Agree; A = Agree; D = Disagree; SD = Strongly Disagree; M = Mean; *SD = Standard Deviation

Table 3 Students' levels of understanding of the lesson videos

'e' sound		'o' sound		'u' sound	
Level of understanding	No. of students (%)	Level of understanding	No. of students (%)	Level of understanding	No. of students (%)
Mostly understand	61 (80.26%)	Mostly understand	65 (85.53%)	Mostly understand	62 (81.58%)
Partly understand	15 (19.74%)	Partly understand	11 (14.47%)	Partly understand	14 (18.42%)
Do not understand	0 (0%)	Do not understand	0 (0%)	Do not understand	0 (0%)

mentioned by Students B, C, E, and G). Moreover, Student A and Student H suggested the advantage of learning some new English words from the videos when introducing the target vowel sounds. Students A, B and D also pointed out the benefit of developing independent learning skills, and Student H thought that she has become more active in learning through the flipped classroom. When asked about the aspect they liked the most about a flipped classroom, six participants (Students C, D, E, F, G and H) suggested watching videos made them enjoy learning the lesson topics. Although students' feelings are mostly positive, five participants (Students A, B, C, D, and H) mentioned about the difficulties they had in understanding the 'English-only' videos. Nevertheless, when the students were asked to rate their overall understanding of the content of the lesson videos in the learning record, most of them (80.26%, 85.53% and 81.58% respectively) indicated that they mostly understand the content of the videos about the 'e', 'o' and 'u' sounds. None of them expressed that they do not understand the videos they have watched (see Table 3 below for details).

4.2 Students' engagement in watching the lesson videos

To find out the amount of effort students from the two flipped classes put on watching the lesson videos before face-to-face lessons to answer Research Question 2, the number of times and the time duration students watched each video were analysed and are shown in the tables below.

As can be seen in Table 4, many students (71.74%, 69.57% and 69.57% of the respondents respectively) just watched each lesson video about the 'e', 'o' and 'u'

Table 4 Number of times students watched each lesson video

'e' sound		'o' sound		'u' sound	
No. of times	No. of students (%)	No. of times	No. of students (%)	No. of times	No. of students (%)
0 time	16 (17.39%)	0 time	16 (17.39%)	0 time	18 (19.57%)
1 time	66 (71.74%)	1 time	64 (69.57%)	1 time	64 (69.57%)
2 times	4 (4.35%)	2 times	6 (6.52%)	2 times	5 (5.43%)
3 times	4 (4.35%)	3 times	2 (2.17%)	3 times	2 (2.17%)
4 times	1 (1.09%)	4 times	1 (1.09%)	4 times	2 (2.17%)
5 times or above	1 (1.09%)	5 times or above	3 (3.26%)	5 times or above	1 (1.09%)

Table 5 Time duration students spent on watching each lesson video

'e' sound		'o' sound		'u' sound	
Time duration	No. of students (%)	Time duration	No. of students (%)	Time duration	No. of students (%)
1–2 min	7 (9.21%)	1–2 min	19 (25%)	1–2 min	4 (5.26%)
3–4 min	41 (53.95%)	3–4 min	43 (56.58%)	3–4 min	54 (71.05%)
5–6 min	20 (26.32%)	5–6 min	9 (11.84%)	5–6 min	12 (15.79%)
7–9 min	4 (5.26%)	7–9 min	0 (0%)	7–9 min	2 (2.63%)
10 min or more	4 (5.26%)	10 min or more	5 (6.58%)	10 min or more	4 (5.26%)

sounds once only. 17.39%, 17.39% and 19.57% of them even did not watch any of the videos about the three sounds.

For those students who had watched the lesson videos, the time they spent on watching each video was also analysed and the results are presented in the following table.

Table 5 shows that more than half of the students (53.95% and 56.58% respectively) from the two flipped classes spent 3–4 min watching each video about the 'e' and 'o' sounds, but many of them (71.05%) spent the same amount of time watching each video about the 'u' sound. On the other hand, fewer than half of the students (36.84%, 18.42% and 23.68% respectively) spent 5 min or even more on watching the videos about the 'e', 'o' and 'u' sounds.

4.3 Students' gain in the knowledge of the lesson topic

Research Question 3 of this study is to answer whether students will have a significant gain in the knowledge of the lesson topic taught through the flipped classroom approach. A paired sample t-test was used to calculate the difference between the mean scores of pre- and post-tests obtained by students of the two flipped classes. First, in one of the flipped classes (Class 401), the scores obtained in the pre-test (M = 8.77,

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Class 401	**Pre-test**	8.7660	47	3.84036	.56017
	Post-test	13.9787	47	4.17284	.60867

Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Class 401	**Pre-test-Post-test**	-5.21277	3.99965	.58341	-6.38711	-4.03842	-8.935	46	.000

Fig. 1 Results of the paired samples t-test for Class 401

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Class 405	Pre-test	11.0213	47	3.08213	.44958
	Post-test	17.2553	47	2.61657	.38167

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the the Difference Lower	Upper			
Class 405	Pre-test-Post-test	-6.23404	3.05893	.44619	-7.13218	-5.33591	-13.972	46	.000

Fig. 2 Results of the paired samples t-test for Class 405

SD = 3.84) and the post-test (M = 13.98, SD = 4.17; t(46) = −8.94, p = .000) were statistically significantly different (see Fig. 1).

In another flipped class (Class 405), the result is similar. The scores obtained in the pre-test (M = 11.02, SD = 3.08) and the post-test (M = 17.26, SD = 2.62; t(46) = −13.97, p = .000) were statistically significantly different (see Fig. 2).

When the results obtained by the students of the two flipped classes were analysed together, the difference between the scores obtained in the pre- and post-tests was also statistically significant. As shown in Fig. 3, there was a significant difference in the scores for the pre-test (M = 9.89, SD = 3.64) and the post-test (M = 15.61, SD = 3.84; t(93) = −15.51, p = .000).

Based on the analysis above, it can be concluded that the students in this study had shown a significant gain in the knowledge of the lesson topic taught through the flipped classroom approach.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Flipped Classes	Pre-test	9.8936	94	3.64402	.37585
	Post-test	15.6170	94	3.83562	.39561

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the the Difference Lower	Upper			
Flipped Classes	Pre-test-Post-test	-5.72340	3.57832	.36908	-6.45632	-4.99049	-15.507	93	.000

Fig. 3 Results of the paired samples t-test for Classes 401 and 405

Table 6 Mean and standard deviation of the pre- and post-test results obtained by students in the flipped classes and the non-flipped (teacher-instructed) classes

Classes	N	Pre-test		Post-test	
		Mean	SD	Mean	SD
Flipped classes	94	9.89	3.64	15.62	3.84
Non-flipped classes	95	10.05	4.09	15.75	2.82

Group Statistics

	Teaching Mode	N	Mean	Std. Deviation	Std. Error Mean
Post-test Score	**Flipped Classroom**	94	15.6170	3.83562	.39561
	Teacher-instructed Teaching	95	15.7474	2.82078	.28941

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means					95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Post-test Score	**Equal variances assumed**	10.621	.001	-.266	187	.790	-.13035	.48939	-1.09579	.83509
	Equal variances not assumed			-2.66	170.782	.791	-.13035	.49017	-1.09792	.83722

Fig. 4 Results of the independent samples t-test

Research Question 4 is to answer whether students in the flipped classes learn significantly better than those students in the non-flipped classes. To answer this question, the mean and standard deviation of the pre-test and post-test results obtained by students in the flipped and non-flipped classes were calculated and summarised in Table 6.

In the flipped classes ($N = 94$), the mean and the standard deviation obtained from the post-test were 15.62 and 3.84 respectively. However, in the non-flipped classes ($N = 95$), the mean score obtained from the post-test was slightly higher than that of the flipped classes (M = 15.75, SD = 2.82). The mean score obtained from the pre-test for the non-flipped classes was also slightly higher than that of the flipped classes (see Table 6). To find out if such a difference was significant, an independent samples t-test was used to compare the mean scores obtained by students from the flipped and non-flipped classes. Figure 4 below shows that the difference in the post-test scores for teacher-instructed teaching (M = 15.74, SD = 2.82) and flipped classroom approach (M = 15.62, SD = 3.84; t(187) = −.27, $p = .790$) was not statistically significant.

4.4 Teachers' perceptions towards the flipped classroom approach

Apart from students, the two teachers teaching the two flipped classes were also interviewed to find out their perceptions towards the flipped classroom approach to answer Research Question 5.

First of all, both of the two teachers found the benefit of this new approach on increasing the teaching and learning effectiveness within the limited class time available, as illustrated in their responses:

- *It's a new way of teaching through which students can learn at home by watching videos before lessons. As we only have 3 lessons each week, the flipped classroom approach can save a lot of class time for students' practice.* (Teacher A)
- *It (Flipped classroom) can save the class time for students to have more opportunities to practise what they have learnt. With more lesson time spared out, I could point out students' pronunciation mistakes in class.* (Teacher B)

One teacher also mentioned the benefits of giving students responsibilities for their learning and enhancing their independent learning skills through this new way of teaching:

- *The flipped classroom approach allows students to be responsible for their learning as they need to do some learning at home before coming to the class. That can also enhance students' independent learning skills.* (Teacher A)

Although there are benefits brought by the flipped classroom approach, the two teachers considered the importance of parents' support and cooperation among colleagues. Their responses are listed as follows:

- *Home-school cooperation is important. I think parents' support is necessary when students watch online videos at home.* (Teacher A)
- *Teachers have to spend a lot of time on searching or preparing suitable videos. Therefore, it would be great to work as a team. One teacher can be responsible for preparing videos for one lesson topic.* (Teacher B)

5 Discussion and conclusion

Based on the results presented above, regarding the use of the flipped classroom approach for teaching English vowel letters in a primary school in China, it can be found that the participating students' perceptions towards the flipped classroom, as the learners involved in previous studies (e.g. Mok 2014; Musib 2014; Nouri 2016) were generally favourable. As many students nowadays are visual learners (Rammal 2006), watching videos can make them enjoy learning. Also, the students' positive feelings can be explained by the advantages of the approach: helping them to fully understand the contents of the lesson topic via flipped classroom activities, and developing their self-management and self-study skills. Only a very small percentage of them expressed negative feelings about their flipped classroom experience: learning has become more difficult

(2.7%), heavy workload (1.5%), feel helpless (1.1%), and become less motivated to learn (0.8%). Through watching some videos before attending face-to-face lessons, students can learn the target sounds easily because they can repeat the videos again and again until they have mastered the pronunciation completely. Apart from helping to learn pronunciation, through watching videos, students can also learn some new English words (the example words shown in the videos when introducing a certain sound).

Even though there are benefits of the flipped classroom approach, for students who had their first year of studying English as a foreign language, it may be a challenge for them to watch the 'English-only' videos. However, only a small number of students from the flipped classes partly understand the lesson videos (19.74%, 14.47% and 18.42% respectively for the videos about the 'e', 'o' and 'u' sounds) and none of them expressed that they do not understand the lesson videos. This may imply that the selected videos are suitable to them in terms of their levels as the videos are all short in time duration, with slow and clear narration and a lot of visuals (UCLES 2019).

Not only were the participating students mostly positive towards the flipped classroom approach, but also the teachers teaching the flipped classes. All the two participating teachers agreed that the flipped classroom approach can save a lot of lesson time for teaching and more class time can be spent on student practice and correcting students' pronunciation mistakes. Brown (2018) points out that greater student responsibility to learning is essential for the successful implementation of the flipped classroom approach. This is particularly important for the school involved in this study because only a limited number of lessons are allocated for the English subject in a week and therefore, students need to study the lesson topics by themselves through watching lesson videos before attending face-to-face classes.

Regarding whether students can have a significant gain in the subject knowledge taught through a flipped classroom, this research echoes the result of Zhang's (2018) flipped classroom study of English pronunciation. In the two flipped classes in this study, the mean score ($M = 15.62$, $SD = 3.84$) obtained by the students in the post-test was higher than that obtained in the pre-test ($M = 9.89$, $SD = 3.64$). In other words, the null hypothesis had to be rejected as there was a statistically significant difference between the mean scores obtained from the pre- and post-tests, meaning that the students in the two flipped classes have a significant gain in the knowledge of the vowel letters taught through the flipped classroom pedagogy.

Finally, whereas Zhang et al.'s (2016) study shows that the mean score of the final exam in the flipped class was significantly higher than that in the non-flipped class in which the traditional teaching mode was used, an opposite result was found in the present study. In this study, the mean scores of the non-flipped classes were higher than those of the flipped classes in both pre- and post-tests ($M = 10.05$, $SD = 4.09$ vs. $M = 9.89$, $SD = 3.64$ in the pre-test and $M = 15.75$, $SD = 2.82$ vs. $M = 15.62$, $SD = 3.84$ in the post-test respectively), though the difference was not statistically significant.

One major limitation of this study is the design of the pre- and post-test. All items of the test paper are multiple-choice items in which students had to find out the word which has the vowel sound that is different from the other three options in each item. Although it is easy to score multiple-choice items accurately, there is a higher chance for students to random guess the answer (McAllister and Guidice 2012) which makes the results less reliable (Burton 2001).

Another limitation is that lesson observations were not conducted in this study. The present study focused mainly on students' and teachers' perceptions of the flipped classroom approach, students' involvement in out-of-class activities (i.e. watching lesson videos before face-to-face lessons), together with students' learning outcomes after implementing the flipped classroom approach. However, what students did during class time, which is also an important component of the flipped classroom approach, was not analysed.

Lastly, simply relying on the learning diaries to find out the amount of effort the students from the flipped classes put on watching lesson videos before face-to-face lessons can be problematic. The exact number of times the students had watched the lesson videos and the amount of time spent on the videos may be exaggerated, which in turn can affect the reliability of the results. As suggested by Nunan (1992, p. 123), it is hard to determine if the learning records can "realistically reflect what was really going on at the time the recordings were made".

6 Implications for practice and future research

Based on the findings collected and the limitations of the current study, we can draw some implications for practice and future research.

First, the flipped classroom approach should be promoted in the EFL classrooms in China even in the primary level. It is an effective approach for teaching pronunciation because students can listen to the correct pronunciation again and again by rewinding and repeating the videos until they have mastered it. Then more class time can be saved for students' practice and teacher giving feedback to their pronunciation.

Moreover, collaboration among teachers is essential when implementing a flipped classroom. It can be rather time-consuming to find or prepare suitable lesson videos and may add extra workload to teachers. Therefore, staff collaboration should be encouraged by having one teacher responsible for searching or preparing lesson videos for one lesson topic and then sharing with other teachers.

On the other hand, home-school cooperation is necessary. Parents can provide some support to their children (especially primary children who are in the beginning stage of learning English as a foreign language) when they watch lesson videos at home so that they will not feel helpless. Parents can also help to supervise their children to make sure that they have watched the videos at

home before attending classes at school so as to facilitate effective implementation of the flipped classroom.

In future research, the design of the pre- and post-tests should be modified. First, apart from having multiple-choice items, there should be other types of question items (e.g. giving a word and asking students to write its vowel sound). Apart from having a written test, an oral test should be designed in which students are required to read aloud some words to assess their accurate pronunciation of the target vowel sounds. By adding an oral part, the validity (face validity) of the test can be achieved, as Hughes (2003) mentions that a test is valid if it can accurately measure what is intended to measure.

Also, in-class activities should be investigated by having class observations. As mentioned previously, watching lesson videos before attending classes is only part of the flipped classroom approach. It may be the in-class activities (e.g. student practice) and teacher's teaching (e.g. correcting students' pronunciation) that make students benefit more and help them have gain in subject knowledge, but this needs to be further explored by having class observations in future studies.

Lastly, more sources of data about the amount of effort students from the flipped classes put on watching the lesson videos should be collected in future. The lesson videos should be posted on an eLearning platform which has the function of keeping track of students' course participation such as Moodle, so that teachers and researchers can know the number of times students log-in to the system to compare with the students' learning logs. Then the data will become more reliable.

Appendix 1

Table 7 Videos selected for the flipped classes

Sound	Video	Time duration
e	Phonics Letter E	1 min 52 s
	Long E Sound	3 min 17 s
	Short E Sound	3 min 8 s
	Silent E Song	2 min 8 s
o	Phonics: The Letter O	4 min
	Long Vowel Sound for the Letter O	2 min
	Short Vowel Letter O: Phonics Song	2 min 1 s
u	Long U Sound	3 min 26 s
	Long Vowel U Sound: Letter U Song	2 min 5 s
	Short U Sound	1 min 39
	Short U Phonics Lesson	3 min 12

Appendix 2

Pre-/Post-test

Letters and Sounds (a, e, i, o, u)

年级_____ 班 姓名_____ 成绩_____

出下列各组单词标线部分发音不相同的一项。(100分)

( )	1.	A. h**a**t	B. c**a**t	C. m**a**ke	D. m**a**p
( )	2.	A. d**a**te	B. d**a**d	C. m**a**ke	D. n**a**me
( )	3.	A. h**a**ve	B. c**a**ke	C. f**a**ce	D. gr**a**pe
( )	4.	A. **a**go	B. **a**bout	C. **a**way	D. **a**pple
( )	5.	A. p**i**nk	B. p**i**g	C. **i**ce	D. b**i**g
( )	6.	A. f**i**ve	B. s**i**x	C. n**i**ne	D. l**i**ke
( )	7.	A. r**i**ce	B. f**i**ne	C. **i**t	D. n**i**ce
( )	8.	A. s**i**te	B. m**i**lk	C. b**i**t	D. **i**ll
( )	9.	A. l**o**t	B. n**o**te	C. h**o**t	D. n**o**t
( )	10.	A. r**o**se	B. n**o**se	C. l**o**st	D. C**o**ke
( )	11.	A. d**o**g	B. h**o**me	C. h**o**pe	D. J**o**e
( )	12.	A. d**o**	B. **o**ld	C. wh**o**	D. wh**o**se
( )	13.	A. c**u**te	B. **u**se	C. d**u**ck	D. t**u**be
( )	14.	A. **u**p	B. c**u**be	C. exc**u**se	D. m**u**sic
( )	15.	A. c**u**t	B. **u**s	C. b**u**s	D. c**u**te
( )	16.	A. p**u**t	B. p**u**ll	C. p**u**sh	D. p**u**pil
( )	17.	A. b**e**	B. h**e**	C. r**e**d	D. sh**e**
( )	18.	A. m**e**	B. l**e**t	C. b**e**d	D. p**e**ncil
( )	19.	A. g**e**t	B. s**e**t	C. n**e**t	D. w**e**
( )	20.	A. c**a**ke	B. h**i**de	C. r**i**ce	D. sh**e**

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