J. Comput. Educ. (2020) 7(2):213–228
https://doi.org/10.1007/s40692-020-00153-w

Gamified flipped EFL classroom for primary education: student and teacher perceptions

Di Zou[1]

Received: 29 September 2019 / Revised: 1 January 2020 / Accepted: 3 January 2020 /
Published online: 10 January 2020

Abstract Flipped classroom, as an innovative and effective approach, has been widely applied in language teaching and learning, but little is known about primary students' and teachers' perceptions of gamified flipped classroom. This research conducted a 1-year project on gamified flipped English as a foreign language classroom among 277 primary students and 8 teachers. Data concerning students' and teachers' perceptions were collected by means of in-class observations, interviews, meeting minutes, researchers' observation logs, and teachers' and students' self-reflections and were analyzed according to the grounded theory and thematic analysis. The results showed that both students and teachers agreed on such advantages of gamified flipped classroom: increased learning motivation and engagement, developed learning skills and confidence, and improved learning performance and outcomes. However, teachers considered pre-class self-learning as an essential part of flipped classroom and played an important role in helping students remember and understand the basic knowledge so that more time was available in class for gamified and interactive activities that aimed to assist students' applying, analyzing, and evaluating of the knowledge, yet not all students indicated favorable attitude toward it. Such differences were probably related to the students' understandings of the flipped classroom, English proficiency levels, self-regulated learning skills, and ages.

Keywords Flipped classroom · Language learning · Primary education · English as a foreign language

✉ Di Zou
dizoudaisy@gmail.com

[1] The Education University of Hong Kong, 10 Lo Ping Road, Tai Po, NT, Hong Kong

Introduction

Flipped classroom refers to a reversion of normal pedagogical processes in which direct instructions that have traditionally taken place in class now move outside the classroom, and interactive activities that involve high-order thinking skills constitute the main practices inside the classroom (Hwang et al. 2015; Zou and Xie 2018). Since its proposal around two decades ago, flipped classroom has been widely applied to diverse education areas, and positive results such as improved academic performance and teacher–student relationships, increased learning motivation and engagement, as well as fostered interactions and collaborations among learners have been reported (Hsieh et al. 2017; Zou et al. 2018). The importance of technology in promoting learning motivation and performance has also increased the impact of technology-enhanced language learning (Fabian et al. 2016; Gu et al. 2015). Moreover, flipped classroom has drawn increasingly more attention from the research community of language education, as its student-centered nature is aligned with the mechanism of effective language teaching and learning (Hung 2018). Consistent with the results of research on flipped classroom for non-language specific subjects, studies on flipped language classroom have also found that flipped language learning is advantageous as pre-class activities that focus on remembering and understanding can warm students up for in-class activities that emphasize applying, analyzing, evaluating, and creating (Kim et al. 2017).

Flipped classroom for language education

Previous literature on flipped classroom for language education is generally of second language acquisition, and English is the main target language that was investigated. The pre-class self-learning, which refers to the delivering of language knowledge in students' private space and time before class, is basically in the format of videos and associated exercises; and the in-class activities in group space and time are normally in the format of pair or group discussions, exercises, or projects (Bergmann and Sams 2012; Hung 2018). A wide range of research issues have been investigated, including students' academic performance, motivation, engagement, confidence, high-order thinking skills, self-regulation, and perception of flipped language learning (e.g., Lee and Wallace 2018; Wang and Qi 2018; Yang et al. 2018). The measurement and data collection methods and tools include tests, presentation assessments, questionnaire surveys, interviews, researcher observation, analysis of log systems or online learning records, as well as weekly journals (e.g., Hao 2016; Kim et al. 2017; Tseng et al. 2018). Concerning the types of students who tend to benefit most from flipped language classroom, the literature indicates that learners of more learning experience, higher level of motivation, and older age ought to make the best use of such an effective and innovative approach (Chuang et al. 2018; Collins and Muñoz 2016). However, most previous studies were conducted among

secondary or university students, and it is uncertain whether primary students who were younger and had comparatively lower language proficiency levels can also benefit from flipped classroom.

Gamified flipped language classroom

Integration of games in language learning has been widely applied and investigated by teachers and researchers (Hung 2018). Hung et al. (2018) conducted a scoping overview of digital games in language education and found that various games, such as immersive games, notably massively multiplayer online role-playing games, tutorial games, exergames, simulation games, and adventure games, had been applied in language learning. The review also indicated that game-based language learning featured positive results, especially those related to students' affective or psychological states and language learning outcomes. Hung (2018) applied technology-enhanced board games in flipped classroom and reported that gamified flipped classroom assisted university students' English learning by promoting their motivation to engage in in-class activities and reducing their anxiety of speaking.

Nevertheless, research showed that novice teachers who were interested in flipped classroom showed concern about how to engage students and make use of the freed-up class time, and students may also consider the face-to-face instruction less organized when teachers acted as a guide on the side, rather than an instructor on the stage (Zack et al. 2015). Considering that games are effective in enhancing student engagement, integration of games in the flipped classroom may assist novice teachers to engage students. Moreover, as primary students are particularly interested in games, and game-based learning is typical for primary education (Ryu 2013), it is of interest to implement gamified flipped classroom in primary English education. However, most studies on flipped language classroom were conducted among secondary or university students, while the implementation of flipped classroom for primary language education has rarely been investigated. Moreover, the majority of previous studies were of short term, and little long-term research has been conducted. In addition, teacher perceptions of flipped classroom have been seldom discussed, although teachers play an indispensable role in the process. The present study therefore aims to investigate primary student and teacher perceptions of long-term gamified flipped EFL classroom. The research questions are listed as follows.

1. How did primary students perceive gamified flipped EFL classroom?
2. How did primary teachers perceive gamified flipped EFL classroom?
3. Were there any differences or similarities between students' and teachers' perceptions?
4. Based on teachers' interviews, what were possible reasons for the differences or similarities?

Method

This study conducted a long-term project on gamified flipped EFL (English as a foreign language) classroom among 157 primary-four students, 120 primary-five students, and 8 teachers. The whole project lasted for a year, and six rounds of flipped classroom were implemented for both grades of students. Data concerning the teacher and student perceptions of the gamified flipped classroom were collected by means of ethnographic in-class observations, interviews, meeting minutes, researcher's observation logs, and teachers' and students' self-reflections. The data were analyzed according to the grounded theory (Glaser and Strauss 2017) and thematic analysis (Nowell et al. 2017).

Setting and participants

The project was conducted in a typical local primary school in Hong Kong. Its overall rank was in the middle range of all Hong Kong primary schools. The students aged from 9 to 11 and were beginning EFL learners with Cantonese as their mother tongue. The primary-four students had received formal English education for approximately 4 to 5 years on average, and the primary-five students had learned English formally for around 5 to 6 years. Their reading level ranged between 11 and 15 based on the guide of the Curriculum Development Council of the Hong Kong Education Bureau (2017). The numbers of male and female students were almost identical. These students were taught by eight teachers who had professional certificates and degrees for primary English education and over 5 years of English teaching experience in local Hong Kong primary schools but had never conducted flipped classroom before joining this project. All participants were informed of the research scope, the use of the collected data, and their right to withdraw at any time, before confirmed their willingness of the participation in this study by signing consent forms.

Three experienced teacher trainers with expertise in technology-enhanced language learning and flipped classroom trained the eight teachers to conduct flipped classroom in their English classes based on Lee et al. (2017) ADDIE model (analysis, design, development, implementation, and evaluation) for project design.

Analysis, design, development, implementation, and evaluation of the flipped classroom

At the analysis stage, the teachers and teacher trainers held roundtable discussion meetings to analyze the objectives, students, content, teaching resources, and activities, as well as the learning environments for the flipped classroom. Detail meeting minutes were kept for further use.

At the design and development stages, the teachers and teacher trainers worked together to decide and create the materials and activities for the online learning and face-to-face (F2F) sessions. Based on the analysis results, relevant decisions

were made considering student factors (i.e., their English proficiency levels, learning abilities, difficulties, needs, and family support , and so on), teacher factors (i.e., their IT skills, work load, teaching objectives and schedules, and so on), and school factors (i.e., the available e-resources, the English learning environment, and the IT support, and so on). During these processes, continuous communications among teachers and trainers took place in diverse formats such as group emails, WhatsApp messages, collaborative Google Doc writing, and editing. Six videos and associated online exercises were created for primary-four students, and six videos and associated exercises for primary-five students. The videos were all approximately 3 min long, as primary students may not be able to maintain concentration longer than this time limit. Such a length also aimed to achieve high completion rates among students. The associated exercises were mainly multiple-choice or true-or-false questions. Edpuzzle was employed as the platform to organize and show the videos and associated exercises as it could provide students with real-time feedback immediately when they submitted answers

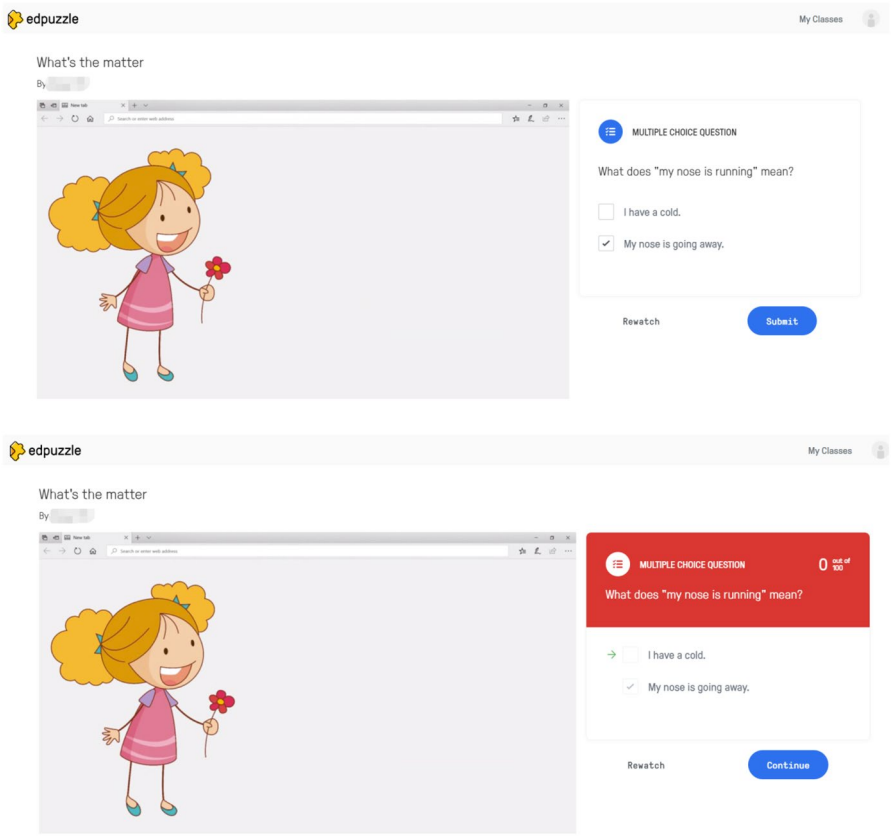

Fig. 1 Once an answer was submitted to the Edpuzzle, the system provided immediate feedback indicating the correct answer

to the system (see Fig. 1). Moreover, it was convenient for teachers and parents to check students' progresses of video-watching and exercise completion in Edpuzzle. Additionally, it was free of charge and easy to use. Concerning the F2F sessions, the formative assessments and learning activities were mainly in the format of games, and a range of tools such as Kahoot!, Nearpod, Socrative, Quizlet, and Padlet were applied.

At the implementation stage, the teachers explained to the students how to log in the Edpuzzle platform, watch the videos, and answer the questions that were embedded in the videos. Students were also empowered to control their learning progresses on the platform through pressing the "Play/Pause," "Submit," and "Rewatch" buttons and adjust the volume and screen size. In the F2F sessions, various assessments and activities were gamified with interactive elements such as competitions, collaborations, and discussions. For example, as demonstrated in Fig. 2, the Kahoot! game asked players to select the correct answer by touching the corresponding color box using their iPads. The more correct answers the students submitted, and the more quickly they reacted, the more scores they would obtain in different rounds of the game. The final ranking of the students who had the highest scores would be presented on the screen at the end of the game. Kahoot was often used in the gamified flipped classroom because it was interactive, interesting, easy to use, and free. Moreover, the participating teachers and students had used it in their classes before. Like Edpuzzle, Kahoot! also provided students with immediate feedback after all students submitted their answers or when time is up. If a student's answer was correct, a congratulation interface appeared in her/his device, showing her/his current ranking and rewarded score; if the answer was incorrect, a notification interface appeared. Depending on the student's general performance, proper encouragement and compliments were given from time to time, aiming to maintain her/his interests and motivation. At the end of the game, a rank of students' scores was presented on the Scoreboard, forming a positive competition where everyone was encouraged to perform better in following rounds of the game by paying more efforts. To further consolidate students' knowledge, teachers also explained the assessment items one by one.

Fig. 2 The Kahoot! vocabulary learning game

The last stage, evaluation, was conducted via several means. Firstly, class observations were conducted by teacher trainers (also researchers). The observer sat in the back corner of the classroom and wrote observation notes quietly to minimize the potential researcher influences on the teachers and students. Detail notes concerning the class procedures, what and how gamified activities, and assessments were organized, how teachers and students were involved in them, and whether learning objectives were achieved were kept. Secondly, the evaluation stage of a former round of ADDIE process was the analysis stage of the following round of ADDIE, and in the roundtable discussion meetings, the teachers were asked to reflect on their design, development, and implementation of the previous flipped classroom and share their thoughts and feelings freely. Cyclically, the ADDIE process repeated six times, and throughout the year, the researchers kept writing notes to record explicit details of the project. As a summative evaluation after six ADDIE rounds, the students were asked to report their perceptions of the gamified flipped classroom by answering short questions such as "do you enjoy the gamified flipped classroom," "if yes, which aspects do you like?", "is this approach useful for you," "if yes, which aspects are useful?". Moreover, the teachers were interviewed with questions like "will you continue use flipped learning in your pedagogy," "what achievements/difficulties do you have," "what aspects do you think can be further improved," "what is your overall evaluation of this approach to teaching and learning." The interviews were conducted face-to-face, one by one, in Cantonese and with no time limit, aiming to encourage teachers' full expression of their opinions. Moreover, the data concerning the students' learning performance were collected through pre- and post-tests that focused on the target vocabulary, phrases, and key sentence structures.

Data analysis

The data concerning students' engagement in pre-class self-learning were analyzed by examining students' completion rates and grades as shown in the Edpuzzle management board. For example, Fig. 3 presents an Edpuzzle screenshot of a class's information such as the students' names, completion rates, grades, and turned-in-time, and Fig. 4 demonstrates the explicit answers to different questions as provided by the student. Teachers could also check how many times a student had watched different parts of the video (i.e., the video views per portion). Based on such data, teachers could know (1) what students found difficult to understand, and more explanations were necessary, (2) who needed additional help, and (3) how the following lesson plans should be developed accordingly.

The data concerning students' engagement in the in-class gamified activities and their perceptions of and attitudes toward the new approach to learning, as collected by researchers' and teachers' observations, researcher journals, and students' self-reflection at the end of the project, were analyzed according to the grounded theory. Students' perceptions, as indicated by their performance in the online and face-to-face sessions and their self-reflection, were firstly categorized into four main types (i.e., positive perception, negative perception, doubts and concerns, and suggestions). This first stage of categorization helped the researcher obtain an overview

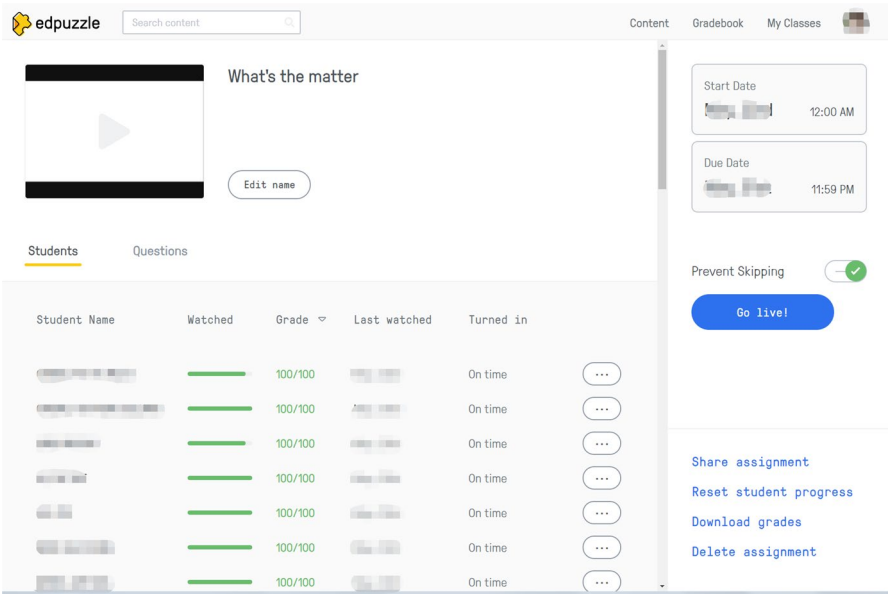

Fig. 3 An Edpuzzle snapshot

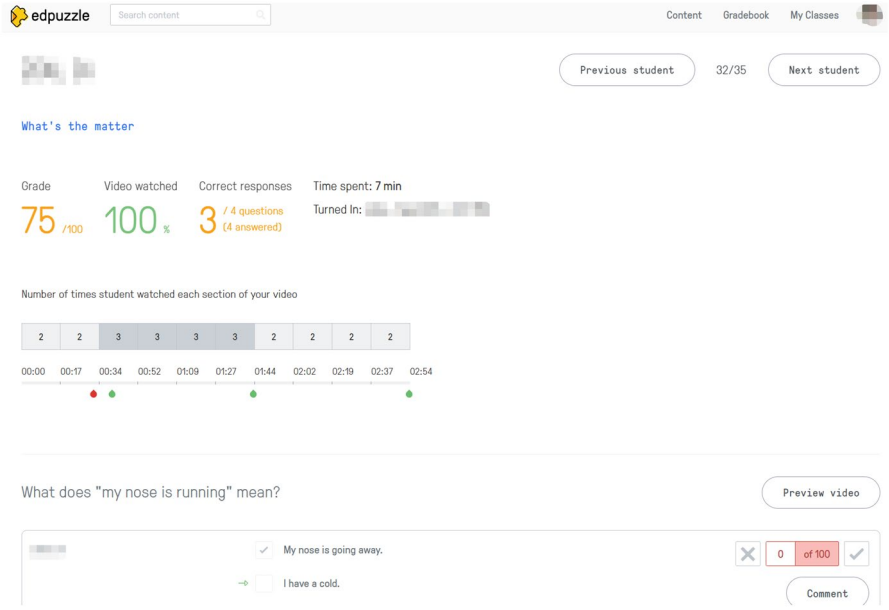

Fig. 4 A snapshot showing the number of times a student watched each section of the video and the answers to different questions

of the data, based on which, the students' performance data and self-reflection were further analyzed together with the researcher's observation logs to understand why students behaved or perceived in such ways. In a similar way, the data concerning teachers' perceptions of the gamified flipped classroom which were collected through roundtable discussion meetings, interviews, and researcher journals were analyzed. Such data concerning teachers' perceptions were categorized into four main types first, including positive perception, negative perception, analysis of problems (and solutions), and reporting of challenges (and suggestions). After obtaining an overview through this categorization process, the researcher further analyzed the data taking into account her observation notes and journals.

Results

Students' perceptions of the gamified flipped classroom

Students' perceptions of the gamified flipped classroom were very positive as indicated by their self-reflection. The primary-four and primary-five students shared similar perceptions although they learned different content. Almost all students agreed that this new approach to teaching and learning was more interesting than the previous ones that they experienced before and were willing to keep learning in this innovative way. Around 95% students considered the gamified flipped classroom "fun," "interesting," "exciting," and "joyful," and almost 90% of the students stated that they were "fully engaged in the gamified learning in class." When the students were asked which aspects of the gamified flipped classroom they enjoyed, over 70% of them mentioned that they loved the in-class interactive games and activities. Approximately half of the students stated that they liked having more opportunities and time to talk and play with their classmates. However, around a quarter of the students regarded the pre-class self-learning "challenging," "troublesome," and "involving heavy work load." Some students preferred that teachers were by their sides while doing the pre-class learning, and one student asked, "why not doing it in class." Nevertheless, over three quarters of the students stated that they were confident in overcoming the difficulties of pre-class self-learning and felt proud that they could learn by themselves. Moreover, around four-fifths of the students agreed that flipped learning was worthy and valuable despite of its challenges.

The Edpuzzle data also showed very high completion rates and grades, indicating that the students were able to complete the pre-class self-learning and benefited from it. Specifically, the overall completion rates of the six rounds of ADDIE model-based flipped classroom were, respectively, 92.35%, 88.53%, 75.16%, 82.16%, 86.62%, and 90.45% for the 157 primary-four students and 95.00%, 89.16%, 85.00%, 81.66%, 87.5%, and 91.66% for the 120 primary-five students. Such high completion rates evidenced that the students were motivated in the pre-class learning. Although there was a mild decline of the completion rates in the middle phase of the project, probably due to the students' reduced feeling of freshness for the new learning method, the rates raised gradually at the latter phase of the project, indicating the general high engagement. Concerning the accuracy of the primary-four students' Edpuzzle

answers, on average, approximately 50% students had 80% or above accuracy rates, 40% had 60% or above, and 10% below 60%. In addition, concerning the accuracy of the primary-five students' Edpuzzle answers, around 55% students had 80% or above accuracy rates, almost 50% had 60% or above, and fewer than 10% below 60% on average. Such high accuracy rates indicated the facilitative effects of the pre-class self-learning in helping students understand the basic language knowledge.

Moreover, the researchers' class observation notes recorded that students were actively engaged in the in-class gamified activities. They answered questions proactively, demonstrated positive learning attitude and high engagement in interactive gamified activities. Very satisfactory learning outcomes were also achieved. Additionally, such findings were triangulated by teachers' observations as reported by them in the roundtable discussion meetings. According to the teachers, after completing the pre-class learning, most students appeared much more prepared.

Teachers' perceptions of the gamified flipped classroom

Teachers believed that the gamified flipped classroom was effective in promoting students' motivation, confidence, and communication and self-regulated learning skills. Aligned with students' self-reflection and researchers' observation, all teachers mentioned that students proactively participated in various gamified class activities, and even the students who used to be quiet and shy were actively involved in learning, indicating high motivation of students in learning. Moreover, as students were provided with rich opportunities to interact with each other in class, their communication skills can be well practiced and improved, and with better communication skills, students became more confident in English learning since the main cause of their low self-esteem was poor speaking skills, as analyzed by two teachers.

Furthermore, the teachers were glad that most students were able to complete the pre-class self-learning satisfactorily. Two teachers also mentioned that they "felt a bit surprisingly happy that the majority of the students were willing to spend time learning at home." However, one teacher reported that "several students were not self-disciplined enough to complete the pre-class self-learning well, and they watched the instructional videos right before the class or even in class, which went totally against the goal of flipped learning." Three other teachers reported similar problems and concerns. Nevertheless, the problems existed only among several students out of 157 primary-four and 120 primary-five students (i.e., the percentage was below 3%), while the majority of the student participants benefited from the flipped classroom in the right way.

Additionally, seven out of eight teachers mentioned that, in their opinions, students with low English proficiency but high motivation benefited most from the gamified flipped classroom. They could watch the videos several times at home until comprehensive understanding was achieved, and as teachers did not need to deliver long lectures in class, they had more time to offer personalized scaffolding to students in need, so these students were provided with the greatest and best assistance in the gamified flipped classroom.

Concerning the work load of analyzing, designing, developing, implementing, and evaluating the flipped classroom, all teachers agreed that the load was heavier than usual for the first time, but as the teaching resources could be re-used in the following flipped teaching, it would be less time-consuming to conduct flipped classrooms in future. Moreover, having experienced the advantages of flipped classroom such as better teacher–student relationships, more interactions in F2F sessions, and better learning outcomes, all teachers were willing to keep flipping their classes.

Differences and similarities between students' and teachers' perceptions of the gamified flipped classroom

The main differences between students' and teachers' perceptions of the gamified flipped classroom were related to the pre-class self-learning. Teachers regarded it very meaningful and important and believed that it promoted students' self-regulated learning skills. Most teachers mentioned that as the instructional videos and associated exercises assisted students in achieving basic remembering and understanding of the key knowledge before class, more time could be spent on applying, analyzing, and evaluating the knowledge in class. Furthermore, as students could learn at their own pace at home and watch the videos many times to ensure comprehensive understanding of the basic knowledge, the pre-class self-learning functioned well in preparing students for the gamified activities in class. After completing the pre-class self-learning, the students also became more confident about themselves in class, as reported by the teachers and observed by the researchers. However, compared to the teachers who showed very positive attitude toward the flipped classroom, students generally showed less favorable attitude toward the pre-class self-learning, and some students felt uncomfortable about the fact that teachers did not offer direct instructions but asked them to watch videos and learn by themselves. A few students even stated that they did not like the pre-class self-learning as they preferred to be taught first and then do exercises. Several students felt that "this is not real learning." Nevertheless, the percentage of the students who indicated such concerns was very low (i.e., around 3%), yet almost all students stated that they loved the videos and felt them useful for their understanding of the key knowledge. Such a case that not all students indicated favorable attitude toward the flipped classroom is understandable, as it is very challenging, if not impossible, to satisfy all students. Different learners have different expectations, needs, and preferences.

The first main similarity between students' and teachers' perceptions was related to the role of gamified flipped classroom in promoting students' motivation. The teachers reported that most students were very engaged in diverse learning activities, and even the students with lower language proficiency levels participated in them proactively. The students also demonstrated great passion and interest in the gamified flipped classroom. Moreover, both teachers and students agreed that gamified flipped classroom promoted effective learning. The teachers mentioned that as the pre-class learning had warmed students up for deeper learning, more relevant topics can be explored in class, richer opportunities can be created, and they could spend more time assessing students' learning and providing them with instant feedback.

From students' perspectives, more resources were provided to facilitate their understanding of the key knowledge, and interesting learning activities were conducted to assist their applying of the knowledge, thus better learning outcomes were achieved.

Discussion and conclusion

This research conducted a 1-year ADDIE model-based project on gamified flipped classroom among 157 primary-four students, 120 primary-five students, and 8 teachers. The results showed that the students generally considered gamified flipped classroom motivative, engaging, effective and worthwhile despite of its challenges. The teachers regarded it effective in promoting students' motivation, confidence, and communication and self-regulated learning skills, and very helpful for students with low English proficiency but high motivation. That is, both students and teachers agreed on such advantages of gamified flipped classroom: increased learning motivation and engagement, developed learning skills and confidence, and improved learning performance and outcomes. These findings were aligned with Schmitt's (2008) argument that increased motivation led to increased engagement.

However, their perceptions of the pre-class self-learning were unidentical. Teachers understood that it was an essential part of the gamified flipped classroom and played an important role in helping students remember and understand the basic knowledge so that more time was available in class for gamified and interactive activities that aimed to assist students' applying, analyzing, and evaluating of the knowledge. Students, however, indicated less favorable attitude toward it, and some did not understand why they were asked to complete it although they enjoyed watching the videos and perceived them useful. Generally, such differences were probably related to the students' understandings of the gamified flipped classroom, their English proficiency levels, self-regulated learning skills, and ages.

Possible reasons for the differences and similarities

Specifically, one possible reason that may explain the differences between students' and teachers' perceptions of the gamified flipped classroom was that some students did not understand the purposes and nature of flipped learning. Although the students were taught the purposes and nature of the flipped learning during the six ADDIE rounds throughout the year, some of them may not fully comprehend such information, possible reasons of which might include their young ages and limited cognitive capacities. The students may not consider the pre-class self-learning as an essential part of the gamified flipped classroom which set up the knowledge foundation so that more time could be better used in the group space to explore more topics in greater depth and practice skills at higher levels. In other words, they did not understand why the pre-class self-learning was important and how it contributed to the effectiveness of the learning at the latter stage, so they demonstrated less favorable attitude toward the pre-class self-learning, compared to the gamified in-class activities. Moreover, the misunderstanding of the nature of the gamified flipped

classroom by some students led to their misperceptions that pre-class self-learning was simply watching videos; and gamified in-class learning activities were just playing games.

Furthermore, the diversified English proficiency levels and self-regulated learning skills of the students were possible reasons for their different attitudes toward the pre-class self-learning. The students with lower English proficiency levels tended to meet more challenges and hence more easily felt frustrated while completing the pre-class self-learning. Also, the students with lower self-regulated learning skills may not know how to set up learning goals and environments, organize time, and select and adopt strategies to complete the pre-class self-learning, so they did not benefit much from the pre-class self-learning and underestimated its importance. For these two types of learners, the work load may seem greater, and the tasks may appear more daunting, as they needed to spend more mental efforts and longer time on the work. Moreover, the participants were primary-four and primary-five students aged from 9 to 11, so they were generally less self-disciplined than teenagers and adult learners (Bergmann and Sams 2012). The pre-class self-learning therefore was very demanding for them, and their attitude toward it was not as positive as the teachers.

Additionally, some students were used to the passive way of learning in which teachers provided direct instructions, and students received input, did exercises, and then checked the answers given by teachers. So, they felt uncomfortable of not being provided with direct instructions first and considered gamified activities not real learning. However, only a very small number of students thought in this way, and these students all reported that they loved watching the videos, found them useful for learning, and enjoyed participating in the gamified activities, which indicated that these students had benefited from the gamified flipped classroom despite of their underestimation of it.

Concerning the similarities between students' and teachers' perceptions, one reason was likely that both parties had experienced and observed the benefits of the gamified flipped classroom in promoting motivation and learning effectiveness. As primary students were very interested in games and interactions, they were motivated and fully engaged in in-class activities; and as flipped classroom helped teachers provide students with more personalized support (i.e., immediate and constructive feedback and assistance) based on their learning performance and needs, better learning outcomes were achieved.

Implications of this research

The findings of this study were basically consistent with previous literature and provided further support to the argument that flipped classroom helped but would not lead to huge improvements on primary students' learning performance and skills in the beginning year (Chuang et al. 2018; Doman and Webb 2017; Lee and Wallace 2018). This is mainly because of the primary students' young ages, limited cognitive capacities and self-regulated learning skills, etc. Also, as many primary school students found it challenging to achieve satisfactory learning outcomes through

the independent online learning, they tended to have difficulty conducting further higher-order learning activities in class. The effects of the flipped classroom for primary school students were therefore not so promising as those for university students. To solve such problems, the teachers in this project sometimes briefed the students the basic knowledge that was covered in the online learning sessions at the beginning of the face-to-face sessions when a high percentage of students showed insufficient basic knowledge. Nevertheless, as learning is a continuous process, and this research found that gamified flipped classroom led to development of primary students' English learning motivation and confidence and self-regulated learning skills, it is suggested that teachers and students keep flipping the classroom for primary English education. According to Loewen (2014), high degrees of motivation and engagement were the prerequisites of deep learning and tended to result in effective language acquisition in the long term; thus, it is necessary to continue the flipped EFL classroom, and more significant benefits are likely to be observed.

To better facilitate the students to make good use of the flipped learning, teachers are advised to explain the purposes and nature of flipped classroom explicitly to the students in the beginning, assisting them to understand what they need to do, why these are necessary, and how they can complete them effectively and efficiently. Moreover, more scaffolding (e.g., reminders, consultations, parent support, and so on) at different stages of the flipped classroom is necessary. Reminders from time to time can help students of low self-discipline or poor time management skills remember to complete the pre-class self-learning. Moreover, parent support is essential for the development of a family environment that is conducive to learning. Considering that a major challenge for the primary students is the pre-class self-learning at home where parents are by their side, parent support would contribute greatly to the success of flipped learning.

Limitations of this research

This research is limited in that the teachers' and students' perceptions are to some extent self-reported, and future studies are advised to apply more approaches to triangulating the results.

Moreover, the focus of this research is on teachers' and students' perceptions, while issues such as the learners' development of self-regulated learning skills and teachers' development of flipped teaching skills are of research impact, and hence, it is suggested that future research work on such areas.

Furthermore, this project only flipped the classes six times in 1 year. This is because all the flipped materials and activities were designed and developed by the primary school teachers, rather than researchers, in this project. The teachers devoted extra time and efforts on all teaching and learning sessions, resources, and activities after working hours, so the number of flipped sessions was limited. The frequency of the flipped classroom was almost once a month, as teachers needed such an amount of time for the design and development of the flipped sessions, and there were no regular classes in May, June, July, August, and December in Hong Kong primary schools. Nevertheless, future research may consider flipping more sessions.

This limitation of involving only a small number of flipped sessions in the research restricted students' exposure to the flipped teaching approach and may influence the results, but it to some extent showed the challenges that we may face when implementing flipped classrooms in authentic teaching and learning environments without researcher intervention.

The fourth limitation is that the perceptions and outcomes of the students with different online learning frequency and time were not analyzed, and that the students' online learning frequency and time with or without gamification were not compared. Follow-up studies may work in such directions for more in-depth investigation on the gamified flipped classroom.

Additionally, the data of this project were mostly descriptive statistics. If more assessments can be conducted throughout the project year from time to time, and sophisticated statistical analysis can be applied to examine the students' learning performance, the results would be more convincing. Future research is therefore advised to include more formative and summative assessments and analyze such data to examine the long-term influence of flipped classroom.

Acknowledgements This research received Grants from the Standing Committee on Language Education and Research (EDB(LE)/P&R/EL/175/2), the Education Bureau of the Hong Kong Special Administrative Region, the Internal Research Grant (RG93/2018-2019R), and the Internal Research Fund (RG 1/2019-2020R), the Education University of Hong Kong. We would like to thank the student and teacher participants for giving their consent to conduct the research project and publish the data.

Compliance with ethical standards

Conflict of interest There is no conflict of interest regarding this research.

Ethical approval Consent was obtained from the participants, the parents, the local primary school, and the anonymized organization. The work had passed relevant ethical review processes, and the code of ethics and the privacy rights of human subjects were observed throughout the project. The data contain no personal or personally identifiable information.

References

Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day*. Washington, DC: International society for technology. (**in education**).

Chuang, H. H., Weng, C. Y., & Chen, C. H. (2018). Which students benefit most from a flipped classroom approach to language learning? *British Journal of Education Technology, 49*(1), 56–68.

Collins, L., & Muñoz, C. (2016). The foreign language classroom: Current perspectives and future considerations. *The Modern Language Journal, 100*(S1), 133–147.

Doman, E., & Webb, M. (2017). The flipped experience for Chinese university students studying English as a foreign language. *TESOL Journal, 8*(1), 102–141.

Fabian, K., Topping, K. J., & Barron, I. G. (2016). Mobile technology and mathematics: Effects on students' attitudes, engagement, and achievement. *Journal of Computers in Education, 3*(1), 77–104.

Glaser, B. G., & Strauss, A. L. (2017). *Discovery of grounded theory: Strategies for qualitative research*. London: Routledge.

Gu, X., Wu, B., & Xu, X. (2015). Design, development, and learning in e-Textbooks: What we learned and where we are going. *Journal of Computers in Education, 2*(1), 25–41.

Hao, Y. W. (2016). Middle school students' flipped learning readiness in foreign language classrooms: Exploring its relationship with personal characteristic and individual circumstances. *Computers in Human Behavior, 59,* 295–303.
Hong Kong Education Bureau. (2017). English language education key learning area curriculum guide (primary 1-secondary 6). Retrieved from https://www.edb.gov.hk/attachment/en/curriculum-development/kla/eng-edu/cdc_ele_kla_curriculum_guide_(p1-s3)_2002.pdf.
Hsieh, J. S. C., Wu, W. C. V., & Marek, M. W. (2017). Using the flipped classroom to enhance EFL learning. *Computer Assisted Language Learning, 30*(1–2), 1–21.
Hung, H. T. (2018). Gamifying the flipped classroom using game-based learning materials. *ELT Journal, 72*(3), 296–308.
Hung, H. T., Yang, J. C., Hwang, G. J., Chu, H. C., & Wang, C. C. (2018). A scoping review of research on digital game-based language learning. *Computers & Education, 126,* 89–104.
Hwang, G. J., Lai, C. L., & Wang, S. Y. (2015). Seamless flipped learning: A mobile technology-enhanced flipped classroom with effective learning strategies. *Journal of computers in education, 2*(4), 449–473.
Kim, J. E., Park, H., Jang, M., & Nam, H. (2017). Exploring flipped classroom effects on second language learners' cognitive processing. *Foreign Language Annals, 50*(2), 260–284.
Lee, J., Lim, C., & Kim, H. (2017). Development of an instructional design model for flipped learning in higher education. *Educational Technology Research and Development, 65*(2), 427–453.
Lee, G., & Wallace, A. (2018). Flipped learning in the English as a foreign language classroom: Outcomes and perceptions. *TESOL Quarterly, 52*(1), 62–84.
Loewen, S. (2014). *Introduction to instructed second language acquisition*. London: Routledge.
Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods, 16*(1), 1609406917733847.
Ryu, D. (2013). Play to learn, learn to play: Language learning through gaming culture. *ReCALL, 25*(2), 286–301.
Schmitt, N. (2008). Instructed second language vocabulary learning. *Language Teaching Research, 12*(3), 329–363.
Tseng, M. F., Lin, C. H., & Chen, H. (2018). An immersive flipped classroom for learning Mandarin Chinese: Design, implementation, and outcomes. *Computer Assisted Language Learning, 31*(7), 714–733.
Wang, Y. P., & Qi, G. Y. (2018). Master-based language learning outside class: Learning support in flipped classrooms. *Language Learning & Technology, 22*(2), 50–74.
Yang, J., Yin, C. X., & Wang, W. (2018). Flipping the classroom in teaching Chinese as a foreign language. *Language Learning & Technology, 22*(1), 16–26.
Zack, L., Fuselier, J., Graham-Squire, A., Lamb, R., & O'Hara, K. (2015). Flipping freshman mathematics. *Primus, 25*(9–10), 803–813.
Zou, D., & Xie, H. (2018). Flipping an English writing class with technology-enhanced just-in-time teaching and peer instruction. *Interactive Learning Environments*. https://doi.org/10.1080/10494820.2018.1495654.
Zou, D., Xie, H., & Wang, F. L. (2018). Future trends and research issues of technology-enhanced language learning: A technological perspective. *Knowledge Management & E-Learning: An International Journal, 10*(4), 426–440.

Di Zou is an Assistant Professor from The Education University of Hong Kong. Her research interests include technology-enhanced language learning, game-based language learning, and flipped classroom. She has published more than 30 research papers in international journals, including Computers & Education, Computer-Assisted Language Learning, Language Teaching Research, and British Journal of Educational Technology. She is an editorial board member of the International Journal of Mobile Learning and Organization, a guest editor of the International Journal of Distance Education Technologies and the International Journal of Innovation and Learning, and a book editor of Current Developments in Web-based Learning.