Performance Evaluation of the Application of Smart Flipped Classroom in Classroom Guided Teaching

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Abstract—The emergence of the smart flipped classroom has since changed the traditional teaching mode in China: students are stimulated to independently learn in advance, and teachers provide classroom guidance according to the problems encountered by students, help students deal with difficult knowledge, and guide them with homework to improve multidimensional learning performance. These advantages lead to various proposals for its application and performance evaluation in classroom-guided teaching. By collecting teaching-related data from students in both the smart flipped and the traditional teaching classroom, the performance of the smart flipped classroom in the classroom-guided teaching was evaluated from three aspects: online learning performance, examination results, and after-school homework results. Results indicate there is a significant difference between students' learning performance before and after application of the mode. The smart flipped classroom teaching mode improves students' academic performance along with the significant difference between students' academic performance and traditional teaching mode. The mode effectively mobilizes students' learning initiative and improves their learning satisfaction. Conclusions herein play a certain guiding role in changing mainstream teaching modes and improving students' learning concepts.

Keywords—Smart flipped classroom, guided teaching, application and performance evaluation, subjective initiative, teaching mode

1 Introduction

As a new and seemingly effective teaching mode, smart flipped classroom plays an important role in teaching various subjects in China, especially in English teaching. Since the 21st century, various colleges and universities have built several smart flipped classroom teaching networks to popularize the construction of college teaching reform and improve the efficiency of talent training. The model emerged earlier in foreign countries and is likewise more common. In the 1990s, famous Harvard University physics professor Eric Mazur initially created the prototype of smart flipped classroom to improve student enthusiasm of students. Later, other researchers made continuous improvements, eventually becoming today's smart flipped classroom. This new teaching

mode in turn upended orthodox teaching modes, effectively transforming the cramming teaching method in traditional classrooms into practice. In smart flipped teaching mode, students could actively and independently receive new knowledge following teaching videos and other relevant multimedia teaching resources. In that context, it has effectively changed the problems left over from the traditional classroom, allowing it to comprehensively improve and enhance the learning efficiency of and provide effective assistance in deepening China's education reform.

In the new round of college teaching reform, China attaches great importance to the dominant position of students' classroom. To effectively stimulate student enthusiasm for learning, guided teaching plays an active role where in paying more attention to student classroom performance and positive speech. Guided teaching is an inquiry-based teaching mode that guides students to carry out learning exploration activities and enables them to independently summarize key points of earning. The introduction of smart flipped classroom in this mode (combined with the new education mode) provides an intuitive impact on the improvement of college learning quality. Currently, the research on the application of smart flipped classroom in guided teaching is mainly realized through the effective evaluation and analysis of its teaching effect. For the research on the performance of smart flipped classroom in guided teaching, it is necessary to study the key influence of this new model in the guided classroom and the evaluation of the effective cooperation between students and teachers in teaching process.

Among them, the degree of students' satisfaction and interest in this kind of teaching model are the key indicators. The learning differences of different students after the application of smart flipped classroom were analyzed and key indicators of performance evaluation were determined according to the differences. Currently, most Chinese colleges and universities apply the smart flipped classroom to guided classroom teaching, thus effectively improving the rigid teaching mode of the traditional college classroom, quickly heightening the overall quality of learning of college students, and comprehensively promoting the reform of higher education in China to make important efforts in deepening its education reform.

2 Literature review

In classroom-guided teaching, teachers make students the "leader" of the class in smart flipped classroom, and students take the initiative to learn through materials such as videos, texts, and others. Here, students confirm the difficult knowledge points so that in the guided classroom, teachers then summarize these difficult knowledge points for students to understand and provide professional knowledge and guidance in solving said difficult problems. In the teaching-guided classroom, students mainly ask questions, discuss, cooperate and solve problems with each other, allowing them to feel the charm of teaching-guided classroom and smart flipped classroom and improve their academic performance.

This is shown in the many studies focusing on the role and application effect of smart flipped classroom in collegiate-level flipped classroom teaching mode, poor accuracy of the statistical analysis of scores, and virtually non-existent classification of data due to excessive teaching resources, Xiang [1] proposed an evaluation algorithm of collegiate English flipped classroom teaching mode using data mining.

The algorithm research determined corresponding teaching strategies and their main analysis characteristics, and data mining algorithm was applied to improve the accuracy of data classification. Experimental results indicated that after the application of the method, the flipped classroom teaching mode of college English achieved a higher rate of resource sharing, higher accuracy in performing statistical analysis, and provided a good teaching effect. Zhang et al. [2] designed a new intelligent college English classroom teaching mode to promote the intelligent development of education and realize the effective implementation of the intelligent classroom teaching mode by setting experimental classes and student surveys. Ahmed et al. [3] analyzed students' cognitive mastery and fairness in smart flipped classroom which has been long proposed as an alternative teaching mode to improve students' knowledge and skills, engagement, and self-efficacy. Meanwhile, the increasing growth of college enrollees includes catering to their rapidly changing and diverse needs. This makes it necessary to improve their cognitive mastery and enhance equity within their boundaries. The method investigates the impact of flipped classroom on improving students' cognitive mastery and fairness. Here, flipped classroom is used in teaching the undergraduate course "Introduction to Teaching Technology". Inside the classroom, whiteboards and smart boards are used to discuss and clarify ambiguous ideas related to the topic and present model answers to the task. Outside the classroom, video files and Google apps (Word, PPT, and Drive) are used to provide learning materials. WhatsApp is used for communication and Google Forms for designing learning activities and making assessments. Results demonstrated the following: (1) To some extent, flipped classrooms improve students' cognitive mastery, especially when performing learning tasks and following teacher instructions, and (2) Flipped classroom improve student fairness. These provide implications in using the flipped classroom to manage the diversity of college students by improving equity of college students and enhancing their abilities.

Jo et al. [4] proposed the effectiveness of adding educational game elements into the online teaching system of flipped classroom to increase participation and interest of students in pre-class online preparation. The study was conducted to understand the sequence of 20 classes over a seven-week course of automation equipment for 30-year-old high school students at Renchuan Technical High School. Surveys and in-depth interviews were conducted after class to measure student learning attitudes. Results found that compared with traditional flipped learning using YouTube, the preparation participation of flipped learning using game elements increased significantly from 65.56% to 78.89%. Next, the comparison of academic achievements showed that the diagnostic assessment before the application of game elements was 57.44, eventually reaching 20.17 after the application. However, for the summative assessment, the degree after the application of game elements was statistically higher at 84.52, compared to 78.86 before application. A comparison between academic performance and the results of word games also found no significant correlation between them, indicating that all students were able to enjoy word games. Moreover, when the average scores for the word games were compared against the students' grades, the scores of medium-to-high-level students were statistically significantly higher than those of high-level students. Last, analysis of the correlation between attitude and word games indicated a high quantitative correlation between competitive spirit and interest in the ranking system, with the latter increasing the spirit of competition and interest.

Gren et al. [5] applied flipped classroom to the teaching of software engineering to provide more active learning time in class and improve students' performance. Generally, it must carry on a longitudinal study on the flipped classroom approach; although said approach can increase students' learning by providing more time for other classroom activities (such as active learning), the study is also rare in software engineering teaching. Expected results include evaluating the use of flipped classroom teaching mode in software engineering teaching. The results show that teaching software engineering topics by introducing a flipped classroom could improve students' academic performance (as measured by test scores). However, this might not extend to students' subjective preferences for material (as measured by student evaluations). Also, when changing the teaching team, the change in teaching methods does not replicate its effect. To promote students' learning performance and knowledge application ability, Ynl et al. [6] integrated flip learning into various disciplines to increase the opportunities for students to practice and solve learning difficulties under teacher guidance. Nonetheless, previous flip studies have focused more on students' performance in terms of cognition, while courses designed to develop students' skills and strategies have often been overlooked. To solve this, the method proposed a "scaffolding, questioning, interacting, reflecting and comparing" (SQIRC-based mobile flipped learning) method to enhance pre-class instruction and classroom reflection by referring to the theory of cognitive apprenticeship and reflective practice. Results demonstrated that SQIRC-based mobile flipped learning significantly improved students' performance in billiard ball hitting strategy, self-efficacy, and learning motivation. Designing video activities with reflection and contrast guidance was proven key in promoting students' billiards strategies and skills in flipped learning, effectively stimulating student self-reflection, and promoting the improvement of sports performance, self-efficacy, and intrinsic motivation.

Cao et al. [7] believed that the flipped learning network based on the artificial intelligence method (FLN-AI) strategy could improve the quality of college English teaching. These include strategies such as strengthening the formation of teachers, revising previous teaching evaluation methods, managing teacher attitudes on time, correctly understanding the role of teachers as users of educational technology in college English education, focusing on the integration of teaching materials and teaching software, and implementing various teaching methods to strengthen interaction inside and outside the classroom. This method analyzed the reasons for the fluctuation of classroom concepts, essentially forwarded the importance that teachers attached to flipped classroom teaching mode in college English teaching, and created and explored the flipped classroom ideas based on the characteristics and theoretical basis of flipped classroom teaching. The numerical results of this paper were students' learning of English at 96.8%, teachers' stress reduction at 98.3% and the development of an appropriate educational curriculum at 94.7%.

Zhang et al. [8] believed that the flipped classroom teaching mode had attracted much attention in China because it reversed the traditional teaching process and innovated a new teaching structure. It thus took flipped classroom English teaching based on WeChat as the research object and constructed a flipped classroom teaching mode based on the platform. This then revealed three advantages: a focus on core competencies in English, the creation of a U-shaped learning environment, and the sharing of digital opportunities. Bernauer [9] explained how performances were used in flipped classroom environment in college educational psychology classes. This teaching method also contained the concept of "comprehensive assessment" where

both assessment and teaching were closely linked. Examples of student-led instruction using performance were then provided. Recently, teachers evaluated to trigger student to make evaluations on these teaching practices, with results indicating that the teaching method worked for most, but not all students. Dolzhich et al. [10] proposed that the reform of college English translation teaching in recent decades mainly drew on its predecessors' theoretical knowledge. Current college-level English classroom translation teaching show problems such as the use of single teaching method (classroom teaching was the main teaching with practice being the auxiliary). In various fields of English learning, including listening, speaking, reading and writing, theoretical and empirical research on blended learning models have gradually improved. Therefore, creating a clear and efficient classroom and scientifically and reasonably change to the teaching mode of college English translation has become an important teaching topic for teachers. English translation teaching in the digital age has likewise been suggested to also transform: The mixed teaching mode offered in CET-4 fully stimulates students' learning enthusiasm, extends learning time, and improves classroom efficiency. Results showed that 75.2% of students and teachers were satisfied with flipped classroom, with the method itself also having prospects for broad application.

Abdullah et al. [11] studied the impact of flipped classroom model on English learners' oral English motivation level. Liu [12] also discussed the reform and innovation of English curriculum and studied the coherent integration of MOOC, flipped classroom, and ESP. Kustandi et al. [13] studied flipped classroom in college teaching to stimulate students' enthusiasm for learning and encourage them to carry out inquiry-based learning. Zheng et al. [14] argued that the era of big data has subverted the classic education model and further promoted flipped classroom in college teaching. Flipped classroom has changed the learning mode and the relationship between teachers and students along with the psychology of both teachers and students changed, which could produce a series of psychological effects when teaching English. Huang et al. [15] analyzed the impact of flipped English classroom intervention on students' information and communication technology and English reading comprehension. Wang et al. [16] studied the application and effect of CBI in college English flipped classroom. Lee et al. [17] investigated the performance effect analysis of smart flipped classroom for English flipped learning in foreign language classrooms. Shaffer [18] viewed studies on the teaching effect of high school English classroom teachers in classroom teaching. Recino et al. [19] also explored the teaching effect of flipped classroom after its application in teaching English education. Dong [20] analyzed the application effect of flipped classroom in college English teaching. Lastly, Kou et al. [21] showed that the flipped classroom teaching model of English translation is based on big data and its teaching performance results.

3 Methodology

Based on the application of relevant literature in different courses, this study looks at the application and performance evaluation of smart flipped classroom. Here, English majors from Guangzhou Institute of Technology were used as research objects. The experimental group was taught using smart flipped classroom teaching mode, while the control group was taught using traditional teaching mode. The online learning

behavior, teaching performance, and classroom satisfaction indices of students in both groups were analyzed to effectively see the application and performance evaluation of smart flipped classroom in teaching-guided classroom.

3.1 Research objects

92 students majoring in English from Batch 2020 in Guangzhou Institute of Technology were selected as the research objects in March 2021. They were divided into Class A and Class B. Class A was set as the experimental group while Class B was set as the control group. There were 20 boys and 26 girls in Class A, and 15 boys and 31 girls in Class B. During the 3 month study period, the teaching mode of English majors in Class A used smart flipped classroom teaching model, while the teaching mode in Class B maintained the traditional teaching mode of the college. In the three months of study, both classes learned the same content. A comparative study was conducted on the teaching results after 3 months. The specific sample statistics is as shown in Table 1.

Table 1. Statistics of objects

Objects	Sex	Quantity	Percentage/%
Students	Female	57	52.44
	Male	35	32.2
Teachers	Male	2	50
	Female	2	50
Total	96		–

3.2 Research process

To verify whether smart flipped classroom teaching is effective for college guided education, the learning objectives of this experiment were as follows:

(1) Master unit vocabulary and grammar;
(2) Ably summarize the main points of listening materials;
(3) Flexibly use the knowledge learned.

Students in the experimental class were taught in groups of two or more. The group was based on the best level of students, which was conducive to mutual promotion among students. A leading learner was selected from each group and was mainly responsible for supervising the group members and ensuring the smooth progress of activities. The characteristics and learning styles of students were considered in group allocation. Effective grouping ensures the smooth progress of teaching activities and promotes the learning effect of students under this mode.

Following the setting of the course objectives, the network learning space was selected as the supporting environment for this study selected the SAIKAI-based E-learning network learning space promoted by Guangzhou Institute of Technology, which mainly included course management, course organization (online testing, homework, online discussion and question room, etc.), course survey statistics (questionnaire survey and statistical analysis) among others.

3.3 Data collection

Here, online learning behavior data, teaching performance data, and classroom satisfaction data of students in the experimental class and the control class were effectively collected. Online learning behavior mainly included oral reading, learning feedback behavior, and online learning interaction behavior. Teaching performance data collection mainly included online learning performance results, test results, and homework results. The teaching performance calculation formula was as follows: learning behavior + academic performance = online learning behavior (20%) + offline learning behavior (20%) + usual homework (10%) + unit test (10%) + final work (10%) + final examination (30%).

Learning satisfaction data were collected through the satisfaction questionnaire survey comprising two parts: the basic information content of students, the satisfaction of teaching effect of smart flipped classroom, and the satisfaction evaluation of teachers' classroom performance. The reliability analysis of the questionnaire is shown in Table 2.

Table 2. Reliability analysis of questionnaire

Main Index	Secondary Index	General Index	Correlation Coefficient between Index and Evaluation Content	Reliability Coefficient
Teaching-guided participants	Teachers	Teaching goal of smart flipped classroom teaching	0.75	0.85
		Role of guidance in class	0.74	
		Innovation of flipped classroom teaching content	0.75	
	Students	Time for watching teaching video before class	0.82	0.84
		Interaction in flipped classroom	0.79	
		Active performance in class	0.83	
Smart flipped classroom teaching support	Teaching resources	Resource richness	0.68	0.79
		Resource reliability	0.65	
	Teaching platforms	Support of teaching-guided personalized platform	0.74	0.82
		Operation stability	0.70	

4 Results analysis

For the different modes of learning performance analysis of the experimental group and the control group, this study analyzes the most intuitive performance distribution through the data of the highest score, the lowest score, and the average score. According to the difference in test results between the two groups, respective to students' academic performance, the influencing factors of students' academic performance under different modes were also analyzed.

4.1 Comparative analysis of the scores of students in different groups

In the application and performance evaluation of the teaching-guided classroom, the final scores of the experimental group and the control group were intuitively analyzed, and the scores were ranked. The final English scores of both groups are shown in Figures 1 and 2.

Results in Figures 1 and 2 show that the experimental group performed better than the control group. Final scores shown in Figures 1 and 2 show that the final scores of the middle school students in the experimental group were mainly distributed in the range of 70–89 points, among which the total score of 70–79 was about 33.5%, and that of 80–89 was 52.5%. The interval between both groups was relatively high, indicating that 80% of the final scores of the experimental class were within the range. Among the scores in the range of 90 points and 100 points, the students in the experimental class accounted for about 11.7%, while those in the control group were only about 6.5%, and the score distribution of the students in this group was lower than those in the experimental group. Moreover, Figure 2 indicates that the experimental class had a relatively high score hence the certain differences in the academic performance between the two groups, which verified the effectiveness of smart flipped classroom in teaching-guided classroom and could effectively improve students' academic performance.

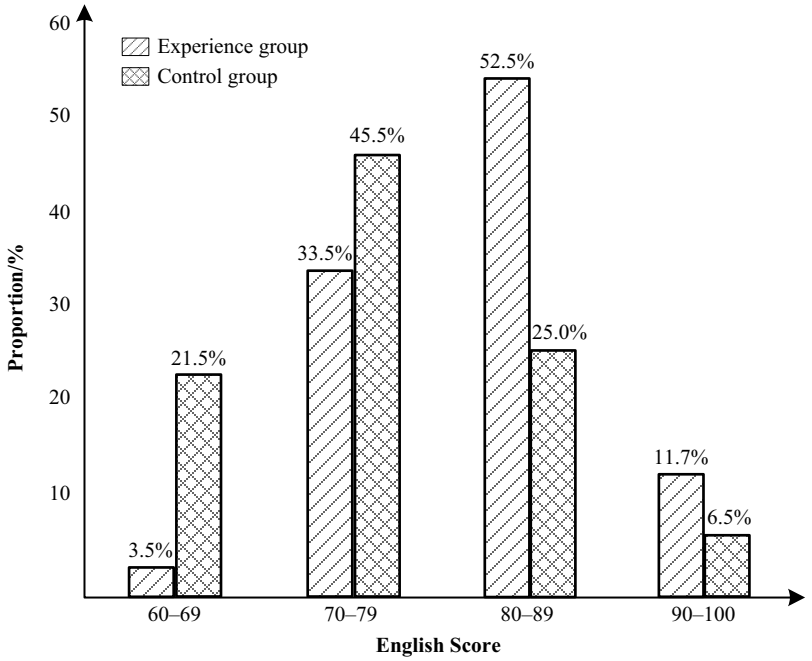

Fig. 1. Final scores of students in different groups

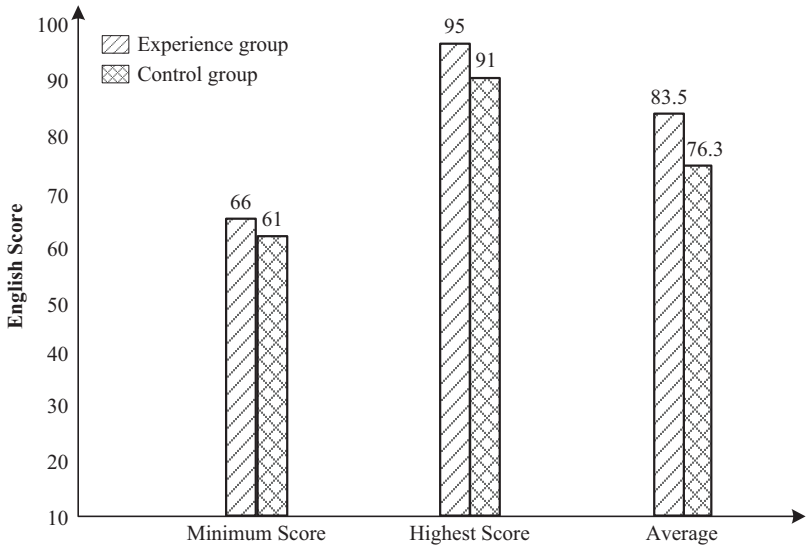

Fig. 2. Three final scores of students in different groups

4.2 Differences in students' academic performance in different groups

To prove that smart flipped classroom improves teaching performance in the teaching-guided classroom, the experiment analyzed the significant difference between the experimental group and the control group and tested the difference between the two groups of students. The results are shown in Table 3.

Table 3. Testing results of differences in students' academic performance in different groups

Items	Average Value		Standard Deviation		*P*-value
	Experimental Group	Control Group	Experimental Group	Control Group	
Score	83.50	76.31	6.20	7.31	0.00

In the test of significant difference, the average values of significance level were 0.10, 0.05, and 0.01 respectively. When the *P* value was less than the value of significance level, this finding indicated the existence of significant differences, relatively significant differences, and extremely significant differences in the correlation levels between both groups. After the test of the difference between the two groups, the average score of the experimental group was notably higher than that of the control group, indicating that the overall level of students in the experimental group was better. There was also a large difference between the standard deviation of the two groups, indicating that the dispersion degree of the experimental students' scores was small i.e., the stability of the

scores in this group was higher than that in the control group. The *P*-value of the student's scores in the two groups was 0.00, which was lower than the standard value, indicating that the application of smart flipped classroom was helpful for students to learn English, which had a significant difference and had an important impact on improving performance of students' scores.

4.3 Learning satisfaction of students in different groups

Based on the abovementioned analysis of the significant differences in learning achievements, it was necessary to further analyze the satisfaction of students in different groups on learning English. This was then done in the form of questionnaire. The questionnaire was divided into three stages: before class, in class, and after class, different factors affecting students' learning satisfaction were selected in each stage, and the descriptive satisfaction statistics were shown in Table 4.

Table 4. Statistics of factors affecting students' learning satisfaction

Stage	Variables	Average Value	Standard Deviation
Before class	Rich learning materials	3.85	0.86
	Independently control learning time and place	4.45	0.87
	Watch over again at any time	2.90	0.62
	Real-time update of content	2.19	1.98
In class	Forms of learning activities	4.13	0.81
	Learning time in class	3.53	1.09
	Teachers' guidance in class	4.57	0.59
After class	Teachers' guidance after class	3.03	0.91
	Set up after-school learning group	2.01	0.78
	Expression ability in after-class discussion	2.43	0.76

Following the factors that affect students' learning satisfaction identified in Table 4, the satisfaction evaluation model was constructed. Assuming that the students' satisfaction was represented by function Y, which was affected by satisfaction factors, Y = 0 meant that students were not satisfied with the learning mode. However, when Y = 1, this meant that students were satisfied with the learning mode. Following the setting evaluation model, the learning satisfaction of the experimental group and the control group was calculated, respectively, with results shown in Table 5.

Table 5. Learning satisfaction results of students in different groups

Stage	Variables	Y-Value	
		Experimental Group	Control Group
Before class	Rich learning materials	1	0
	Independently control learning time and place	1	0
	Watch over again at any time	1	1
In class	Real-time update of content	1	1
	Forms of learning activities	1	0
	Learning time in class	1	1
After class	Teachers' guidance in class	1	1
	Teachers' guidance after class	1	0
	Set up after-school learning group	1	1
	Expression ability in after-class discussion	1	0

Table 5 illustrates certain differences in the satisfaction of teaching before class, in class, and after class. Among them, the experimental group which adopted smart flipped classroom for English teaching had higher satisfaction, and the Y-value of all factors affecting satisfaction was 1. The results of Y-value in the control group were 1 and 0, indicating that the satisfaction of students in the control group under the traditional teaching mode was not high, while the satisfaction of students in the experimental group under the smart flipped classroom teaching mode was high. This verified that the application of smart flipped classroom in the teaching-guided classroom could improve the overall level of students' learning and enable students to be satisfied.

5 Conclusion

With the continuing and intensifying education reform in China, smart flipped classrooms have been widely applied in teaching various subjects. To analyze the effects of this novel method of teaching, this study selected related research objects and tools following detailed research design and studied the learning performance of students under this mode according to setting teaching objectives. The following conclusions can be drawn: there is a significant difference between students' learning performance before and after application of the mode. Student intuitive performance is also better and indicated that they are satisfied with the teaching of said mode, thus verifying the favorable performance and effects of smart flipped classroom in the teaching-guided classroom. Accordingly, the quality of learning materials before class and the transformation of teaching knowledge in the classroom under this model are constantly improved to ultimately improve the performance of guided teaching.

6 References

[1] Xiang, J. (2021). Evaluation of the college English flipped classroom teaching model based on data mining algorithms. Mobile Information Systems, 2021, 1407407. https://doi.org/10.1155/2021/1407407

[2] Zhang, X., Chen, L. (2021). College English smart classroom teaching model based on artificial intelligence technology in mobile information systems. Mobile Information Systems, 2021, 5644604. https://doi.org/10.1155/2021/5644604

[3] Ahmed, M. M. H., Indurkhya, B. (2020). Investigating cognitive holding power and equity in the flipped classroom. Heliyon, 6(8), e04672. https://doi.org/10.1016/j.heliyon.2020.e04672

[4] Jo, J., Jun, H., Lim, H. (2018). A comparative study on gamification of the flipped classroom in engineering education to enhance the effects of learning. Computer Applications in Engineering Education, 26(5), 1626–1640. https://doi.org/10.1002/cae.21992

[5] Gren, L. (2020). A flipped classroom approach to teaching empirical software engineering. IEEE Transactions on Education, 63(3), 155–163. https://doi.org/10.1109/TE.2019.2960264

[6] Ynl, A., Lhh, B., Gjh, C. (2021). Promoting pre-class guidance and in-class reflection: A SQIRC-based mobile flipped learning approach to promoting students' billiards skills, strategies, motivation and self-efficacy. Computers & Education, 160, 104035. https://doi.org/10.1016/j.compedu.2020.104035

[7] Cao, Q., Hao, H., Sabitha, R., Thanjai, V. (2021). Occupational stress management of college English teachers under flipped classroom teaching model. Aggression and Violent Behavior, 101712. https://doi.org/10.1016/j.avb.2021.101712

[8] Zhang, X., Cen, H. (2020). Research on procedures and advantages of flipped classroom based on WeChat: Taking English teaching in open university as an example. Canadian Social Science, 16(4), 46–50.

[9] Bernauer, J. (2020). Using performances in a flipped classroom setting. Learning Landscapes, 13(1), 53–66. https://doi.org/10.36510/learnland.v13i1.1002

[10] Dolzhich, E., Dmitrichenkova, S., Ibrahim, M. K. (2021). Using m-learning technology in teaching foreign languages: A panacea during COVID-19 pandemic era. International Journal of Interactive Mobile Technologies, 15(15), 20–34. https://doi.org/10.3991/ijim.v15i15.22895

[11] Abdullah, M. Y., Hussin, S., Ismail, K. (2019). Investigating the effects of the flipped classroom model on Omani EFL learners' motivation level in English speaking performance. Education and Information Technologies, 24(5), 2975–2995. https://doi.org/10.1007/s10639-019-09911-5

[12] Liu, D. (2016). The reform and innovation of English course: A coherent whole of MOOC, flipped classroom and ESP. Procedia-Social and Behavioral Sciences, 232, 280–286. https://doi.org/10.1016/j.sbspro.2016.10.021

[13] Kustandi, C., Wargahadibrata, H., Fadhillah, D. N., Nursetyo, K. I. (2020). Flipped classroom for improving self-regulated learning of pre-service teachers. International Journal of Interactive Mobile Technologies, 14(9), 110–127. https://doi.org/10.3991/ijim.v14i09.11858

[14] Zheng, S. Y., Jiang, S. P., Yue, X. G., Pu, R., Li, B. Q. (2019). Application research of an innovative online education model in big data environment. International Journal of Emerging Technologies in Learning, 14(8), 125–138. https://doi.org/10.3991/ijet.v14i08.10404

[15] Huang, Y. N., Hong, Z. R. (2016). The effects of a flipped English classroom intervention on students' information and communication technology and English reading comprehension. Educational Technology Research and Development, 64(2), 175–193. https://doi.org/10.1007/s11423-015-9412-7

[16] Wang, Z., An, F. (2020). Application of CBI in college English flipped classroom. International Journal of New Developments in Education, 2(1), 48–50.
[17] Lee, G., Wallace, A. (2018). Flipped learning in the English as a foreign language classroom: Outcomes and perceptions. TESOL Quarterly, 52(1), 62–84. https://doi.org/10.1002/tesq.372
[18] Shaffer, S. (2016). One high school English teacher: On his way to a flipped classroom. Journal of Adolescent & Adult Literacy, 59(5), 563–573. https://doi.org/10.1002/jaal.473
[19] Recino Pineda, U., Elizabeth Minchala, O., Ortega Auquilla, D. (2018). Using the flipped classroom to teach educational models in English at the Education National University (UNAE) of Ecuador. Speech, Language and Hearing, 21(2), 94–97. https://doi.org/10.1080/2050571X.2017.1369068
[20] Dong, X. (2016). Application of flipped classroom in college English teaching. Creative Education, 7(9), 1335–1339. https://doi.org/10.4236/ce.2016.79138
[21] Kou, X., Song, Q. (2022). Improvement of mobile learning model in flipped classroom in English classroom teaching: Based on big data analysis. Mathematical Problems in Engineering, 2022, 4422229. https://doi.org/10.1155/2022/4422229

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