Evaluating the Effectiveness and Challenges of the Rain Classroom-Based Teaching Method in China College Students English Performance: A Systematic Review of Studies from 2016 to 2024

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Abstract

This research systematically reviewed 13 articles published between 2016 and June 2024 that investigated the effectiveness of the rain classroom-based teaching method in the context of college English education in China. The findings suggest that rain classroom is broadly recognized as an innovative and effective intelligent teaching tool, demonstrating significant improvements in students' English performance compared to traditional teaching methods. Beyond enhancing academic outcomes, the method has been shown to foster greater student interest, initiative, and engagement in the learning process. Despite its advantages, certain challenges were identified during its implementation, particularly in addressing the diverse needs of students with varying levels of English proficiency. To maximize its potential, it is recommended that educators utilize Rain Classroom not only as a cognitive tool to promote autonomous learning but also as a complementary approach integrated with traditional teaching strategies. This result emphasizes the need for further research to explore the specific impacts of Rain Classroom on individual English language skills, as existing literature primarily focuses on overall English performance. Also, future investigations should adopt a broader scope by incorporating a wider range of articles and keywords to provide a more comprehensive and nuanced understanding of the effectiveness of the Rain Classroom-Based Teaching method in college English education in China.

Keywords: Rain Classroom-Based Teaching Method, English Performance, College Students in China

1. Introduction

English, as the first global lingua franca, play a vital role in science, engineering, technology, medicine, trade, commerce, scientific research, education, tourism, the Internet, banking, business, advertising, the film industry, transportation, pharmacy (Rao &Parupalli, 2019). The Ministry of Education of China has underscored the importance of English by making it a compulsory subject nationwide, introducing English learning at the elementary school level in 1978 (Hu, 2005). English has become aessential aspect of the national education system, significantly contributing to the country's modernisation efforts, in which 400 million learn English as a foreign language in China (Beijing Evening News, 2019).

The College English course is designed for non-English major college to cultivate their English language abilities in five key dimensions: listening, speaking, reading, writing, and translation (Fan Yang, 2020). Despite years of English education from primary school to university, many Chinese students struggle with speaking, listening, reading, and writing in English, with fluency remaining as the most challenging aspiration (Wu Yuntao, 2019). The traditional approach to English instruction, which persists in China, is recognised as a major contributor to these difficulties (Chen Qian, 2024). Redefining the traditional teaching approach to bolster college students' English proficiency is crucial.

To transform traditional teaching patterns (He Kekang, 2004), information technology has the potential and should be utilised. Specifically, the adoption of smartphone-based course management applications has emerged as a significant avenue for classroom teaching reform (Deng Chao Lu, 2019). In 2016, Tsinghua University introduced a complimentary intelligent teaching tool named "Rain Classroom", which has since gained attraction among domestic universities. This tool integrates the strengths of CMS (Course Management System) and ARS (Audience Response System), creating a novel teaching approach that has garnered widespread approval from university educators and students, with its popularity consistently on the rise (Deng Chao Lu, 2019). Numerous scholars have made an assumption that it can act as a vital instrument and catalyst in reforming college English instruction (Sun Ye, 2016). Data from the China National Knowledge Infrastructure (CNKI) indicate that previous studies on Rain Classrooms have predominantly focused on

theoretical or observational examinations of its practical implementation (Li Lulu & Zhou Qu, 2020); some studies adopt experimental research methods to explore the effects of Rain Classroom-Based Teaching Method (Cao Ye,2019; Wei Wei,2020).

Advances in technology have created opportunities to transform traditional teaching methods (He Kekang, 2004). One such innovation is the "Rain Classroom," introduced by Tsinghua University in 2016, which integrates Course Management Systems (CMS) and Audience Response Systems (ARS) into a smartphone-based platform. This tool has gained widespread approval for its ability to enhance pre-class preparation, in-class interaction, and post-class reinforcement (Deng Chao Lu, 2019). Studies suggest that Rain Classroom can catalyze reforming college English instruction (Sun Ye, 2016), with prior research focusing on theoretical or observational analyses of its practical application (Li Lulu & Zhou Qu, 2020).

However, existing literature lacks a comprehensive analysis of the Rain Classroom's early-stage effects, particularly its empirical impact on English performance (Xia Hailing, 2018). To address this gap, this study reviews articles published between 2016 and June 2024, specifically those employing randomized controlled trials (RCTs) to evaluate Rain Classroom's effectiveness. The inclusion of RCTs ensures robust methodological rigor, minimizing biases and providing reliable insights into the tool's efficacy.

It is crucial to bridge this gap, as an in-depth examination of existing scholarly research on the Rain Classroom-based teaching approach in college English education can provide a rich array of insightful data. This data is instrumental in guiding and enhancing institutional planning and decision-making processes.

Through this process, the main effects of Rain Classroom-based teaching methods on Chinese college students' English performance is aimed to be identified through this study, as reported in the literature. the study seeks to uncover these findings' universal and unique aspects and critically assess the presented results and discussions. By doing so, the study aspires to distill actionable insights for advancing college English education in China.

2. Literature Review

Rain Classroom and its Functions

As blended teaching models have started to grow Tsinghua University pioneered the launch of 'Rain Classroom' in 2016, endeavoring to integrate state-of-the-art information technology into the educational landscape. This initiative is designed to provide data-driven, intelligent support for the teaching process, as articulated by Wang ShuaiGuo (2017). 'Rain Classroom' transcends the limitations of traditional classroom teaching and online learning by offering comprehensive teaching functions encompassing the entire educational journey, from pre-class preparation to in-class engagement and post-class reinforcement, thereby enhancing interaction at each stage. The platform's intuitive design ensures ease of installation and utilisation, operating as a PowerPoint plugin. It facilitates a suite of essential features upon its integration, students can actively participate in online learning, quizzes, interactions, and other educational tasks through the WeChat public account, which is convenient and expeditious. A comprehensive summary of the specific functions is delineated in the table below.

As blended teaching models grow, Tsinghua University pioneered the launch of "Rain Classroom" in 2016, integrating state-of-the-art information technology into education (Wang ShuaiGuo, 2017). Designed to provide data-driven, intelligent support, Rain Classroom bridges traditional and online learning by enhancing interaction across pre-class preparation, in-class engagement, and post-class reinforcement. Its intuitive design, as a PowerPoint plugin, ensures ease of use. Through the WeChat public account, students can participate in online learning, quizzes, and interactions efficiently.

Teaching process	Main functions
Before	Push prep materials ---- can include videos, PPT, exercises, and audio explanations to prep more difficult course content in advance Share quality learning resources withstudents. Students can use the "report teacher" function to give feedback to the teacher on (a)problems encountered in the learning process (b)Push test exercises ---- can contain single choice, multiple choice, subjective, and pre-poll testsat students' level before class to prepare for class content adjustment. (c)Publish course announcements ---- can contain graphic notices, web articles, and online video files; share quality learning resources; remind, urge and guide students to study.
During	(a)PPT is pushed to students' mobile terminals page by page - real feedback from students on what they "lost"; no need to waste time taking pictures and notes. (b)Real-time classroom bullet screen、publication、group discussion and word cloud interaction - let shy students dare to speak their true thoughts and change the classroom atmosphere in the classroom. (c)Classroom real-time quizzes ---- can include single-choice, multiple choice, subjective, and voting functions; teachers get instant access to students' learning; effectively pull back students' attention.
After	(a)Homework push - can include single choice, multiple choice, subjective, and voting homework to reduce teachers' workload to collect homework and correct homework so that teachers have more time to devote to teaching. (b) Collect classroom data to analyze data for scientific and reasonable adjustments to the classroom.

Rain Classroom is an innovative course management system that controls the power of smartphones to connect the intelligent devices of educators and learners, thereby ensuring a seamless integration of educational activities across pre-class, in-class, and post-class phases (X. M. Li & S. Q. Song, 2017). It exceeds the functionalities of established educational platforms such as Edmodo, Schoology, and Google

Classroom by incorporating an Audience Response System (ARS), which all enabling students to be engaged in anonymous question submission, voting, and feedback lecture pacing (D. Baron et al., 2016). Rain Classroom also promotes interactive learning through games and group activities, which enhance the assimilation of course content (Jenifer Santos, 2019). Students can view presentations on their devices, participate in quizzes, and engage in discussions, while also enjoying the ability to ask anonymous questions and endorse posts with 'likes' (Jérôme Hutain& Nicolas Michinov, 2022; D. Baron et al., 2016).

Rain Classroom stands out by combining CMS and ARS functionalities. It allows students to engage anonymously with features like question submission, voting, and feedback on lecture pacing (Baron et al., 2016). Additionally, it incorporates gamified learning, fostering interactivity and improving knowledge retention (Santos, 2019).

A distinctive feature of Rain Classroom is that it integrates bullet screen technology to foster real-time interaction during classroom sessions (Meng XiangLei, Chong LanXiang, & Zhang YanMin, 2017). The capabilities of ARS and Course Management System (CMS)are merged to ensure that Rain Classroom effectively bridges the preparatory, interactive, and consolidatory stages of learning (Jia, R., Meizhen, L., Yu, L., &Yibo, Z., 2023), allowing blended learning components to operate in unison rather than in isolation (Li Yang, 2021). The platform's benefits are further highlighted by its capacity to significantly bolster the quality of offline classes, with evidence indicating that face-to-face discussions based on Rain Classroom in offline settings are markedly effective, leading to a substantial enhancement in students' understanding of the material (Jia, R., Meizhen, L., Yu, L., &Yibo, Z., 2023). Rain Classroom has therefore become an essential instrument and resulted the cornerstone of mobile blended teaching methodologies and classroom interaction.

A unique feature is its bullet screen technology, enabling real-time classroom interaction (Meng XiangLei et al., 2017). This seamless integration across the learning phases significantly enhances offline class quality through active discussions (Li Yang, 2021; Jia et al., 2023). Rain Classroom has thus become a cornerstone of mobile-blended teaching and classroom interaction.

Research on Applying Rain Classroom-Based Teaching Methods to College English Teaching in China

Since its launch in China in 2016, Rain Classroom has garnered widespread attention from educators, it has been incorporated into daily teaching routines and extensive research was conducted from various angles. Given that Rain Classroom is a novel teaching tool in China, there is a limited body of research on the platform from an international perspective. Consequently, this review aims to provide an overview of the studies conducted within China that explore the use and impact of Rain Classroom in educational settings.

Since its introduction, Rain Classroom has gained significant attention in Chinese higher education. It has been integrated into daily teaching and extensively studied for its applications, particularly in university English courses. Yang Fang and colleagues (2016) demonstrated its effectiveness in blending MOOCs with English listening and speaking courses, significantly enhancing student enthusiasm for learning.

The incorporation of Rain Classroom into university teaching has spurred many valuable initiatives focused on amalgamating information technology with educational methodologies, especially within the realm of university English courses. Yang Fang and colleagues from Tsinghua University devised a blended learning activity that integrated MOOCs and Rain Classroom, which was applied to the English listening and speaking curriculum of the 2016 Tsinghua University Summer English Camp. The Survey results revealed that the platform's innovative and engaging interactive features significantly bolstered students' enthusiasm for learning (Yang Fang, Zhang Huanrui, & Zhang Wenxia, 2017).

Cao Ye provided an in-depth analysis of Rain Classroom's role in establishing a blended learning environment within university English translation courses, shedding light on its pedagogical integration (Cao Ye, 2019). A comprehensive examination of Rain Classroom by Lou Ruijiun and assocociates has given impact on university English teaching, elucidating the challenges associated with its application (Lou Ruijuan, 2018). In addition, there are many positive influences of Rain Classroom on the pedagogical evolution of business English translation courses, thus proposing specific strategies for improvement (Chu Lingyun, 2016).

Studies by Cao Ye (2019) and Lou Ruijiun (2018) highlighted Rain Classroom's pedagogical value in translation courses, addressing challenges and proposing strategies for improvement. Gao Lei et al. (2020) used Rain Classroom to develop a smart learning model at New Horizon University, identifying key considerations for implementation. These works underscore Rain Classroom's utility in university English instruction.

Most research lacks experimental rigor. Many studies rely on surveys or interviews, which may not sufficiently reflect actual learning outcomes due to subjective factors (Liu Jianzheng et al., 2021). For instance, Wei Wei (2021) and Deng Chaolu (2019) explored Rain Classroom's effects through questionnaires but did not utilize robust experimental designs like randomized controlled trials (RCTs).

3. Methodology

Data Collection Procedure

The researcher used "Rain Classroom" and "College English" as keywords and data related to relevant publications were extracted from CNKI (China National Knowledge Infrastructure), one of the largest academic literature databases in China. In June, data collection took place from the AHUCM (Anhui University of Chinese Medicine), a research university subscribing to the above database. The data retrieval period was from 2016 to June 30, 2024, in which a total of 107 documents were retrieved.

Data Screening

Before further analysis, all 107 records were screened. In the first screening step, all records from CNKI were integrated into one Excel sheet to check for any duplicates, with a confirmation that there were none. A total of 107 records remained for further analysis.

Inclusion and Exclusion Criteria

To be included in the bibliometric analysis, a document had to satisfy all of the following criteria: 1) an abstract and full text; 2) a research study conducted within the context of Rain Classroom-Based Teaching Method in Chinese college English; 3) a sample respondents involving Chinese college student participants who were randomly divided into an experimental group and a control group, with the experimental group using the "Rain Classroom based"teaching method and the control group using the traditional teaching method; 4) include a pre and post-test; 5) accurate and clear experimental data; 6) out of any conference proceedings; 7) non of review works.

All 107 articles (with title and abstract) were screened under the same inclusion and exclusion criteria. It was found that 94 documentswhich did not meet all seven eligibility criteria, had to be excluded, and the remaining 13 articles that were relevant to the theme and eligible for bibliometric analysis.

4. Results

In this section, we delve into the findings of a systematic review that has carefully examined 13 scholarly articles focused on the Rain Classroom-Based Teaching method and its influence on the English performance of Chinese college students. English proficiency is a multifaceted construct encompassing five core competencies: reading, writing, speaking, listening, and translation. This research endeavor aims to thoroughly analyse the distribution of courses within the English language curriculum and evaluate the effectiveness of the Rain Classroom-Based Teaching method across these diverse linguistic domains. By critically observing the interplay between course offerings and pedagogical strategies, the study seeks to provide a nuanced understanding of the Rain Classroom-Based Teaching method's impact on the development of English language skills among Chinese college students.

Analysis of Course Distribution

Analysis of the articles shows that the majority of the studies (n=10) which conducted the Rain Classroom-Based Teaching method in the course of English College, which is an overall English curriculum including writing, listening, reading, speaking, and translation. Besides, two (n=2) articles are found in the course of reading. Similarly, only one (n=1) article was applied in the course of Translation. Table 1 shows detailed information about the studies grouped based on the varied courses.

Table 1. Course Distribution of Studies

Course	No. Studies	Studies
Reading	2	赵润兴莫茉 2022;邢香玉程芳 2021
Translation	1	曹野 2019
College English	10	郝甜 2021;董燕，张爽 2022;石媛 2021 张爽，董燕 2022;赵瑞雪 2022; 刘晓燕苏静刘晓杰 2023;张娟 2020; 高磊，袁月红，孙宏，刘瑛 2020; 姜晓娜 2020;廖静宇 2020

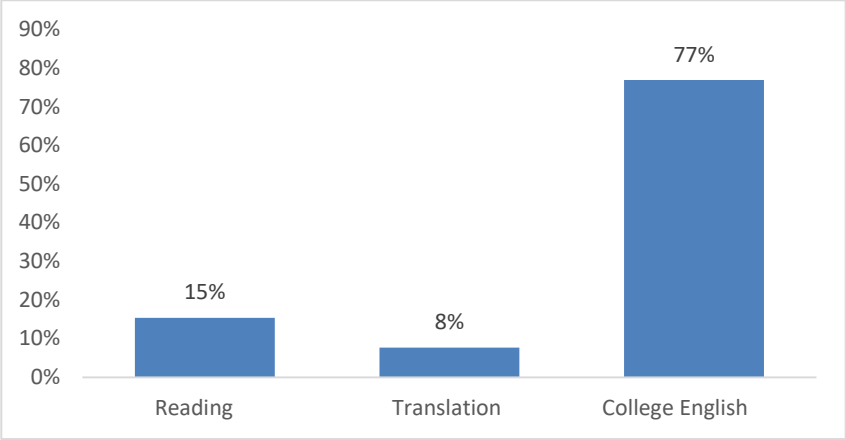

Figure 1. Course Distribution of Studies

Analysis of Effectiveness of Rain Classroom-Based Teaching Method

The results show that the Rain Classroom-Based Teaching method has been deemed a supportive language teaching and learning approach in China. As the findings indicate, the majority of the reviewed studies point out that implementation ofthe Rain Classroom-Based Teaching method improved students' English performance. There were only three studies reported that there were no significant differences between the experimental and control groups.

Table 2. The frequency and percentage effectiveness of the Rain Classroom-Based Teaching method

Effectiveness	Studies	Frequency	Percentage
Improve	赵润兴莫茉 2022;邢香玉程芳 2021 曹野 2019;郝甜 2021;董燕，张爽 2022; 石媛 2021;赵瑞雪 2022;张娟 2020; 高磊，袁月红，孙宏，刘瑛 2020; 姜晓娜 2020;	10	77%
Not Improve			
Other	廖静宇 2020; 张爽，董燕 2022; 刘晓燕苏静刘晓杰 2023;	3	23%

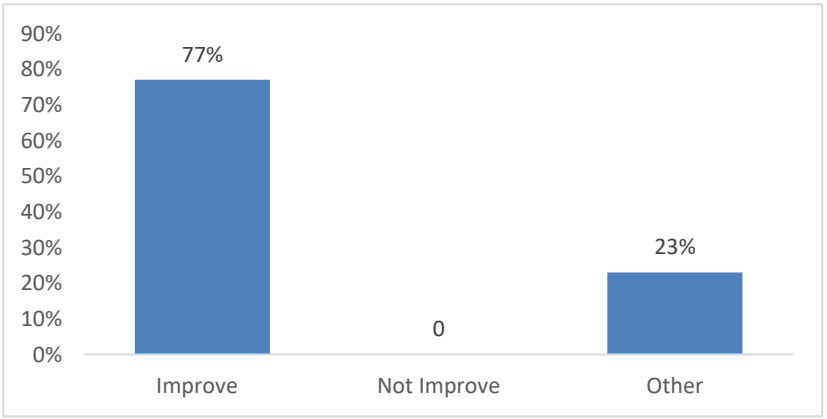

Figure 2. effectiveness of the Rain Classroom-Based Teaching method

4. Discussions

The analysis of the articles revealed that the majority of scholars have reported positive outcomes from the implementation of the Rain Classroom-Based Teaching method, leading to significant improvements in English language performance. Jiang Xiaona (2020) conducted experiments demonstrating that students in Class A, who utilised the Rain Classroom-based mixed teaching model, achieved significantly higher English exam scores than those in Class B, who were taught using traditional methods. The mean difference (MD) was 9.997, highlighting the effectiveness of the Rain Classroom approach.

Hao Tian's (2021) research further corroborated these findings, showing that the CET-4 scores of students in the experimental group surpassed those of the control group, with a p-value of 0.005 for the total scores of both classes. This result indicates a significant difference between the experimental and control groups at the 0.05 significance level, suggesting that the Rain Classroom teaching model is more effective than traditional classroom teaching in enhancing students' comprehensive English skills.

Moreover, students had been giving overwhelming positive feedback towards the Rain Classroom teaching model, with a high proportion of students indicating that it increased their interest and participation in learning. In a study by Dong Yan and Zhang Shuang (2022), 89.73% of students expressed a willingness to participate in classroom activities facilitated by the Rain Classroom, and 81.73% felt their learning engagement had significantly improved. In Shi Yuan's (2021) study, 88% of students were satisfied with the teaching model, 92% of them were willing to continue using it, and 96% believed their interests in learning had increased.

Despite the overall positive reception, three studies did not find a significant effect of the Rain Classroom-Based Teaching method on students' English outcomes. Liao Jingyu (2020) discovered that the experimental group's post-test scores were only 1.16 points higher than the control group's, suggesting that was no significant impact on English performance. Liu Xiaoyan, Su Jing, and Liu Xiaojie (2023) also reported that the higher average test scores of the experimental class at the end of two semesters did not yield statistically significant results.

Furthermore, concerns were raised by Hao Tian (2021) and Zhao Runxing, Mo Mo (2022) regarding the potential for the mobile-based application to interfere with classroom learning if students were lackofself-control. Gao Lei, Yuan Yuehong, Sun Hong, and Liu Ying (2020) posited that the teaching method may be more suitable for students with a strong English foundation and less effective for those with weaker proficiency. Therefore, while the Rain Classroom-Based Teaching method has shown promise in enhancing English language performance and student engagement, its effectiveness may be contingent upon individual student characteristics and the learning environment.

The analysis of the articles revealed that most researchers have integrated the Rain Classroom technology into university English courses to enhance all aspects of English skills, including reading, speaking, writing, listening, and translation. Nevertheless, the utilization of Rain Classroom technology to enhance a specific English proficiency has been very seldom. Due to the unique attributes of each skill acquisition, the Rain Classroom-Based Teaching technique has not consistently fostered all five facets of English proficiency. Hao Tian (2021) employed Rain Classroom as a tool for enhancing students' CET-4 scores in university English instruction. The post-test findings revealed a substantial enhancement in students' overall scores, particularly in their reading and listening abilities. However, there was no significant improvement in their writing scores. difference. Similarly, Dong Yan and Zhang Shuang (2022) conducted experiments that showed the experimental class had slightly improved scores in reading, writing, and translation compared to the control class, but only the listening scores exhibited a significant increase.

The literature analysis indicates that only a few studies, such as those by Zhao Runxing and Mo Mo (2022), Xing Xiangyu and Cheng Fang (2021), and Cao Ye (2019), have made beneficial attempts to apply Rain Classroom technology to specific English skills. Zhao Runxing and Mo Mo (2022) and Xing Xiangyu and Cheng Fang (2021) focused on university English reading instruction, while Cao Ye (2019) explored its application in the field of translation. Their research confirmed that the Rain Classroom-Based Teaching method can significantly improve students' English reading and translation skills.

Therefore, as Xing Xiangyu and Cheng Fang (2021) have advocated, future research should concentrate on areas such as listening, speaking, and writing, which have not yet been fully explored. This will help develop a Rain Classroom-based blended English teaching model that maximizes its potential in enhancing students' English performance across various aspects.

A prominent and respected research approach known as the Randomised Controlled Trial (RCT) pretest-posttest design in the field of educational research, tailored explicitly for evaluating the efficacy of targeted interventions, such as innovative teaching methodologies (Shadish, W. R., Cook, T. D., & Campbell, D. T., 2002). This experimental paradigm involves randomly assigning participants to either an experimental or control group, effectively reducing selection bias and potential confounding factors. The experimental group is exposed to the evaluated intervention, such as a novel teaching approach, while the control group receives conventional instruction or no intervention. Assessments are conducted for both groups at the onset and conclusion of the intervention, offering a comparative framework to gauge the intervention's impact.

Data analysis within RCTs typically leverages appropriate statistical methods to contrast the pretest and posttest results between the experimental and control groups, thereby determining the intervention's effectiveness. Consequently, randomized controlled trials are acknowledged as the gold standard for assessing the efficacy of educational interventions (Higgins, J. P. T., & Green, S. (Eds.), 2011).

In the pursuit of understanding the influence of Rain Classroom-Based Teaching Methods on the English proficiency of Chinese college students, the integration of randomized controlled trials and other experimental methodologies is essential. Utilizing such rigorous research designs bolsters the validity and reliability of the study's findings, fostering a comprehensive appreciation of the impact of these

pedagogical approaches on student learning outcomes.

5. Conclusion

The study reviewed 13 studies on the effectiveness of the Rain Classroom-Based Teaching method in English College in China. It is found that Rain Classroom received much attention as an effective, intelligent teaching tool for teaching and learning English and has a positive impact on enhancing students' English performance. It has been confirmed that implementing Rain Classroom-based instruction instead of traditional teaching approaches significantly improves English performance. While improving academic performance, it also increases learning interest, learning initiative, and participation, thereby bringing substantial changes to classroom teaching and enhancing teaching effectiveness. Nonetheless, despite the benefits, researchers encountered challenges in implementing Rain Classroom-based instruction in the English learning context. To address these challenges, teachers should recognise that using Rain Classroom does not mean abandoning all traditional teaching techniques but rather emphasises using Rain Classroom as a cognitive tool to promote students' autonomous learning. At the same time, teachers need to promptly identify differences in students' learning abilities during teaching, especially for students with poor English language foundations, and effectively supervise and encourage students to repeatedly practice and engage seriously in their studies.

This paper is subject to r limits as it only reviewed a total of 13 published studies. Advisable to contemplate and evaluate a greater number of articles incorporating a wider range of keywords to enhance the accuracy and precision of the conclusions. the findings indicated that most research examined the efficacy of Rain Classroom-based training in college English. Further investigation is required to examine the effects of this on individual English skills.

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Authors' contributions

Shuwen Wang was responsible for conceptualization, methodology, and writing-original draft. Si Na Kew was responsible for data curation, supervision, and writing-review & editing. All authors have contributed equally to this work. All authors read and approved the final manuscript.

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No additional data are available.

Reference

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