

Empirical Study on the Ecological Effects of Online Teaching in College English

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Abstract

With the widespread application of big data and internet technology, the popularity of online courses has been increasing, and online teaching has become the mainstream trend in education. This study aims to explore the implementation effects of online English teaching at the university level, the ecological harmony effects produced by online English teaching, and the inspirations of online language learning ecological effects on teaching. Through empirical research, it was found that during special periods, the adoption of ecological teaching models can effectively facilitate the smooth implementation of blended learning. Based on the theories of educational ecology and language ecology, this study adopts quantitative and qualitative research methods to delve into the ecological effects of online English learners in the teaching environment. The research results not only reveal the existing problems in online teaching models but also propose corresponding solutions. This paper aims to provide reference suggestions for online teaching of university English and related research, promoting the further development of online education.

Keywords: On-line Teaching, College English, Ecological Effect

Introduction

The “College English Teaching Guidelines” (2020 Edition) clearly points out that colleges and universities should incorporate online courses into their curriculum, emphasizing the development of high-quality courses such as open online courses, offline courses, blended online and offline courses (Anthony, B, Kamaludin.Romli, A), virtual simulation courses, and so on. It aims to seamlessly integrate classroom teaching with web-based learning, merging them into a cohesive whole. College English teachers are urged to make full use of online teaching platforms to implement multi-channel teaching that combines online and offline elements so as to stimulate students' enthusiasm and facilitating comprehensive language learning. Furthermore, college English instructors should leverage online teaching platforms to provide students with independent learning paths and abundant resources that integrate classroom instruction with modern information technology, thereby encouraging a shift from passive to active learning (Almonacid-Fierro, 2021). With the increasing prominence of online teaching environments, there is a growing need for research on the effectiveness of college English learning. This research adopts an ecological perspective rooted in the theory of

educational ecological balance to investigate the harmonious factors and key intersections of language learning environments in the context of online settings. The educational ecological perspective applies holistic, covariant, symbiotic, and dynamic equilibrium theories from ecology to study various educational phenomena, their causes, and educational issues (Zhang zhenhui, 2019). It aims to discern educational patterns, reveal directions and trends in educational development, and promote a harmonious, dynamic, and sustainable educational environment. Linguistic ecology, defined in the "Dictionary of Language and Logic," refers to the study of the interaction between language and the environment in fields such as anthropological linguistics, human linguistics, and sociolinguistics. Although the discipline of ecological linguistics is relatively recent, the concept of ecological language has long been ingrained in linguistic research (Mei, 2015). Historical comparative linguists have long expounded on the organic nature of language and the ecological laws governing language development. Humboldt, a 19th-century German linguist, believed that all languages are "organisms." Based on the organic theory of educational ecology and the theory of language ecology, this study makes a quantitative and qualitative study on the ecological effects of college English learners in the online teaching environment, in order to explore the existing problems in the online teaching model and their solutions. The purpose of this study is to provide reference suggestions for college English online teaching and related research.

Conceptual Overview

Ecology originated as a concept in the field of natural sciences but has now extended its scope from the field of natural sciences to social sciences. The concept of educational ecology applies ecological theories such as integrity, covariance, symbiosis, and dynamic equilibrium from ecology to study various educational phenomena, their causes, educational issues, educational laws, directions and trends in educational development, thereby promoting a harmonious, dynamic, and sustainable education. Applying the perspective of educational ecology to explore and research college English education will stabilize and efficiently develop English listening, speaking, and teaching within its external environment, aiding in the formation of a harmonious English audio-visual teaching ecological model (Yingxia et al., 2020). Tudor's publication of "Dynamicity in the Language Classroom" in 2001 and Leather's publication of "Ecology of Language Acquisition" in 2003, which marked the formal development of ecological theories in foreign language classrooms. Classroom ecological theory pays attention to the collaborative construction of classroom ecological subjects by teachers and students, fostering a favorable classroom ecological environment (Holiver et al., 2020), and then to build an organic sum of classroom ecological structures. In the process of the development of college English teaching modes, it has been directly influenced by educational ecology (Lili et al., 2020). Some universities and teachers have developed English ecological teaching models with their own characteristics based on traditional teaching models. English has its own particularity in the process of teaching, under the guidance of ecological language educational pedagogy, the English teaching mode is gradually developing towards a more scientific and reasonable direction. However, the establishment and development of ecological linguistics have a closer relationship with the English ecological teaching model. Ecological linguistics integrates certain viewpoints of linguistics and ecology to develop a new method of language research. In ecological linguistics, people have done some research on the cultural environment of language existence, the environment of language use, and interactions between individuals, so as to develop a new research model of linguistic theory (Fan, 2019). This study will investigate the online learning environment of

college English from the perspective of ecological language education and analyze the ecological effects of college English teaching through practical data analysis(Liu hui, 2020).

Research Design

Research Questions

This study aims to address the following key questions

- (1) What are the effects of online teaching on college students' English learning outcomes, learning efficiency, and motivation?
- (2) How do students perceive online teaching? Are there any students who are not adapted to or resistant to online teaching? How can we improve students' online learning experience?
- (3) Does online teaching of college English produce ecological harmony effects? Is ecological application related to learning outcomes?

Research Subjects

This study selects undergraduate students from a university in East China as research subjects to investigate their participation in online teaching. The teaching mode adopted is purely online, with a total of 4 class hours per week divided into 2 sessions. We distributed questionnaires to 1500 students participating in online college English learning and received 1389 valid responses. According to grade statistics, 54.01% were freshmen, 39.04% were sophomores, 6.95% were juniors, and no seniors participated in the survey. Therefore, the subjects of this study are mainly concentrated in the freshman and sophomore groups.

Research Methods

In order to gain a comprehensive understanding of the impact of online teaching on college students, this study employs a combination of quantitative and qualitative research methods. Specifically, the research uses a variety of methods such as questionnaire surveys, observation, case studies, and interviews. First of all, we distributed questionnaires to 1500 students participating in online learning to understand their views and experiences with online teaching. Simultaneously, during the implementation of teaching, we observed students' learning situations and made tracking records to obtain more intuitive data and information. Additionally, we selected 4 students as case study subjects and conducted in-depth interviews to understand their learning motivations, difficulties, and sense of achievement. The interviews were conducted in a semi-open manner, providing students with a relaxed environment to encourage them to openly share their thoughts and feelings, so as to obtain richer and more in-depth research results.

Ethical statement: this study is survey-oriented and does not disclose any specific personal information, so there is no need for ethical agreements.

Participants were recruited on a voluntary basis, emphasizing in the introduction to the survey that "the survey is anonymous, but if you complete the survey, the researchers will interpret it as a formal agreement to use your answers in future research papers." Therefore, once the participants have completed the questionnaire and interview, the default is that they participate voluntarily.

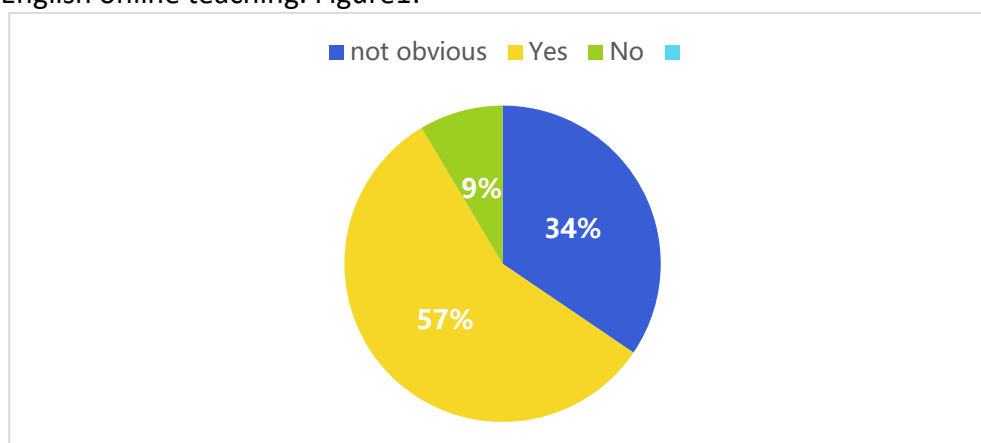
Data Analysis and Discussion

Analysis and Discussion of Questionnaire Results

The survey questionnaire was designed using the Likert 5-point scale. The scale consists of a set of statements, with responses ranging from “Strongly Agree” to “Strongly Disagree,” scored as 5, 4, 3, 2, and 1, respectively and the total score for each respondent reflects their attitude strength or different states on the scale. A total of 1389 valid questionnaires were collected, with a questionnaire efficiency of 96.53%.

Relationship between Online Language Learning and Expected Results

SPSS was used to analyze the collected data, firstly analyzing the implementation effects of college English online teaching. Figure1:



The question addressed in the figure is: Do you think that the online learning method contributes to improving learning efficiency? 57% of respondents answered “yes,” indicating that the majority of students acknowledge the effectiveness of online teaching. 34% of students believe the effect is not very significant, while 9% of respondents feel there is no effect. In the digital age, online teaching is particularly necessary. Many people in society hold inherent biases against online teaching, assuming that its effectiveness can not match that of traditional face-to-face teaching. They overlook some factors such as class demographics, teaching methods, and course content and other characteristics. For primary school students with poor self-control, the effect of online teaching may be slightly less effective than offline teaching. However, college students are adults with a certain degree of self-control and preparedness, so online English teaching with high quality is a certain help to college students. Through well-prepared online teaching and the use of reasonable live teaching methods, the effectiveness has been proven through experiments and practice and is helpful to improve learning efficiency. The overall data generally reflects that college English online college English teaching can enhance students' learning efficiency and make a significant contribution to online college English teaching (Zhiwen, 2020).

In our investigation of whether the target group can achieve the expected goals through online courses, we found some numbers that indicate that well-performing online English teaching can indeed achieve the expected goals (Chandra, 2019). When testing the model, the R-squared value was found to be 0.214, which means that the expected goals were achieved through online course learning, explaining the reasons for the high learning efficiency. Upon conducting an F-test on the model, it was found that the model passed the F-test ($F=13.039$, $p=0.001<0.05$), with a p-value less than 0.05, indicating significant significance, which means that the expected goals were achieved through online course learning. The model formula indicates that the expected goals were achieved through college

English online course learning and can improve students' online learning efficiency. The specific analysis results ultimately demonstrate that the regression coefficient value for achieving the expected goals through online college English course learning implies a significant positive impact on improving learning efficiency (Garrison et al., 2008). This is closely related to the active teaching of college English teachers. If teachers adopt scientific teaching methods, fully prepare for each online class, prepare teaching materials, prepare class, anticipate potential problems in the course, and are familiar with computer hardware operations, it will not affect the progress and effectiveness of the class due to minor issues. Whenever possible, live broadcasting should be used for classes, and platforms such as Tencent Classroom, Rain Classroom, and Study Pass, etc (These are all online education platforms in China) should be chosen rather than recorded or PowerPoint presentations. Such classroom formats are conducive to promoting learning efficiency and achieving expected goals. During the specific online teaching process, the interaction and communication between students and teachers show that 58.24% of students actively participate in interaction, while only 6.95% never interact with teachers, indicating that a positive ecological connection between teachers and students has been established. Related factors also have a significant positive impact on learning outcomes. This also suggests that platform-based live streaming is a new form of face-to-face teaching in the new digital ages. Teachers should use various methods to promote communication and interaction, such as rapid response quizzes, rewarding correct answers with small rewards, using emojis to express feelings, or dividing the class into small learning groups for discussion, with groups connecting through video and text comments in the comment section. Additionally, random answering of questions among students, interactive activities utilizing signal lights, and one-on-one or one-to-many interactions that all contribute to improve the interactive effects of online teaching (Chen & Yang, 2015).

ANOVA

	(Mean±Std. Deviation)					F	p
	Very inconsistent (n=9)	Inconsistent (n=4)	Average (n=51)	Consistent (n=24)	Very consistent 非常符合 (n=12)		
Multi platforms	0.44±0.53	0.25±0.50	0.69±0.47	0.75±0.44	0.92±0.29	2.478	0.049*
Multi teaching resource	0.22±0.44	0.50±0.58	0.67±0.48	0.75±0.44	0.92±0.29	3.450	0.011*
Online teaching	0.56±0.53	1.00±0.00	0.78±0.42	0.75±0.44	0.92±0.29	1.305	0.274

* $p < 0.05$ ** $p < 0.01$

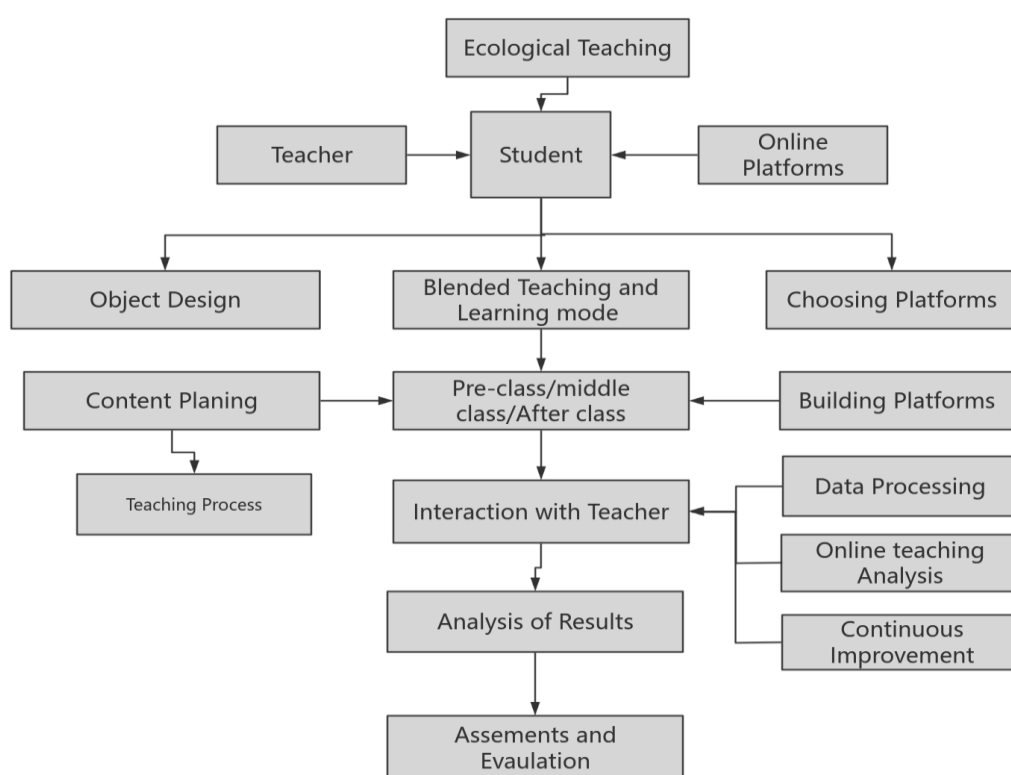
Furthermore, when conducting the F-test on the collected questionnaire data, indicating that the model construction is meaningful. Figure2:

As can be seen from the above table, the analysis of variance is used to study the relationship between variables, and the results show that the learning of online courses has achieved the desired goals. Through the study of online courses, the sample does not show significant for online teaching ($p > 0.05$), which means that students have achieved the desired goals through online courses. The samples show consistency for all online teaching, and there is no difference. In addition, through the study of online courses, the sample shows a significant

difference in selecting a variety of learning software and platforms and providing more teaching resources ($p < 0.05$), which means that through the study of online courses, the expected goal has been achieved.

This suggests that various ecological factors in college English teaching can harmoniously develop during the process, collectively promoting the final learning outcomes with significant significance.

College English online courses resemble a web of ecology, where teachers, students, platforms, and other factors become various ecological components. These components engage in energy and information transfer among each other, with interactions occurring between teacher and student groups and tight associations between teachers and students (Wu Yingying, 2021). Teachers and students constitute the main body of the online ecological classroom, but each factor is influenced by the learning environment and can also influence for each other. The relationships between ecological factors are illustrated visually in the following diagram: Figure3:



Clearly, the online classroom ecosystem includes many elements, eg, teachers、 students、 platforms teaching mode and so on. In the post-pandemic era, especially with the integration of the internet and the background of massive open online courses (MOOCs) and big data Cai Shuhong (2022), the classroom ecosystem has undergone significant changes, relying more on online media for constructing foreign language ecological classrooms.

From the above data, some conclusions can be drawn : in the post-epidemic era, college English online education not only shows its inevitability, but also highlights its unique advantages. With the rapid development of Internet technology, big data, cloud computing and other technologies, online education has been able to achieve a more efficient and convenient teaching experience. Online English language education can quickly adapt to the teaching needs of different environments, and effectively ensure that the teaching progress will not be affected during the special period. In addition, online English language education

can provide more personalized teaching opportunities to meet the differentiated needs of different students and scenes. Students can arrange their study according to their own time and schedule, which improves the flexibility and autonomy of learning English language. Online English language education can provide a variety of interactive forms, such as real-time discussion, online questioning and so on, which enhance the communication and cooperation between students and teachers, students and students. There are some more powerful advantage that online English language education breaks the regional restrictions, realizes the extensive sharing of educational resources, and makes the distribution of high-quality educational resources more equitable.

College English online education and teaching has not only become an emergency choice, but also shows its long-term development potential(Altay, I.F.,&Altay,A,2019). In the face of the new educational environment, it is an important direction for the transformation of college English teaching mode to make full use of the advantages of online education and teaching and constantly innovate and improve the English teaching mode.

Based on the quantitative data presented above, it is clear that in the context of reasonable use of teaching methods and effective and secure platforms, online teaching of college English can generate positive ecological effects among various factors. These ecological factors can harmoniously develop and effectively enhance teaching outcomes, hence laying a solid foundation for the construction of college English teaching.

Observational Records

During online teaching, records are maintained daily, covering two aspects: classroom observation and post-class summaries.

Classroom Observation

Classroom observation primarily focuses on monitoring the number of students attending class, their engagement levels, participation in answering questions, frequency, depth of thought, and accuracy, as well as the appropriateness of classroom discussion topics in relation to the unit being taught and the difficulty level. Observations also include students' interest and involvement in topic discussions, their preferred topics, discussion methods, the effectiveness of different teaching strategies employed, etc. It's observed that with careful preparation by teachers, overall student participation in online classes remains quite high. Additionally, the accuracy of responses to questions and exercises suggests that online teaching has been effective to some extent.

Post-Class Summaries

After each class, records are made regarding the content covered and reflections on its relevance and necessity. Feedback is collected from different students to evaluate their perception of the class content. The appropriateness of teaching methods, identification of challenging and crucial points during class, and students' responses are all documented. From the records, it's evident that online teaching progresses harmoniously and orderly, providing both teachers and students with more time for reflection and summary.

Individual Interviews

To further explore the effects of the ecological system, interviews were conducted with four students online, ensuring respect for privacy. The interviews were conducted in a semi-open manner, with several semi-open questions designed to facilitate a smooth and productive

conversation. The atmosphere was kept relaxed and pleasant to ensure effective communication. Prior to the interviews, an outline was prepared, including questions relevant to this research. The table below illustrates the interview questions: Figure4:

Table: Interview Questions

Item	Questions
1	Have you participated in online English classes?
2	Can you tolerate the time and intensity of each class?
3	Do you have interaction and communication with the teacher?
4	Which type of interactive communication method used by the teacher during class do you like the most?
5	How do you feel about the level of participation of your classmates during class?
6	Does the teacher assign offline homework?
7	How does the accuracy of your homework compare to before?
8	Do you like online teaching? Why?
9	What kind of changes do you think online English teaching has brought to your English learning?
10	If you were to evaluate the effectiveness of online learning on a scale of 1 to 100, what score would you give?

Interviews were conducted with four students who participated in online English classes. Each class lasted for 40 minutes with a 10-minute break in between, a level of intensity the students indicated they were completely comfortable with. All four interviewed students expressed a preference for interacting with the teacher, stating that the interaction through the screen was equally effective as in-person interaction. This was because they were already familiar with their teachers, so they did not feel any sense of unfamiliarity. When asked about their favorite interactive communication methods used by the teacher during class, each of the four students had their own preferences. Some liked quick exchanges of humorous comments in the text area, some enjoyed participating in rapid-fire Q&A sessions, some preferred group video discussions, and one student even mentioned enjoying the teacher's cheerful jokes. Regarding the level of participation in class, three students mentioned that they felt everyone was actively engaged in discussions, while one student didn't have any particularly strong impressions. Of course, the teacher assigned homework, and most students were able to submit it within the specified time. They felt that the accuracy of their homework submissions did not decrease compared to before, with higher accuracy in vocabulary and grammar questions due to the ability to review unclear areas through replay in online teaching. Several students expressed their fondness for online teaching because English classes, unlike other practical courses, allowed them to learn listening, speaking, reading, and writing regardless of time or location. Through participating in online English classes, they first learned to flexibly manage their schedules, cultivating their independent learning abilities and proactive planning skills. This was also a new challenge to their learning abilities, which ultimately increased their learning efficiency under pressure and challenges. They felt that the teacher's teaching and the students' learning in the online classroom were quite harmonious. As a result, they all gave high ratings, with each student giving a score of over 90 points. Finally, they affirmed the harmonious ecological effect of language teaching,

believing that although online classes were necessitated by the pandemic, it did not affect the learning outcomes. This indicated that online classrooms were effective, and under the active guidance of the teacher, students' learning was not interrupted. From the perspective of online ecological teaching and student learning motivation and outcomes, there is also a correlation between them. Self-determination theory categorizes human behavior into self-determined and non-self-determined behaviors, positing that drives, intrinsic needs, and emotions are the primary sources of motivation for self-determined behaviors (Ryan & Deci, 2000). Within self-determination theory, learning motivation encompasses three essential needs: autonomy, relatedness, and competence. In the context of online English language learning, students' motivations are often diversified, with both intrinsic and extrinsic motivations coexisting and interacting. Research has shown that a mixed model of motivation, wherein students exhibit both intrinsic and extrinsic motivations, is generally associated with optimal language learning outcomes. The online learning environment significantly influences students' learning motivation. Adapting this mixed motivation in various learning contexts can sustain students' motivation for learning the English language. Some factors such as flexible learning times and spaces, rich multimedia resources, and highly interactive learning platforms contribute to enhancing students' interest and engagement in learning English. Moreover, online English language instruction offers personalized learning experiences that better meet the diverse needs of students, thereby strengthening their motivation. This emphasizes the importance of designing online English language teaching models and learning environments, as well as the implementation of blended teaching strategies by teachers, to effectively stimulate and sustain motivation. The data from this paper indicate that when teachers focus on creating a supportive learning environment and employ a variety of motivational strategies, they can significantly enhance both intrinsic and extrinsic motivations, thereby maximizing students' online English language learning outcomes. However, two students raised some issues that need improvement in teaching and learning^{Error! Reference source not found.}. For example, in the homework section, the completion rate and evaluation of assignments after each class were not particularly ideal. Without face-to-face supervision, some students felt a sense of distance, leading to a sense of complacency, which in turn affected the evaluation process.

In summary, a series of experiments were conducted to verify and address the initially designed research questions.

(1) Regarding the first question, online teaching has shown positive and effective impacts on various aspects of university students' English learning, including academic performance, learning efficiency, and motivation. Concerning academic performance, studies have indicated that online teaching can enhance students' grades to a certain extent, although individual differences in outcomes cannot be ruled out. These differences may be influenced by factors such as teachers' instructional design, individual student differences, and the level of technical proficiency with the platforms. Online English instruction also has the potential to positively affect learning efficiency. Given the inherent characteristics of language disciplines, which are not confined to specific time and space, students can engage in learning at their own pace and convenience, utilizing a variety of online resources such as videos, online courses, and interactive learning platforms. However, online learning may pose challenges to the motivation of some students, as the absence of face-to-face interaction and classroom ambiance may lead to decreased engagement and motivation.

(2) Concerning the second question, students' perceptions of online university English instruction vary due to individual differences. The majority of students exhibit a positive attitude towards online teaching due to its flexibility, convenience, and the richness of online resources, which better align with their learning pace and needs. However, a minority of students may exhibit resistance to online teaching, either due to a preference for traditional face-to-face instruction or due to confusion stemming from a lack of familiarity with online learning tools. To enhance university students' online English language learning experience, various measures are implemented, including providing clear learning objectives and guidance, designing interactive and diverse online learning activities, offering technical support and training, and actively promoting interaction and collaboration among students.

(3) Addressing the third question, empirical evidence confirms that online university English instruction can generate ecological harmony effects. Ecological application refers to the interaction between online teaching and the learning environment, resources, and individual student characteristics, which positively influences learning outcomes. Online teaching can provide students with a broader range of learning resources and opportunities, thereby enhancing learning outcomes. The key to whether ecological harmony effects exist lies in instructional design, technological application, student engagement, and other factors. Therefore, further research is needed to explore the relationship between online university English instruction and ecological harmony effects, as well as strategies to maximize the promotion of learning outcomes.

Conclusion

This study conducted an in-depth investigation into the ecological teaching situation in the context of college English ecological teaching environment based on the "language education ecology" theory, at the same time using large-scale questionnaire surveys and small-scale interviews as empirical methods. After a semester of online English teaching practice for some college students at one university, we found that the language learning conditions of first and second-year students improved significantly, and the language learning outcomes were significantly enhanced (Artigliere, M, 2019). Furthermore, we observed a significant positive correlation between teachers' online teaching and students' language proficiency, indicating that the ecological model of teaching and learning played a positive role in promoting language learning outcomes, with preliminary evidence of ecological effects. These findings aim to provide valuable reference suggestions for language ecological teaching in the post-pandemic era. The positive contributions to the field of university English language teaching specifically are: (a). The research facilitates the development of learner autonomy and personalized learning. Students can autonomously and reasonably arrange their studies according to their individual needs. (b). The findings and data from this research can assist schools and educational institutions in better resource allocation, thereby improving teaching efficiency and promoting the equitable development of educational resources in English language teaching. (c). By comparing the effectiveness of online and offline teaching, the empirical research data can provide valuable references for the development of blended teaching models, thereby fostering the diversification of English language teaching methods. However, despite conducting a large-scale survey, the research sample was limited to only one university, and the size of the interview sample was relatively small. Therefore, future research should largely expand the sample size and conduct more in-depth exploration to promote the establishment and improvement of a harmonious ecological effect model for

online English teaching at the university level. Additionally, it will also provide more references and guidance for future blended learning.

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