Application of Educational Technology in English Teaching--- Citespace-Based Visualization and Analysis

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Abstract. With the rapid development of the Internet and the arrival of the intelligent era, the education model is gradually changing from traditional informatization to modernization, and the rapid development of educational technology has greatly advanced the development of teaching and learning, and educational technology is also more and more widely used in English teaching . In this paper, we used CiteSpace software to do a visual analysis of the research on the application of educational technology in English teaching between 2013 and 2024. The results of the study show that China, the United States and Iran are leading the way in this area of research. The Education University of Hong Kong, The University of Hong Kong and National Cheng Kung University ranked the top three in terms of research. There is some collaboration between East China Normal University and the other institutions, and the other institutions need to strengthen their communication and cooperation in future research. In terms of research hotspots, this paper finds new research hotspots and trends, the application of educational technology in English teaching needs to focus more on the student as the main body, stimulate students' learning initiative, and promote the common development of students' English learning literacy and creativity.

Keywords: Educational technology; English teaching; CiteSpace; Visual analysis

1 Introduction

In 1994, the Association for Educational Communications and Technology (AECT) of the U.S. first defined the concept of educational technology: Educational Technology is the theory and practice of design, development, utilization management and evaluation of processes and resources for learning[1]. In 2005, AECT defined Educational technology is the study and ethical application of theory, research, and best practices to advance knowledge as well as mediate and improve learning and performance through the strategic design, management and implementation of learning and instructional processes and resources[2]. Twelve years later, ACET has newly defined the concept of educational technology, which is the study and ethical application of theory, research,

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and best practices to advance knowledge as well as mediate and improve learning and performance through the strategic design, management and implementation of learning and instructional processes and resources[3]. It is easy to see that modern educational technology emphasizes the use of modern information technology and does not contradict the use of traditional educational media. In a given situation, the integration of modern technology into the educational process in a positive way can shape a diverse environment for teaching English, and students can efficiently input their knowledge with the convenience of educational technology[4]. Educational technology is becoming an important tool for teachers to teach and students to learn. In actual classroom teaching, educational technology has gradually entered into teaching practice, establishing a good learning environment and conditions for students. However, in order to fundamentally realize a better combination of English teaching and educational technology[5], it is necessary to conduct further research on the application of educational technology to ensure that all teaching aspects can be further optimized.

So, what is the current trend of research publications on the educational technology in English teaching? In what aspects does the research focus? What kind of characteristics and shortcomings are presented? What might be the future research trends on this aspect? These questions are the focus of this study, and CiteSpace is used to visualize and analysis the current status of research on the application of educational technology in English teaching and to provide suggestions for further research.

2 Research Methods and Tools

2.1 Data Sources

In this study, the core data collection of Web of Science databases (including SCI and SSCI) was used as the data source, and the search terms were “educational technology” and “English teaching”. The research direction is “Education Educational Research”, the literature type is “Artistic”, and the language is “English”. The search period was from 2013 to 2024. 358 documents were selected as the sample for this study, excluding those that did not fit the theme.

2.2 Research Methods and Tools

This study mainly used CiteSpace software for the econometric analysis of the data. CiteSpace is a software that analyses domestic and international literature by visualizing it[6]. By analyzing the literature through this software, we can understand what the research history is and what the development trend is in the related fields. By visualizing the structure, patterns and distribution of scientific knowledge, it is possible to obtain the desired information more quickly.

Therefore, we used CiteSpace software to quantitatively and qualitatively analyze the 358 documents collected, and used bibliometrics and data visualization analysis methods to conduct an in-depth study of the original documents in terms of the year of publication, country distribution, institutional distribution, and keyword co-occurrence. The development of research on the application of educational technology in English

teaching in the last decade was understood, and future hot research trends were explored based on scientific knowledge mapping.

3 Research Results and Analysis

3.1 Changes in Publication Volume

The data analysis of the screened 358 documents according to the number of annual publications can be obtained in Figure 1. The chart shows that between 2013 and 2024, the application of educational technology in English teaching has received much attention from researchers. Among them, the years from 2013 to 2021 show fluctuations, but the overall remains in the phase of steady growth. From 2021 to 2022,the number of articles has increased dramatically. But from 2022 to 2023, the number of articles in 2023 decreased significantly compared to the number in 2022.

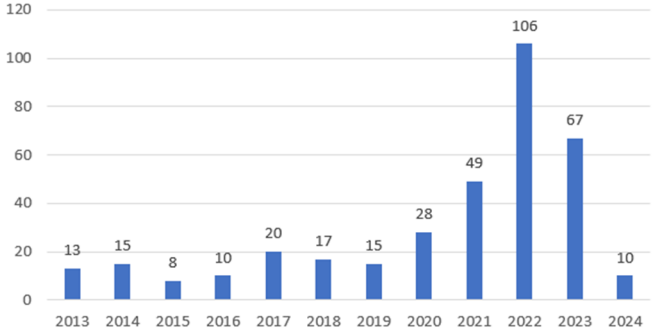

Fig. 1. Statistical distribution of annual number of publications

In 2022, the digital transformation of education has become an important trend in the international field, and several countries and international organizations have introduced policies to promote the development of digital transformation in education. UNESCO has issued the "Guidelines for ICT in education policies and masterplans"[7], which elaborates on the necessity, implementation principles and guidelines for the application of information and communication technologies (ICT) in education. Particularly, in the fifth part of the guideline, the design of ICT in different aspects of school education, higher education, technical and vocational education, and curriculum and assessment is introduced, and the release of the guideline also provides a reference for carrying out digital transformation in the field of educational practice. In addition, the 18th International Conference on Language Intelligence Teaching and Learning was held online, which was organized by the Committee on Language Intelligence Teaching and Learning of the Chinese Society for Comparative Studies of English and Chinese, and co-sponsored by Xi'an University of Electronic Science and Technology and Beijing Foreign Studies University[8]. The conference centered on the theoretical and practical innovations of technology-enabled language teaching and learning, and discussed in depth the methods and strategies of deep integration between educational technology and language disciplines[9], which is of great significance to the devel-

opment of the field of foreign language educational technology. As a result, the number of articles increases dramatically in 2022.

3.2 Country Distribution

We used CiteSpace software to visualize and analyze the countries of the 358 papers collected, and we obtained Figure 2. As can be seen from the figure, a total of 62 countries have made studies on the application of educational technology in English teaching between 2013 and 2024, which is the majority of countries, and it is clear that the application of educational technology in English teaching is worthy of in-depth research. In Table 1, we list the top ten countries and their number of publications. Among that we can find that during the period of 2013 to 2024, China has had the most attention in this research with 179 publications, accounting for 50% of the total. It shows that China is at the forefront of research in this field. The following countries are the USA(36), Iran(19),England(17),Spain(16), Turkey(27),Australia(14),Turkey(13), South Korea(8),Canada(7),etc. This indicates that research in this field first requires advanced technology, with economic and technological support[10], so that it is possible to better apply educational technology to English teaching. Secondly, these countries attach great importance to education, especially China has been emphasizing the strategy of strengthening the country through education[11], so there will be a lot of documents to support the application of educational technology in English teaching.

Table 1. Pubilshed number of top 10 countries

Number	Country	Publish Number
1	PEOPLES R CHINA	179
2	USA	36
3	IRAN	19
4	ENGLANG	17
5	SPAIN	16
6	AUSTRALIA	14
7	TURKEY	13
8	MALAYSIA	10
9	SOUTH KOREA	8
10	CANADA	7

Through the visualization analysis, as in Figure 2, it can be seen The links between countries are relatively close.There are close ties with other countries under the leadership of China, the United States and Iran. It shows that in recent years, the application of educational technology in English teaching has received common attention worldwide[12], and that this close co-operation will increase in the future.

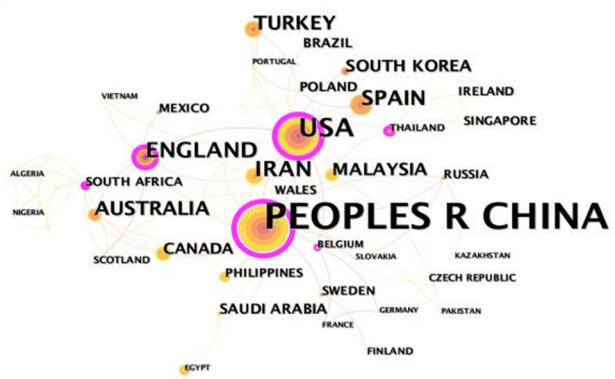

Fig. 2. Country co-occurrence knowledge graph

3.3 Analysis of Research Institution

In order to study the source and provenance of these articles in more depth, we used CiteSpace to analyze the institutions that researched these articles, and Figure 3 shows the occurring knowledge graph of the institutions. From Figure 3 we can see that there are many institutions that have researched the application of educational technology in English teaching. Among them, The Education University of Hong Kong, The University of Hong Kong and National Cheng Kung University are leading the research. They are closely followed by East China Normal University, Zhejiang Normal University, Cent China Normal University, National Taiwan University of Science and Technology, The National University of Malaysia. We can see that in China most of the research is done by normal university while in other countries such as the USA and Iran, it is done by comprehensive universities.

Fig. 3. Institution co-occurrence knowledge graph

Although there are a lot of research institutions, we can see that there is not too much cooperation between institutions. East China Normal University, for example, has

some co-operation with other institutions, but there is very little co-operation between other institutions. We know that the application of educational technology in English teaching is to assist students' learning and teachers' teaching[13], so there is more research of this kind in normal colleges. However, for research in the field of educational technology, the application of educational technology in English teaching is an essential trend[14]. In the future, it is recommended that educational technology organizations can increase their research in this area and develop new technologies and products to be applied in English teaching.

3.4 Analysis of Research Hotspots

Keywords are a concise summary of the main content and core of the literature. Keywords that appear more frequently and are more central have a higher degree of importance and can be considered to be hot topics of interest to researchers in a particular period of time[15]. Generally speaking, there must be some kind of correlation between keywords in the literature, and this correlation can be expressed by the frequency of co-occurrence. Therefore, by visualizing and analyzing the keywords through CiteSpace[16], we can learn the focus, hotspots and research trends of the research in the field of educational technology applied to English teaching.

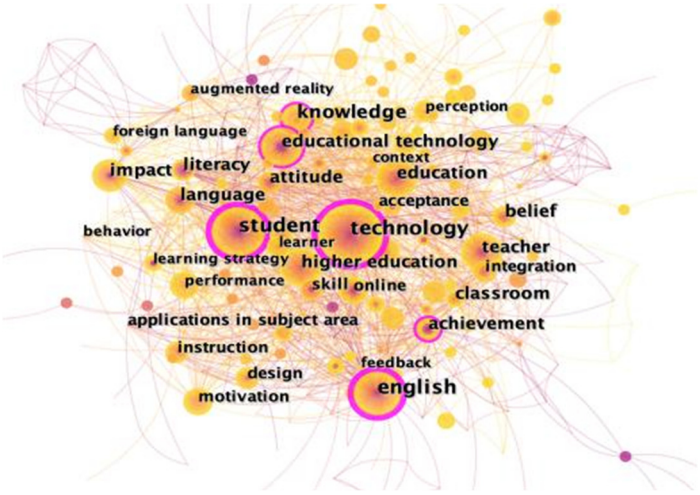

Fig. 4. Keyword co-occurrence knowledge graph

The keywords of 358 documents can be seen by analyzing them through CiteSpace, with a total of 314 nodes, 1442 connecting lines, and a network density of (Density)=0.0293, which indicates that the centrality is strong(Figure 4). From the keywords with word frequency over 20(Table 2), the top five keywords are information technology (294), user acceptance (117), higher education (117), education (89), model (66). And we can also get the high frequency keyword centrality statistics through

Table 3.These keywords are all related to each other in some way, for example, there is a strong connection between technology and English, student, education and so on.

Combining the frequency and centrality of keyword appearances, the research hotspots of educational technology in English teaching can be categorized as follows:

1) Educational technology: the main keywords involved are educational technology, system, online, model and so on. In the process of using educational technology, an "English informatization teaching system" can be set up, which contains a variety of types of educational technology, such as multimedia technology, network technology and voice recognition technology, etc[17]. Each type of technology corresponds to the corresponding function, in which multimedia technology can establish a good communicative environment for students in English, network technology can provide support for students' online learning, and voice recognition technology is the basic condition for realizing human-computer dialogue. The speech recognition technology is the basic condition for realizing human-computer dialogue[18]. All of the above technologies take students as the main body, and effectively cultivate students' retrieval ability, multimedia expression ability and cooperation ability. In practical application, the system can not only establish a good environment for students to practice speaking, but also guide students to learn independently[19]. It internalizes the knowledge that students hear and see in the classroom, takes students as the main body in the classroom, provides a platform for them to express themselves freely and show themselves[20], and in this way provides students with opportunities to apply their knowledge.

Table 2. High frequency keyword frequency statistics

number	keywords	frequency	number	keywords	frequency
1	technology	48	11	classroom	15
2	English	42	12	knowledge	15
3	student	38	13	attitude	13
4	education	30	14	design	13
5	educational technology	29	15	online	13
6	higher education	23	16	model	12
7	teacher	22	17	achievement	12
8	language	19	18	belief	12
9	impact	18	19	system	12
10	motivation	17	20	augmented reality	11

2)English teaching: the main keywords involved are teacher, English, language, classroom and so on. English Course, as a language subject, relies to a greater extent on specific contexts for its pedagogical content. The use of educational technology can create vivid life situations in actual teaching, for example, the use of AR to build teaching scenarios, promote educational immersion[21], so that students are immersed in the situation, and effectively expand their knowledge. In contextual teaching, human-computer interaction technology can be fully used, but also to achieve on-site feedback, to maximize the effectiveness of the use of educational technology in English

teaching[22]. However, Some teachers do not have enough modern educational technology skills, so in English teaching, they directly download the corresponding courseware from the Internet for teaching convenience, without any modification or research, and directly move it to the classroom for use[23]. The centre of the classroom must be the students, and the use of modern teaching techniques must be student-centred, rather than courseware and teaching resources. Teaching methods that do not adequately prepare lessons nor take into account the actual situation of students will lead to inefficient or even ineffective teaching[24]. Teachers should continue to improve their ability to use modern technology and try to learn and innovate independently, not only to improve their ability to use new technology, but also to greatly improve classroom efficiency. How teachers use educational technology to solve problems in actual English teaching must be emphasized and addressed.

3)Categories and objects of education：the main keywords involved are students, higher education, attitude and so on. Teachers should actively encourage students to cooperate with each other, using educational technology to achieve further expansion of the thinking space, for example, the English textbooks in the form of graphics, but still static mode, teachers can use educational technology to dynamic processing, expanding the classroom content, enriching the amount of knowledge in the classroom, to stimulate the students' interest in learning[25]. Teachers can guide students to cooperate in the production of courseware, a clear division of labour in the group, co-operation, and give full play to their individual strengths[26]. In the process of co-operation, students can understand the ideas of group members, learn from each other and make up, get inspired, and ultimately effectively cultivate the interactive thinking of students[27], students in the process of making courseware, can be designed on the basis of respect for the original teaching materials, and to ensure that the design of the courseware is aesthetically pleasing. It can not only provide conditions for knowledge learning, but also enjoy the visual pleasure[28]. Organizing students to participate in the graphic recreation of teaching materials can cultivate students' innovative and practical spirit.

Table 3. High frequency keyword centrality statistics

number	keywords	centrality	number	keywords	centrality
1	technology	0.25	11	classroom	0.07
2	English	0.25	12	knowledge	0.1
3	student	0.2	13	attitude	0.07
4	education	0.09	14	design	0.03
5	educational technology	0.13	15	online	0.03
6	higher education	0.09	16	model	0.03
7	teacher	0.05	17	achievement	0.12
8	language	0.1	18	belief	0.09
9	impact	0.07	19	system	0.01
10	motivation	0.04	20	augmented reality	0.03

4 Conclusion and Outlooks

In this study, we use CiteSpace to visualize and analyze the literature in the field of application of educational technology in English teaching in last decade, and sort out the research hotspots. Based on above data analysis results, the following conclusions are obtained:

1. From the aspect of the annual publication volume, the number of publications in this this research in the last decade has shown a continuous growth trend. As the digital transformation of education has become an important trend in the international arena, UNESCO released the "Guidelines for ICT in education policies and masterplans"[29], and the Language Intelligence Teaching Committee of the Chinese Society for Comparative English and Chinese Studies hosted and held the 18th International Conference on Language Intelligence Teaching[30], in addition to many other conferences related to the field of educational technology around the world in the year 2022. As a result, there is a surge in the number of papers issued in 2022. At present, the core objective of the field of educational technology can be found to be: technology-enabled teaching and learning for quality and equitable development[31]. Focusing on the core goal of educational technology development and the key elements to achieve changes in teaching and learning, such as people, environment and resources, major international organizations, national governments, and various parts of the region have successively introduced policies to promote technology-enabled teacher development, talent training, teaching environment construction, and the construction of digital resource libraries[32]. These policies and practices also provide guidance for the construction of education informatisation in other countries, and provide supportive impetus for the sustainable development of education in the future. In the future, the research on the application of educational technology in English teaching will still be a continuous growth trend.

2. From the aspect of countries and institutions, we found that China, the USA, Iran and England have published a large number of papers in this field. And The Education University of Hong Kong, The University of Hong Kong and National Cheng Kung University are leading the research. At the same time, there is more co-operation between countries and less between institutions. In future research, there is a need for greater co-operation and communication between institutions, especially between educational technology and normal institutions.

3. From the aspect of keywords, we divided the main keywords into three parts: educational technology aspect, English teaching aspect and Categories and objects of education aspect. The educational technology aspect is mainly about the application of educational technology in English teaching. Only by strengthening the construction of hardware facilities and establishing a sound information resource base for teaching can educational technology be better integrated with English teaching, and it is necessary to ensure an adequate supply of teaching technology infrastructure to provide teachers with complete facilities for teaching[33]. In the English teaching aspect, Teachers must be knowledgeable in the field of educational technology and have adequate skills in the use of educational technology. With regard to the categories and objects of education, the research hotspots in the past ten years have mainly focused on higher education and

students. This is also due to the fact that the development of educational technology has brought great changes to the teaching mode, and student-centred teaching has made how educational technology assists student learning a key concern of research[34]. In addition, how to better integrate educational technology and traditional teaching in English teaching is a matter of concern for future research.

In conclusion, this paper uses CiteSpace software to visualize and analyze the research hotspots and trends in the application of educational technology in English teaching. In future research, we believe that we should pay more attention to how to apply educational technology in English teaching to take students as the main body, stimulate students' learning initiative and improve teaching efficiency.In the English classroom teaching under the technical support of education, teachers should recognize the positive effects of the development of modern education on teaching and make use of them to solve the problems encountered in actual teaching. Continuous organic integration of teaching and educational technology, to ensure that the teaching process of teachers and students active, positive, efficient participation, and promote the common development of students' English learning literacy and creative ability.

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