

Challenges in Teaching Medical English Vocabulary to Tertiary Students in China: A Systematic Literature Review*

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Abstract—This study aims to provide a comprehensive review of the research perspective on current medical English vocabulary teaching over the last fifteen years (from 2009 to 2023). The objective is to offer references and measures for instructors, researchers, and higher educational institutions to improve medical English vocabulary teaching. To achieve this, a systematic literature review (SLR) methodology was employed, resulting in the selection and meticulous examination of 168 articles. As identified in this review, studies conducted on medical English vocabulary have mainly been non-empirical, focusing on describing terminologies and teaching strategies and taking undergraduates as the primary research participants. The most popular effective teaching strategies identified through the review encompasses word structure, mind mapping, etymology, and multimedia. It is noteworthy that there has been a significant sharp upward research trend from 2018 to 2023. Several factors influencing medical English vocabulary teaching have been illuminated, namely, non-diverse teaching strategies/methods, inadequate course/curriculum, shortage of professional teachers, and limited needs analysis. Despite numerous studies that have focused on medical English vocabulary teaching, few were recorded in the review of it. This study presents a holistic and in-depth review on medical English vocabulary teaching in the past fifteen years, which will provide educators and higher educational institutions with comprehensive understanding of the existing research landscape and contribute valuable references to ongoing and future scholarly pursuits within this field.

Index Terms—medical English, research characteristics, systematic literature review, teaching strategies, vocabulary teaching

I. INTRODUCTION

In the era of globalization, language is an indispensable and important medium in the process of communication. English, as an international language, has become the primary means of international communication in various fields such as business, science, and education, which plays a critical role in promoting higher education, occupies an important position in college teaching, and has been an integral part of a successful professional career in medicine (Nataliia, 2021). The need for English as a professional language in medicine nowadays is beyond doubt (Ouis, 2022), which is now known as the new “lingua franca” (Faure, 2016). There is currently a significant increase in the number of scientific publications in the medical field in English, and 80 percent of the scientific journals indexed in the international Scopus database are also published in English (Saydullayevna & Furkatovna, 2020). There has been growing interest in medical English, and it is said that in the 21st century, there is an urgent need to develop more medical English teaching around the world (Romane & Bahloul, 2022), as well as widespread international projects in the field of medicine (Mavjuda & Nadezhda, 2020).

As is known, learning a language largely depends on learning its vocabulary because words are the fundamental part of the language (Brown, 2001), and the first thing needed to understand a text in that language is to know its vocabulary knowledge (Pournia, 2019). Vocabulary is a subset of language skills (listening, speaking, reading, and writing) in the process of language learning (Karimkhanlooee & Maboudi, 2017), which lays a solid foundation for second language (L2) learners to cope with academic tasks (Kaur, 2020, 2017). Medical English is designed to give students opportunity to learn specialized vocabulary and expressions, activate passive vocabulary, learn English pronunciation of medical terms, and improve fluency and confidence in using English in professional settings (Spalević et al., 2018). Medical students who learn English as a foreign language (EFL) must improve medical English level to compete internationally, be familiar with language communication skills in medical settings, and better adapt to the future development of international medicine.

Different studies have reported that insufficient language proficiency for EFL medical students may be considered a

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major barrier to their academic performance, and problems they face in medical subjects may be partly attributable to English language incompetence (Piroozan et al., 2016). Research in the field of medical English language presents great challenges for medical practitioners and linguistics, as medical linguistics is a relatively new area of research (Dubey, 2022). Moreover, teachers of professional English courses often do not know which medical English vocabulary their students must learn (Pournia, 2019). Hence, to truly achieve the purpose of medical communication and interaction, the mastery of vocabulary is the most basic requirement (Yang, 2021), which has become the primary content and necessary foundation for effective medical English learning.

However, medical English vocabulary is not only substantial but also very complicated and laden with jargon. It was found that medical students' difficulties involved nonexistent intentional English vocabulary learning and stagnant specialized medical English vocabulary acquisition (Reynolds et al., 2023). Comprehending medical English lexis has become a significant obstacle for medical students, especially non-native English-speaking learners, that might lead to failure (Al-Wadi & Alkhabbaz, 2019), which has become one of the challenging aspects of medical English instruction (Ismayilli-Karakoç, 2020). The previous study indicated that students believed medical lexis was challenging to learn because of weak linguistic skills (Zaidi & Jadaan, 2022), its complex, jerky, lengthy, and incomprehensible characteristics (Cui & Kaur, 2023).

Therefore, faced with a vast number of medical English vocabulary items which are relatively long, difficult to read, write, and remember, many students are confused about how to master a voluminous number of professional lexical items (Ismayilli-Karakoç, 2020). According to statistics, more than 75 percent of medical English professional terms are derived from Greek and Latin (Lin, 2018). Hence, teaching medical English is a strenuous endeavor due to numerous challenges, which range from syllabus challenges to teacher and learner issues (Boualem & Lotfi, 2022). Although the reform of college English teaching has achieved mixed results, the medical universities/colleges have yet to achieve a breakthrough (Han et al., 2022).

Despite of its significance, the challenges in medical English vocabulary teaching, notably in this new era, warrant further investigation. Limited comprehensive research has been reported on medical English vocabulary teaching as previous studies have been scattered in different aspects. Thus, it is difficult to give satisfactory answers to medical English vocabulary teaching research. The purpose of this study is to systematically comb and integrate the knowledge based on the existing literature to reveal the research status of medical English vocabulary teaching, providing instructors with effective teaching strategies and enlightenment, researchers with theoretical guidance and inspirations, and higher educational institutions with practical proposals for educational reform.

II. METHODOLOGY

In order to comprehensively review studies on medical English vocabulary teaching, this study utilized an exploratory approach - a systematic literature review (SLR) process (Borrego et al., 2014; Lacey et al., 2011), which included a qualitative content analytic approach (Krippendorff, 1989). Compared with the traditional literature review method, the SLR method enables researchers to collect, synthesize, and evaluate research results on specific issues rigorously and reproducibly (Bearman et al., 2012). Researchers can use scientific methodology to define relevant literature, evaluate research quality, and summarize the research results. At present, the SLR method has been widely used in a large number of studies (Atewologun et al., 2017). In this study, the routine procedures of a systematic literature review designed by Lacey et al. (2011) were employed: planning, literature search, literature evaluation, data extraction, data synthesis, and writing a review.

A. Planning

The main task in the planning phase is to identify the specific topic of the review and state the research question. Identifying the specific research topic is not only the initial step in conducting effective research but also navigates the focus of the entire research process. The research question drives the entire research process and, in particular, determines the inclusion and exclusion criteria of literature. This study primarily focused on medical English vocabulary teaching, so the research questions were set as follows:

1. What are the main research characteristics (research focus, trend, participants, and methods) of medical English vocabulary teaching?
2. What are some of effective strategies for teaching medical English vocabulary?
3. What are the factors influencing medical English vocabulary teaching?

B. Literature Search

The electronic bibliographic databases selected in this study were Google Scholar, Scopus, Web of Science-SSCI, China National Knowledge Infrastructure (CNKI), and Wanfang Medical Data. The publication time period was from 1 January 2009 up to 31 December 2023. The lexical terms and English keywords relevant in the English database include "medical English", "medical English education", "medical English vocabulary", "English for Medical Purposes", "English for Specific Purposes", "English as a foreign language", "medical language", "medical vocabulary", "medical language barriers", "English vocabulary teaching strategies", and "vocabulary teaching skills". The terms and keywords used in the Chinese database were "医学英语词汇 (medical vocabulary)", "医学英语 (medical English/English for

Medical Purposes)”, “英语词汇教学 (English vocabulary teaching)”, “词汇教学方法 (vocabulary teaching skills)”, “医学英语词汇教学策略 (medical English vocabulary teaching strategies)”, “医学英语教育 (medical English education)”. A total of 556 articles were attained.

C. Literature Evaluation

The evaluation of the retrieved literature is primarily to accurately include or exclude literature to ensure the validity and reliability of the data, which includes determining inclusion/exclusion criteria and assessing the research design of the literature (Lacey et al., 2011). This study formulated the literature inclusion/exclusion criteria according to Indriasari et al. (2020). The inclusion/exclusion criteria were made for the retrieved 556 papers, as shown in Table 1. Items one to three are the screening criteria generally adopted by the systematic literature review method to ensure the accuracy and authority of the research samples. The fourth is to limit the research time and ensure that the research time range is from 2009 to 2023. Item five aims to focus the research topic on medical English vocabulary teaching and eliminate the literature unrelated to the targeted research area. Items six and seven are criteria in terms of the language used in the articles.

TABLE 1
LITERATURE INCLUSION/EXCLUSION CRITERIA

No.	Inclusion criteria	Exclusion criteria
1	Full text available	Full text unavailable
2	The article is a journal article	The article is book manuscript, conference paper, report, etc.
3	The title only appears once	Repetitive titles
4	Published during 2009 to 2023	Publication period is not during 2009 to 2023
5	Research focus on medical English vocabulary teaching	Research does not focus on medical English vocabulary teaching
6	The article is written in English Language	The article is not written in English Language
7	The article is written in Chinese Language	The article is not written in Chinese Language

The authors screened the literature carefully according to the inclusion/exclusion criteria. The retrieved documents were screened by reading titles and abstracts in the preliminary screening stage. In the secondary screening stage, the full articles were read and proceeded to an in-depth re-screening. During the second screening stage, two more professors with expertise in both Chinese and English were invited to translate the main part of each Chinese article (research focus, methodology, findings, and conclusions), respectively. Similar translation copies were adopted, and if their translation of the same article differed significantly, a re-translation was required, eventually reaching a similar result. The authors then identified the full texts with the professors' translations. Cross-examination between the authors was also done to reach a consensus. Based on the two screening processes, relevant literature mentioned and cited were searched, read, and screened according to the criteria, and finally, 168 sample documents were obtained. The specific process is shown in Figure 1.

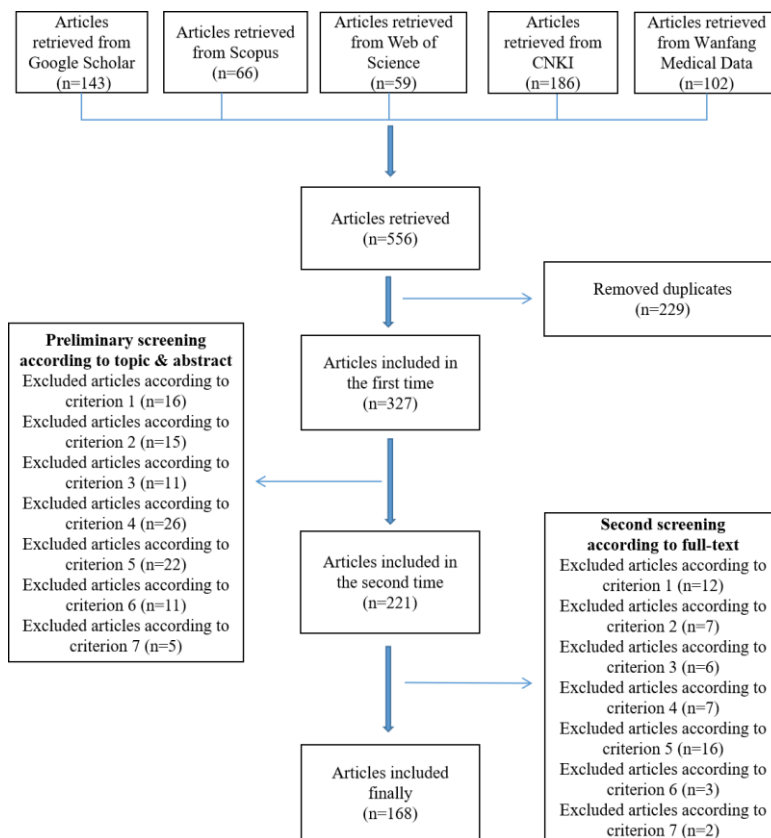


Figure 1. The Process of Literature Screening

The authors assessed quality of the included articles independently to ensure the validity of each paper. Discussions ensured that disagreements during the counter-checking process were mitigated. Therefore, only qualified academic papers were retained, and irrelevant studies were excluded.

D. Data Extraction and Synthesis

The authors systematically reviewed relevant medical English vocabulary teaching research to obtain key information. Data extraction fields include categories of author(s), year of publication, research focus, research methods, and research participants. In order to ensure the accuracy and rigor of the coding, the authors discussed and adjusted any problems arising from the coding through video meetings on WeChat during the review process.

III. FINDINGS AND DISCUSSION

The researchers retrieved 556 literature items, from which 327 were selected for abstract review and 221 for full-text review. Finally, a total of 168 articles were selected for final review. Since this study focused on medical English vocabulary teaching technique, characteristics of the research, effective teaching strategies, and influencing factors in medical English vocabulary teaching, presentation of findings and discussion were thoroughly illustrated based on the analyzed articles.

A. Research Characteristics of Medical English Vocabulary Teaching

In this study, the research characteristics of medical English vocabulary teaching primarily refer to research focus, trend, methods, and participants, which provide a comprehensive understanding for future study.

(a). Research Focus

From the literature review, studies on medical English vocabulary teaching in the past fifteen years (from 2009 to 2023) have been found to mainly focus on the aspects of description of vocabulary, teaching models/approaches, language theories, medical English courses, corpus in medical English, and teaching strategies. The research on medical English vocabulary accounted for 10 percent of the total studies reviewed, research on teaching models/approaches recorded for 12 percent, studies on language theories accounted for 7 percent, and research on medical English courses and corpus in medical English made up 11 percent, respectively. The studies on teaching strategies in medical English vocabulary comprised 42 percent, and the other related research reported 7 percent (see Figure 2).

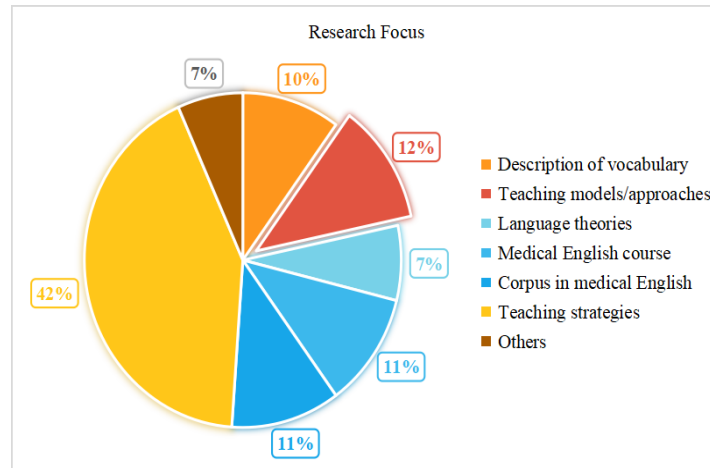


Figure 2. Research Focus on Medical English Vocabulary Teaching

It can be seen that the previous research focused on teaching strategies, teaching models/approaches, corpus in medical English, and medical English courses. As is known, medical English has been an essential part of English for Specific Purposes (ESP), and the teaching of medical English has changed significantly to meet the needs of learners who have grown up in the new era in recent years (Vo et al., 2020). One of the most challenging tasks for any language teacher is to attract students' interest and thus keep them with a high degree of learning spirit (Nguyễn, 2019). As effective teaching strategies play an essential role in promoting the effectiveness of medical English vocabulary teaching (Xue, 2020), instructors are supposed to find suitable teaching strategies, models, and approaches that correspond to learners' needs since vocabulary learning is hard and frustrating for learners sometimes. In this study, teaching strategies, models/approaches are all techniques assisting teachers achieve sound teaching effectiveness, which are reported to account for more than half of the total medical English vocabulary studies (54 percent). Hence, it is apparent that research on medical English vocabulary teaching strategies, models/approaches is vital.

Corpus in medical English vocabulary research has been more available than before (Coxhead, 2022) and plays a crucial role in medical English vocabulary teaching and learning. The combination of fundamental corpus and rational analysis is not only a language study but also a meaningful way to learn English vocabulary, which has become a common sense for linguistics to make the corpus speak (Liu, 2019). Therefore, there has been growing interest in corpus research on medical English vocabulary teaching. Besides, it is generally believed that ESP courses assist students in being more effective and confident in their profession (Zaidi & Al Jadaan, 2022), so medical English courses benefit medical personnel in obtaining better achievements. In view of this matter, a growing body of research in the field of medical English vocabulary teaching is concentrated on the exploration of medical English courses.

(b). *Research Trend*

Regarding the publication time, the current research data was extracted between 2009 and 2023. It can be seen that research on medical English vocabulary teaching was in an increasing trend in general. Nevertheless, from 2009 to 2017, it was in an inactive stage, while from 2018 to 2023, it showed a sharp upward trend (Figure 3).

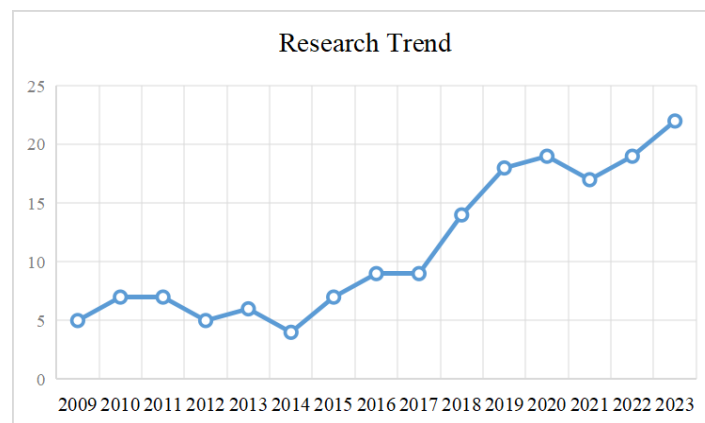


Figure 3. Research Trend on Medical English Vocabulary Teaching

It was found that from 2009 to 2017, the related literature accounted for 35 percent of the total articles, while it was reported as 65 percent from 2018 to 2023. It is apparent that studies on medical English vocabulary teaching in the last six years (2018-2023) are nearly twice that of those in the past nine years (2009-2017). This phenomenon may be

attributed to the acceleration of the globalization process and increasing exchanges between countries because medical exchanges between countries are increasing with the acceleration of internationalization (Nishimura & Nasu, 2021; Yang, 2021). Internationalization also means that the cultivation of cross-cultural communication skills is indispensable, so the goal of the internationalization of medical professionals has made it increasingly important for medical colleges to promote the construction of ESP courses. Hence, in the backdrop of the internationalization of higher education, ESP teaching in medical colleges is an inevitable trend (Chen & Wang, 2021). Only by mastering professional medical English knowledge can one obtain the most cutting-edge medical technology information and participate in international medical-scientific research exchanges (Zhou et al., 2022).

Besides, in order to contribute to national and international scientific development, researchers need to obtain membership in the academic discourse community to exchange information through conferences or published research articles, so learning English seems to be essential for students who need to pursue the development of world science and technology (Romane & Bahloul, 2022). Therefore, the role of medical English communication is more evident, and medical English vocabulary teaching research has received increasing attention from scholars, with research trends rising in recent years.

(c). Research Methods

The research methods employed in medical English vocabulary teaching are found primarily as descriptive analysis, questionnaire survey, corpus research, test, questionnaire survey and interview/test, teaching experiment, material analysis, interview, and mixed methods research. It was found that 52 percent of the research on medical English vocabulary teaching adopted descriptive analysis, while 40 percent employed questionnaire surveys and 10 percent carried out corpus analysis. 7 percent of the studies administered tests, and 6 percent of them carried out questionnaire surveys and interviews/tests and teaching experiments, respectively. The research conducted material analysis and interview accounted for 2 percent, respectively, and mixed methods research was only testified for 1 percent. In general, descriptive analysis research, classified as non-empirical research, accounted for 52 percent. Questionnaire surveys, corpus research, tests, questionnaires, and interviews/tests, teaching experiments, material analyses, interviews, and mixed methods research, categorized as empirical research, occupied 48 percent of the research methods.

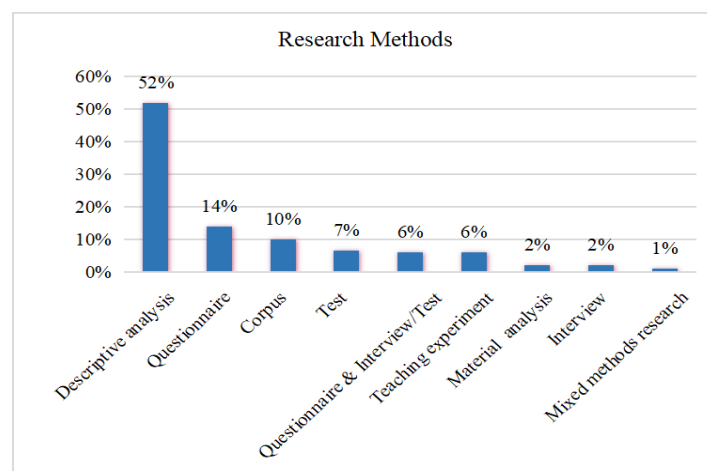


Figure 4. Research Methods Used in Medical English Vocabulary Teaching

Therefore, the research methods employed in medical English vocabulary teaching are mainly non-empirical research. Similar result was found by Cui et al. (2024) that the empirical research was insufficient in English for Medical Purposes (EMP) vocabulary memorization. As reviewed in this study, most studies are about the introduction or elaboration of medical English vocabulary (Irkabaeva, 2023; Le & Miller, 2023; Magdaminkhodjaevna, 2023), teaching methods, strategies, and models (Ikhtiyorovna, 2023; Klochko & Yashchenko, 2023). Hence, application of strategies used in medical English teaching are also found to be insufficient. This may be because of the characteristics of medical English itself, where the lexis of medical English itself is complex, lengthy, and difficult to memorize (Zhou et al., 2022). Thereby, the research primarily focused on describing medical English terminology (Božena, 2019; Frinculescu, 2021) and explanations of what strategies should be used (Piroozan et al., 2016; Saydullayevna & Furkatovna, 2020; Wang, 2021) to expect to provide appropriate strategies for medical English learners.

Besides, the empirical studies primarily employed single research methods such as questionnaire surveys, tests, teaching experiments, and interviews. Fewer studies were found applying questionnaire surveys and interviews or tests (6 percent), while minimal studies utilized mixed methods research (one out of 168). Hence, there is a considerable gap in employing complex research methods in medical English vocabulary teaching in future.

(d). Research Participants

With regards to research participants, fifty-six out of seventy-six (74 percent) studies were found taking medical

undergraduates as research participants, ten out of them (13 percent) were medical corpus, 5 percent were medical educators, 4 percent were postgraduates, 3 percent were hospital personnel, and 1 percent were made up with high school students. Apparently, the research participants were mainly medical students, followed by corpus.

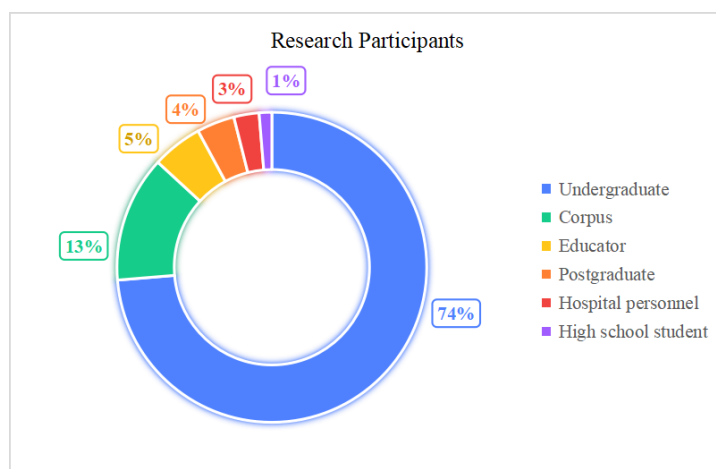


Figure 5. Research Participants in Medical English Vocabulary Teaching

The research subjects in medical English vocabulary teaching are found to be focused on undergraduates, which may be attributed to the reason that medical English is a compulsory course for medical students since English plays an important role in medicine and is the international language for communication in the world of medical science, and English proficiency provides latest perspectives and opportunities for medical students (Magdaminkhodjaevna, 2023). Hence, medical undergraduates become the main research participants. Besides, medical English as a professional English is highly targeted, which is designed to give learners the opportunity to learn specialized vocabulary and expressions so as to increase their fluency and confidence in using English in professional settings (Spalević et al., 2018). Thereby, corpus has become popular in medical English research field, which is proven to be an effective resource that students can use to improve and develop their terminological knowledge (Del Mar Sánchez Ramos, 2020), enhance medical English vocabulary acquisition to a certain extent (Zhang, 2019), and has been widely used to deepen learners' vocabulary understanding (Coxhead, 2022).

B. Some Effective Strategies for Teaching Medical English Vocabulary

It is widely acknowledged that learning technical vocabulary is crucial to medical English learners because words often have multiple meanings depending on the context and, thus, may be more challenging to learn and understand than purely technical words (Le & Miller, 2023). Hence, some strategies are vital for medical English terminology learning, and many researchers have employed various methods to teach medical English vocabulary. According to the research data attained in this study, the main teaching strategies used in medical English vocabulary teaching were composed of word structure, mind mapping, etymology, multimedia, metaphor, word list, blended, game, contextual, contrastive, and some other scattered strategies such as association, communicative, schema, image, and collocation strategies (see Figure 6). Among these strategies, word structure, mind mapping, etymology, and multimedia strategies are the most popular teaching strategies.

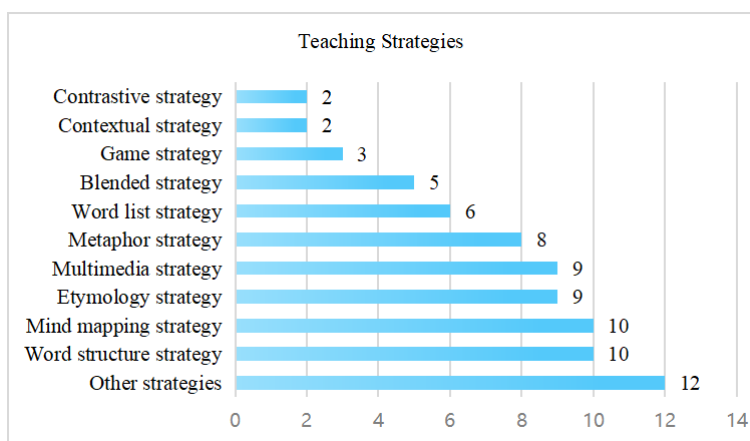


Figure 6. Teaching Strategies Used in Medical English Vocabulary Teaching

Word structure strategy accounted for ten of seventy-six (13 percent) of the total strategies in the previous studies. In

this study, suffixes, prefixes, and roots methods are collectively called word structure strategy. It is found that word-structure is one the learners' favorite strategies (Cui et al., 2024), which is also the most commonly used teaching strategy and has been proven to be beneficial in improving learners' lexical learning and reading comprehension (Karimkhanlooei & Maboudi, 2017). Although most medical English vocabulary is often verbose and complicated, its combination is relatively regular and simple, so once students understand the characteristics of medical English vocabulary, it is easier to grasp the meaning of a word and effectively guess the meaning of an unfamiliar medical lexis in a specific context (Cui, 2018). Therefore, word structure strategy can assist students improve efficiency of medical English vocabulary memorization, enhance students' understanding of professional vocabulary, improve vocabulary memorization, and enhance medical English vocabulary teaching quality (Kang, 2021).

In the previous studies, mind mapping strategy took the same proportion (13 percent) as word structure strategy. Mind mapping has been found to positively affect learners' vocabulary memorization, which can improve their interest in learning and comprehensive analysis ability (Nie, 2020). The use of mind mapping in medical English vocabulary teaching can promote student-centred classroom teaching, enhance collaboration ability and improve vocabulary memorization (Wu & Lan, 2020). According to previous research, mind mapping in medical English teaching can also improve teaching quality and learning efficiency (Guo, 2019). Therefore, mind mapping is one of the popular strategies in medical English vocabulary teaching.

Etymology strategy recorded nine out of seventy-six (12 percent) of the total teaching strategies. It was found that medical English etymology knowledge teaching based on rich etymology stories could expand learners' vocabulary size and assist teachers achieving sound teaching effectiveness (Ding, 2019). Some other research showed the significance and role of etymology in college medical English teaching, which could increase vocabulary knowledge and improve students' learning interests (Wang, 2014). Therefore, etymology in medical English vocabulary is also one of the effective strategies.

Multimedia strategy has been found frequently utilized in medical English vocabulary teaching in recent years, which rated the same proportion as the Etymology strategy (12 percent). In the backdrop of the advancement of digital technologies, medical English teaching has been changed significantly to meet the needs of new generations of learners (Vo et al., 2020). By using multimedia-assisted teaching methods and making full use of the network interaction platform, students can effectively deal with various situations in the workplace and further improve their English communication ability and employment competitiveness (Yang, 2023). Teachers also benefit from integrating digital technologies into teaching activities (Vo et al., 2020). The role of computer-assisted language learning in the development of vocabulary knowledge has been widely studied in medical English academics and has achieved positive results (Zhang et al., 2022). Computer-assisted word acquisition is a very likeable element in medical English textbooks, which should be a dominant part of medical English materials (Zafirovska & Xhaferi, 2022).

C. *The Main Factors Influencing Medical English Vocabulary Teaching*

Despite medical English vocabulary teaching has received growing attention of researchers in recent years, it is influenced by several factors: professional teachers, teaching methods, course curriculum/arrangement, and needs analysis, which affect the quality of medical English vocabulary teaching and learning.

(a). *Non-Diverse Teaching Strategies/Methods*

Since medical English has become internationally popular, many medical universities and colleges have sought better methods of learning medical English (Lodhi et al., 2018; Nishimura & Nasu, 2021). However, most studies have focused on explaining theoretical knowledge of medical English vocabulary, such as roots, affixes, or word-structure analysis. Limited studies were recorded making full use of types of teaching strategies/methods. Teachers usually utilize a single teaching strategy/method but not various teaching methods (Zaidi & Al Jadaan, 2022), and students are inactive in their participation (Yuan et al., 2019) and are less motivated to learn vocabulary (Wu & Lan, 2020). Moreover, students usually spend much time and energy learning vocabulary, but most of them only know the word and its corresponding meaning while not its usage in practical circumstances, which seriously reduces vocabulary teaching and learning effectiveness (Xue, 2020).

Therefore, monotonous teaching style makes students bore with the course (Yuan et al., 2019) and poor vocabulary teaching effectiveness (Nie, 2020). The single vocabulary teaching strategy/method cannot meet medical students' needs or solve difficulties and obstacles in the current medical English vocabulary teaching (Zhang, 2020). Thereby, it is suggested that teachers try to avoid using single methods, such as grammar and translation methods, in vocabulary teaching but utilize different teaching strategies/methods.

(b). *Inadequate Medical English Vocabulary Course/Curriculum*

Medical English vocabulary teaching has problems, such as being too theoretical and unable to combine specific clinical knowledge because of inadequate course/curriculum. It was revealed that limited professional medical textbooks are provided for medical English learners (Zafirovska & Xhaferi, 2022), and the English courses offered are unrelated to the students' academic needs (Betyna, 2015). The teaching arrangement is unreasonable, and medical students have little chance to learn medical English before entering university (Liu, 2018). The time allocated by the university for medical English classes is short (He, 2020) and students have to complete medical English learning in a limited time, which is a

challenge for teachers and students (Jin et al., 2021), restricting medical English vocabulary teaching to developing effectively. Less English language vocabulary with higher lexical characteristics is introduced by relevant instructors as well (Pournia, 2019). The teaching content is too limited (Deng et al., 2021), lacking professional, systematic, and notably high-quality teaching materials, so students are not able to expand and improve their medical English knowledge in a timely and effective manner (Wang, 2021).

In view of this fact, the inadequate medical English vocabulary course arrangements have led to low learning efficiency, resulting in serious problems, severely dampening the students' enthusiasm to learn vocabulary (Yin & Ni, 2019), and hindering medical English vocabulary teaching smoothly (Sun, 2021). Students are offered without advanced course design, time, and textbooks (Boniadi et al., 2013). It is found that medical English vocabulary teaching applied practically the same method as general English, which is absolutely unsuitable because medical English cannot be taught using the same method as general English (Spalević et al., 2018). Hence, the medical English curriculum needs to be improved to better meet learners' needs (Romane & Bahloul, 2022; Zafirovska & Xhaferi, 2022). It urgently needs to perfect medical English vocabulary course/curriculum comprehensively in all-round perspectives, such as course design, text materials, teaching time, teaching methods.

(c). Shortage of Professional Medical English Teachers

In most medical universities/colleges, the task of teaching medical English is generally undertaken by general English teachers or clinicians because of lacking professional medical English teachers (Zhao, 2022). Although general English teachers have rich basic English knowledge and teaching experience, they have insufficient understanding of medical phenomena or characteristics of medical English and lack of understanding of medical professional knowledge (Zeng & Sou, 2021), resulting in inability to accurately analyze and explain medical vocabulary (Xue, 2020). In contrast, clinicians can deeply grasp the connotations and characteristics of medical English, while they are usually poor commander of English language (Zhang, 2020) and are often not trained in English professional teaching or not have a deep enough understanding of teaching methods and characteristics (Zhao et al., 2022). Hence, they do not know how to teach professional medical vocabulary, directly leading to ineffective teaching (Zhang, 2020).

However, in the medical field, many professionals need to be internationally trained to express ideas clearly in English and be proficient in the language. Therefore, they need appropriate medical English terms. In order to fully meet these diverse needs of students, instructors need to have the latest methods of teaching vocabulary (Zafirovska & Xhaferi, 2022). It is known that keeping pace in medical English teaching with the times is the top priority to improve teaching quality (Zhao et al., 2022). Hence, it is vital to cultivate outstanding medical English professionals and also the key to adapting to modern society's requirements. Medical English instructors should be trained to master English language and medical knowledge, so that they are able to teach students in a knowledgeable way.

(d). Lack of Needs Analysis Research

"Needs" covers both the needs of the learners and the teaching situation, representing a person's needs, desires, and demands in his particular environment (Romane & Bahloul, 2022). Richterich (1972) states: "...a need does not exist independent of a person. It is people who build their images on the basis of data relating to themselves and their environment". Implementing academic needs analysis has an important role in identifying and reviewing the needs of any educational institution, so continuous demand analysis should be a prerequisite for any project/course design to achieve effective teaching outcomes (Romane & Bahloul, 2022). However, limited studies are recorded to analyze learners' needs in medical English vocabulary learning comprehensively.

Research indicated that needs analysis should be conducted to give teachers and administrators an accurate understanding of what students want and need in their future careers as a crucial tool of instruction and curriculum design (Zafirovska & Xhaferi, 2022). Medical students and doctors need the English language in their academic and professional careers, and they are highly motivated to have a medical English module in their field of research (Romane & Bahloul, 2022). Hence, it is crucial to conduct needs analysis research to collect learners' authentic thoughts on medical English courses, vocabulary learning, teaching strategies, to further assist researchers developing medical English vocabulary teaching reform and instructors improving teaching skills and ability.

IV. CONCLUSIONS AND RECOMMENDATION

It can be concluded that medical English vocabulary teaching research mainly focused on teaching strategies, models/approaches, corpora, and courses in the background of internationalization. A significant upward developing trend was recorded in the recent six years, indicating that research on medical English vocabulary teaching attracted more attention from academic circles. Although non-empirical research rating more than empirical studies in the previous studies, it is promising that more experimental studies will be conducted, considering the proportion between non-empirical and empirical studies is becoming smaller and smaller. As the majority of medical university/college, undergraduates were the primary research participants in medical English vocabulary teaching. The most welcome teaching strategies are word structure, mind mapping, etymology, and multimedia strategies. Moreover, the undiversified teaching strategies/methods, inadequate course/curriculum, shortage of professional teachers, and lack of needs analysis were the main factors which affected medical English vocabulary teaching.

While numerous studies have focused on medical English vocabulary teaching, few studies were recorded on the review of it. This study comprehensively reviewed studies on medical English vocabulary teaching in the past fifteen years. The research findings contributed significant references to medical English vocabulary research, which can assist medical English teachers obtaining more effective teaching strategies, models, and approaches, inspire scholars to explore more in-depth researches, and urge higher educational institutions to advance medical English reform.

It is widely acknowledged that future medical personnel should master literary language norms, professional terms, and standardized structures of the medical field and be able to use language tools according to the purpose and circumstances of communication (Klochko & Yashchenko, 2023). Based on the results and discussion, the following recommendations are prospected to improve medical English vocabulary teaching.

The first is to innovate medical English vocabulary teaching strategies, models, and approaches because effective teaching strategies play a vital role in improving medical English vocabulary proficiency (Al Shihabi et al., 2023; Reynolds et al., 2023). Therefore, various modern teaching methods should be applied to create an excellent humanistic environment and active learning atmosphere, improving students' learning efficiency, and motivating them to learn independently.

Then, it is to perfect medical English vocabulary course/curriculum. The current research indicates that imperfect course arrangements are causing a series of adverse consequences in medical English vocabulary teaching (Romane & Bahloul, 2022; Zafirovska & Khaferi, 2022). Systematic course plans should be made in advance, such as reasonably improving vocabulary teaching time and content and providing basic learning materials with medical professional knowledge according to students' needs to improve their learning efficiency further.

Besides, it is to conduct a deep needs analysis in medical English vocabulary teaching. As needs analysis assists educators in tailoring courses, assessments, and teacher training to meet the needs of students (Zafirovska & Khaferi, 2022), it is crucial to investigate students' needs in medical English vocabulary learning to further improve teaching quality.

Moreover, it is paramount to train professional medical English teachers with both English and clinical knowledge, since strengthening the construction of medical English teachers is the key to ensuring the improvement of students' medical English level (Zhao et al., 2022). As a highly specialized subject, medical English teachers are required to have solid fundamental knowledge and be proficient in both English language and medical knowledge.

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