**A Meta Analysis of Research on Using Robot Chat Strategies in English Language Teaching and Learning**

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**Abstract**

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 This study aims to investigate the general trends, describe and focus on the studies on robot chat studies in English language teaching and learning, and investigates the publication type, design of studies, skills and areas, the participants of the study, the effectiveness of robot chat, the design of studies, the gender of participants, year of publication, the length of the text and the type of robot chat. The study used a meta analysis research design in data collection and analysis. The sample of the study consisted of 50 articles in scientific journals, conference proceedings, and graduate theses and dissertations published between 2000 and 2023. The instrument of the study was a meta analysis checklist. The descriptive statistics including frequencies and percentages were used to find if there were differences between the different features. The findings of the study showed that the journal article had the highest frequency in research on the use of robot chat. Conference proceedings received the second highest frequency, while the thesis had the lowest frequency. The control/ experimental pre/post-test design had the highest frequency in research for the design of the studies related toresearch on the use of robot chat strategies. Experimental and descriptive designs had the highest frequency, and vocabulary had the highest recurrence in research studies using robot chat strategies in teaching and learning. ESL learners scored the highest frequency compared with the research on the use of robot chat strategies in teaching and learning English. The undergraduate level had the highest repetition rate, while school had the lowest. The number of participants “15 and over” had the highest frequency, while 1-14 had the lowest. The robot chat was more effective than other methods of research in teaching and learning English. Females had the highest frequency in research on the use of robot chat strategies in teaching and learning English, while males had the lowest frequency. The period 2021-2023 had the highest frequency by females on searching the use of robot chat strategies in teaching and learning English, while the period 2000-2005 had the lowest frequency. Texts ranging between 11-20 pages (5.001–10.000 words) had the highest frequency

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in research on the use of robot chat strategies in teaching and learning English, while the texts that are over 30 pages (more than 15000 words) had the lowest frequency. Google Dialogflow, on the other hand, had the highest frequency, and finally, the voice chat had the highest frequency.

**Keywords**: Robot Chat, Meta Analysis Study, Teaching English Language, Learning English Language.

بحث ما بعد التحليل حول استخدام استراتيجيات الدردشة الآلية في تعليم
و تعلم اللغة الإنجليزية

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ملخص

 تهدف هذه الدراسة إلى إستقصاء الاتجاهات العامة ووصف وتركيز الدراسات حول الدردشة الآلية في تعليم وتعلم اللغة الإنجليزية، وتبحث في نوع النشر، وتصميم الدراسات، والمهارات والمجالات، وأفراد الدراسة، وفعالية الدردشة الآلية، وتصميم الدراسات، وجنس المشاركين، وسنة النشر، وطول النص، ونوع الدردشة الآلية. استخدمت الدراسة تصميم بحث ما بعد التحليلية في جمع البيانات وتحليلها. تكونت عينة الدراسة من 50 مقالاً في المجلات العلمية، ووقائع المؤتمرات، وأطروحات الدراسات العليا والأطروحات المنشورة بين عامي 2000 و 2023. كانت أداة الدراسة عبارة عن قائمة مراجعة باستخدام اسلوب ما بعد التحليلية. تم استخدام الإحصاء الوصفي بما في ذلك التكرارات والنسبة المئوية لمعرفة إذا كانت هناك اختلافات بين الميزات المختلفة. أظهرت النتائج التي توصلت إليها الدراسة أن: مقال المجلة يحتوي على أعلى نسبة من الأبحاث حول استخدام الدردشة الآلية. حصلت وقائع المؤتمر على ثاني أعلى تكرار، في حين أن الأطروحة والرسالة كان لها أقل تكرار. كان لتصميم الاختبارات الضابطة / التجريبية ما قبل اللاحق أعلى تردد في البحث لتصميم الدراسات الخاصة بالبحوث حول استخدام استراتيجيات الدردشة الآلية. وسجلت التصاميم التجريبية والوصفية أعلى معدل تكرار، وسجلت المفردات أعلى معدل تكرار في الدراسات البحثية باستخدام استراتيجيات دردشة المحادثة الآلية في التدريس والتعلم. سجل متعلمو اللغة الإنجليزية كلغة أجنبية أعلى معدل تكرار مقارنة بالبحث حول استخدام استراتيجيات دردشة المحادثة الآلية في تدريس اللغة الإنجليزية وتعلمها. كان أعلى معدل تكرار في المستوى الجامعي، بينما سجلت المدرسة أدنى معدل، وسجل معدل الدراسة "15 وما فوق" أعلى تكرار، و 1-14 حصل على أقل تكرار، وكانت الدردشة الآلية أعلى فاعلية من طرق البحث الأخرى في تدريس اللغة الإنجليزية وتعلمها، وكان للإناث أعلى معدل تكرار في البحث عن استخدام استراتيجيات الدردشة الآلية في تعليم وتعلم اللغة الإنجليزية، بينما كان للذكور أقل تكرار. حصلت فترة 2021- 2023 على أعلى معدل في الإناث للبحث حول استخدام استراتيجيات الدردشة الآلية في تدريس اللغة الإنجليزية وتعلمها، بينما سجلت الفترة 2000-2005 أقل تكرار، وكان للنصوص التي تتراوح بين 11-20 صفحة (5،001-10،000 كلمة) أعلى تكرار في الدراسات حول استخدام استراتيجيات الدردشة الآلية في تعليم وتعلّم اللغة الإنجليزية، بينما حصلت للنصوص التي تزيد عن 30 صفحة (أكثر من 15000 كلمة) على أقل تكرار، بينما حصلت الدردشة الآلية بواسطة Google Dialogflow على أعلى تكرار، وأخيرًا حصلت الدردشة الصوتية على أعلى تكرار.

**الكلمات المفتاحية**: الدردشة الآلية، دراسة ما بعد التحليلية، تعليم اللغة الإنجليزية، تعلم اللغة الإنجليزية.

**Introduction**

Today, the world is witnessing great developments in all sectors, which have imposed on societies to develop their systems and means and to keep track of the development that has taken place. The education sector was not immune to these developments, and keeping pace with development in the education sector has become an imperative and an urgent necessity in order to prepare a generation capable of learning. It was necessary for English language teachers to develop tools and means that would help them in teaching English language.

There has been employment of many technological tools in teaching English, which has a significant positive effect, and with the recent and growing spread of the concept of artificial intelligence and through social networks. The integration of digital Internet technologies and tools into education has begun to a great extent, and programmed and intelligent codes have appeared, called robot chats across many social media platforms, such as Facebook and Skype, as digital assistants for students, and these technologies rely on automatic text chatting (He & Xin, 2021). Chabots are mini-applications designed to work in the online learning environment and to conduct conversations with humans in a way that simulates a chat between two people. These robots appeared several years ago, and they were widely used through old chat programs, but they developed in subsequent years due to the great development in artificial intelligence research and machine learning. Robots became closer to human language due to the development of natural language processing techniques and became more able to understand what a person writes or what he asks of her (Herriman et al., 2020).

The robot chat has specific tasks. Most of them work to carry out some of the tasks requested by the user, depending on the task for which they were developed, and this is through text chat, as if it is a conversation with another person and in a language like human language (Reyes et al., 2019). In the field of education, many studies have indicated the effectiveness of using robot chat in the field of education, and it is possible to use robot chat in education to design a smart learning environment based on simulation, and enable them to apply their knowledge and skills, and create a more interactive learning environment (Omari, 2019).

Employing Web 3.0 applications based on artificial intelligence technology as interactive robot chats in education provides a smart mobile learning environment based on multimedia. It helps in analyzing the messages that the student sends to other peers who respond in answers that are saved in the bot in advance, and are stored in a huge database of its own (Elfar, 2019). The robot chat is an information program that communicates with the student automatically through a number of predetermined scenarios. It relies on platforms that provide instant messaging to do its work, such as Facebook, Skype and Telegram (Ahmed, 2021).

The robot chat facilitates students' lives, as it works as a personal assistant in their daily lives, and has a limited number of answers that it can provide to students, and the owner of the robot can stop it, block a user, read all messages sent by students. It can send group messages to users any time (Herriman et al., 2020). The robot chat can also be used to simplify the presentation of information and convert lectures into sessions. One lecture can be segmented, transformed into a set of interactive questions, and it includes many texts, images, videos and audio comments, instead of writing the lecture at once or creating a large message that is difficult to read and understand (Vanichvasin, 2021).

There are many studies that have researched the subject of robot chats, and their effect on education in general, but there is a clear lack of studies dealing with the issue of the effect of robot chat on teaching English language, and its application in teaching (He & Xin, 2021). Meta Analysis is a quantitative statistical method; it evaluates each study separately, as well as classifies the studies according to the characteristics of each study, in order to reach general results by collecting quantitative estimates, with the aim of integrating and understanding the results (Kuhail et al., 2022).

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## Meta Analysis

San and Kiymaz (2020) defined meta analysis as a subset of systematic reviews as well as a technique for compiling quantitative and qualitative data from a number of carefully chosen research in order to draw a single, more statistically robust conclusion. The statistical analysis of the findings of any one research is thought to be weaker than this conclusion. Its strength is a result of the expansion of topics or the diversification of those themes.

Meta analysis, also known as the statistical analysis of a large set of results from individual studies in order to integrate the results of multiple studies, is a concept that has been around since 1930. However, the term first appeared in 1976 by Glass Géne at the University of Arizona to describe his studies in psychotherapy and education (Ayaz & Sekerci, 2015). Nematollahi et al. (2017) defined it as a set of organized procedures to resolve the apparent contradictions in the results of various researches. Where the existing analysis meta translates the results of a number of different studies into standard units and by using statistical methods it shows the relationship between the characteristics of studies and the results. These studies are organized according to some of their characteristics, and then procedures are started to calculate the average size of the general effect concluded for these studies.

Durlak (1995) showed that meta analysis is used to evaluate systematic research studies, a structured evaluation according to split steps to draw conclusions from them, in addition to the fact that it includes the analysis of analysis, as it can be used to reach the results. The statistic of a wide range of findings from individual studies and their amalgamation, is a very accurate substitute for episodic and narrative research studies discussions; studies are collected, coded, and reported using statistical methods similar to those used in the analysis of primary data. The result is an integrated review of findings that is more objective and rigorous than narrative reviews.

 Meta analysis is used for the following purposes (San & Kiymaz, 2020):

• Determining the statistical significance of studies with conflicting results,

• Developing a more accurate estimate of the effect,

• Providing a more thorough study of the advantages, safety data, and dangers, and

• Examining the odd-numbered subgroups that have no statistical significance.

In general, meta analysis is a systematic quantitative statistical method for organizing, summarizing and extracting information from a huge amount of data obtained by various studies. The steps of the dimensional analysis method are the following (Boulton et al., 2017):

1. Determining the focus of interest: The researcher begins choosing the topic that he/ she would like to review the studies and research that has been conducted for it. As choosing a topic; then the researcher selects one method that he would like to focus the light on, such as defining the problem-solving method as a focus (Muhammad, 2020). Collection of studies and research: The researcher collects the studies and research available to him/ her, and collects them based on the contents of the study title, the previously identified topic (Muhammad, 2020).
2. Examining studies and research: The researcher examines the content of each study or research he/ she has collected separately to make sure of its relationship to the focus of attention, and this is done in light of the procedural definition that the researcher took for the focus of attention (Muhammad, 2020).
3. Descripting the studies and research: The researcher describes each of the previous studies and research that resulted from the third step according to the variables addressed by the study, namely: the chronological age of the study sample / gender of the sample members (male and female) / year of publication / place of completion of the study / Source of the study (Master's thesis, PhD thesis, Periodicals, and Conferences.) / Type of treatment used with the control group (Dialogue method, the normal way, and Scout method) / Field of study (mathematics, algebra, and physics) / Tools used (specially designed tools, published tools, cards, observations, interviews, and choices) / Number of study sample members / Number of teachers participating in the study / Section size / Study duration / Stability of the tools used in the study / Type of measured dependent factors (cognitive, evasion, and emotional) (Muhammad, 2020).
4. Tabulating of data and results: The researcher then tabulates the data collected from each of the study according to the variables that were addressed and which were mentioned in the fourth step, and then classifies these studies according to those variables, and sets in each of them the average scores of each group (experimental. control). The number of participants in each group and the standard deviation of the control group's scores (Muhammad, 2020).
5. Calculating of the effect size: The measures of effect size differ according to the statistical test used to test the hypothesis (Muhammad, 2020).
6. Calculating the value of the average effect size equal to the sum of the effect size of all studies divided by the number of studies (Muhammad, 2020).
7. Judging the value of the average effect size (Muhammad, 2020).

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## Robot Chat

Using computer software called robot chats, people may converse with digital gadgets as if they were conversing with actual people by simulating and processing human speech (spoken or typed). Robot chats may be as basic as one-line programs that respond to simple questions or as complex as digital assistants that learn and develop to offer ever more individualized service as they gather and analyze data (Winkler & Sollner, 2018).

Robot chat are mini-applications designed to work on platforms in a computer network, and their purpose is to conduct conversations with humans in a way that simulates a chat between two people. Artificial intelligence and machine learning, as a result of advancements in natural language processing techniques, applications now have a greater ability to comprehend human language, bringing them closer to a human-like understanding. Additionally, robot chat have been designed to perform straightforward tasks like retrieving weather information, streaming videos from YouTube, or locating particular emojis (Clarizia et al., 2018).

Chat robots can be used in education to design a smart and adaptive mobile learning environment based on simulation, so that it is more interactive to force students to apply their acquired knowledge and skills, and this would help create environments that help the student to retrieve and apply their knowledge and skills more effectively. The application of such an educational system would be in line with the requirements of the modern era, which calls for the development of the educational system and the scientific and technical revolution that it carries. Interactive robot chats in education provide more time to work with students and ensure their comprehension of the scientific material. Helping them adapt their learning pace according to their needs and schedule, giving access to all lessons and exams anytime and anywhere, and the student can request help with a click of a button (Hiremath et al., 2018).

Santirattanaphakdi (2018) mentioned that interactive robot chats are among the modern methods that can be used in the field of education. They can be used to provide educational content to students in a fun and attractive way, so that the teacher can send new lessons that he/ she prepares weekly for all students, and those lessons are called by a special name inside the robot, which is “capsules”. These lessons are based on video as digital content, and are presented in the form of short scenes, and each scene is followed by a question related to the scene, and the answers to the questions inside the robot are done through multiple choice, and if the student makes a mistake in the answer, he/ she can try again and then move to the next scene. With each scene, the student gets to know a new piece of information, term, or concept, until he/ she reaches the last stage to be able to watch the video in full after he has mastered all the concepts and terms to be learned.

Interactive robot chats are artificial intelligence application, which can analyze user messages and respond to them immediately through responses saved in a database of their own, and in a language that mimics human language, and interactive robots are used in education so that knowledge, skills and trends are provided automatically to the learner according to his/ her abilities and needs, which are mini-applications that aim to have a conversation with the learner in a language that simulates his/ her own, through various means (audio, textual, and visual) that help him/her answer his/ her questions. It conducts conversations with learners using communication interfaces in their natural language, and provides them with a faster solution to their questions rather than relying heavily on the teacher, and its main objective is to simulate an intelligent human conversation as close as possible to a conversation with another person, in order to provide specific information (Bungodchai, 2017).

By utilizing artificial intelligence, automated grammar, natural language processing (NLP), and machine learning (ML), robot chats are capable of processing data and generating responses for a wide range of requests (Hien et al., 2018).

There are two main types of robot chats as Kasthuri & Balaji (2021) mentioned:

1. **Robot chats (non-procedural) to achieve specific tasks**

Task-oriented robot chats are designed to perform a singular function, utilizing grammar, Natural Language Processing (NLP), and a small amount of machine learning (ML) to generate automated yet conversational responses to user inquiries. These robot chats are best suited for structured interactions, particularly in support and service functions such as interactive FAQs. They excel at handling common questions that involve minimal variables, like inquiries about business hours or simple transactions. Although they utilize NLP to provide users with a conversational experience, their capabilities are generally straightforward. Task-oriented robot chats remain the most commonly used type of robot chat (Kasthuri & Balaji, 2021).

1. **Data-based and predictive robot chats**

Virtual assistants, also known as digital assistants, are highly advanced robot chats that offer a more interactive and personalized experience than their task-oriented counterparts. These robot chats are context-aware and employ NLU, NLP, ML to continuously learn and improve. By applying intelligence and predictive analytics, digital assistants can tailor responses to individual user profiles and past behavior. Over time, they can learn a user's preferences, make personalized recommendations, and even anticipate their needs. In addition to monitoring user data and intent, they can also initiate conversations. Notable examples of data-driven predictive robot chats designed for consumers include Apple's Siri and Amazon's Alexa (Kasthuri & Balaji, 2021).

Chat robots have great benefits in education, as Brandtzaeg and Folstad (2017) stated that in their use:

* Provide students time to be able to work with other students, and ensure their understanding of the scientific material
* Helping students adapt their own pace of learning according to their needs and schedule
* Providing access to all lessons and exams anytime and anywhere.
* Students request help with a button click.

 Ahmed (2021) Mentioned other benefits of robot chats in education:

1. Reducing costs for employees who provide customer service.
2. Immediate support and immediate responses to students and parents.
3. Enhancing the user experience.
4. Empowers artificial intelligence systems to recognize user preferences.
5. Seamlessly integrating into diverse digital platforms, eliminating the need for downloading additional applications or software.
6. Providing the ability to conduct conversations through text or voice methods, and programs are designed to simulate the way humans actually behave during a conversation and this makes them pass the test.

 Interactive robot chats in the field of virtual education have a number of features (Omari, 2019):

1. It detects the emotional state of students, can be identified by robot chats, and the response can be modified by adapting language to the emotional state, or incorporating pleasant words.
2. Interactive robot chats provide students with personalized learning, adapting to the pace of student learning, according to their own needs and requirements, and this provides a more direct approach when sending information or resolving course inquiries.
3. By offering instant, pre-programmed responses to frequently asked questions, robot chats enable teachers to reduce the time required for organizing and carrying out tasks.
4. The time saved can be utilized for conducting research or completing pending course projects, as well as for supervising and motivating students.
5. Through using Artificial Intelligence (AI), data pertaining to student assessment and progress can be effectively stored and analyzed, enabling students to manage their time efficiently and assign tasks based on their objectives.
6. Improving access to education, as interactive bots are an interaction-oriented machine learning tool, and do not take into account the resources, language, or location of the student.

Yin and Satar (2020) mentioned that robot chats improve the learning process, make learning fun, help attract students' attention, help solve problems that students face in practical material and in online education, and enables students to make decisions quickly and automatically, and enables them to get rid of repetitive tasks such as sending an email to all students, and frequently asked questions to students. In addition to providing robot chats an interactive environment, based on the diversity of educational content, and reminding of the required tasks when they are due, and this helps teachers to analyze the student’s academic performance, providing education according to he/ she needs, assisting the student in research, providing various sources for obtaining correct and accurate information, enhancing communication with students, and providing them with immediate feedback.

As for the role of robot chats in education, Vanichvasin (2021) confirmed that there are robot chats that have been developed to solve various challenges in the education sector to facilitate study and learning, and robot chats used in education were created with great care to enable students and schools to access reliable materials, and students’ study has become much easier, and one of the areas in which robot chats have been integrated is mobile learning and distance education, where robot chats have helped students access all the information they want, and they can get answers to their questions without having to talk to specialists and straightforward, robot chats are a time-efficient way to engage with different lessons and learn while students are on the go.

The most important function of robot chats is their ability to determine the user’s intent, and if robot chats cannot understand the request of the user, it cannot give the correct answer as the following (Clarizia, 2018):

* generic and predefined text response,
* user-provided data context,
* stored data in databases, and
* specific actions list.
1. **Robot Chat and English Language Teaching and Learning**

Several studies, such Kasthuri and Balaji (2021) and Hien et al. (2018) have shown that the use of interactive robot chats is highly effective in learning English as a foreign language students prefer to study English through robot chats more than learning it through teachers. Robot chats help English language teachers to become more efficient in teaching English, robot chats answer frequently asked questions, and the teacher focuses on the questions that are the most specialized and complex, robot chats do not ask students to mention their names when sending questions to teacher. This reduces the barrier that students feel when asking questions, and provides them with basic knowledge of the English language.

Omari (2019) pointed out that there are 6 benefits to teaching English through robot chats:

1. It makes students feel more comfortable talking to the computer than talking to the teacher directly, which makes them deal with English language easily.
2. Robot chat helps students repeat the same material without the bot getting bored or losing control.
3. Robot chat provides a range of text and speech; This allows students to practice both listening and reading skills.
4. Chat robot chat are a new interactive tool for the student, and exciting his/ her attention, which increases his/ her motivation to learn the language.
5. Through the use of robot chat, students have the opportunity to use a variety of linguistic structures and vocabulary, which allow them to be used later.
6. Robot chat effectively provides instant feedback to students in English spelling and grammar learning.

## Problem of the Study

After the researchers conducted a survey of previous research studies that focused on investigating the effectiveness of using robot chat in teaching English in the different stages of public education, during the period from 2010 to 2023, it was found that there was a large number of previous research and studies which concluded with many results. There is no study that focused on a comprehensive review of the results of those previous research within the limits of the researchers' knowledge-to benefit from them in educational decision-making, and to indicate the priorities of educational research in this regard, and to explain the levels of contradiction between the results of studies, and their fields and explaining its reasons. Therefore, the main question that emerged was: what were the general trends, description and focus of research of using robot chat strategies in English language teaching and learning?

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## Significance of the Study

The theoretical importance in the current study stems from the importance of empirical research in the fields of English language teaching and learning. It also provides many tools, methods and treatments to develop variables of importance and connection to achieving the goals of English language education, and what it includes in developing English language skills such as speaking, writing, and reading. It also stems from the importance of the technology use variable in developing English language teaching treatments and operations, as technology is directly related to the English language as a study subject and as a science.

The practical importance of the current study is determined in building a clear and general vision about the effectiveness of using the innovations of learning technologies as conversational robots in teaching English, which can be employed by decision makers, curricula designers and professional development programs in developing work with technological tools and means in the stages of developing and implementing the developed English language curricula.

Its practical importance lies in building a detailed vision that may benefit English language teachers and educational supervisors about the degree of effectiveness of using innovative learning techniques in teaching English, in order to achieve the objectives associated with the English language and its skills, and to develop teachers’ performance in education, and the current study may benefit researchers in the fields of language education. The results of this study may shed light on empirical research in the areas of effectiveness of the use of robot chat innovations in teaching English, which may help in developing students’ language skills and areas.

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## Goal and Question of the Study

The aim of this study is to present an overview of research on robot chat strategies by examining various aspects. The question of the study was what are the general trends, description, and focus of research about using robot chat strategies in English language teaching and learning related to the following features: the publication type, design of the study, skills and areas, instrument of the study, participants, effectiveness of robot chat, design of the study, gender of participants, year of publication, length of text, robot, and type of chat.

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## Related Studies

## Related Studies About Meta Analysis in English Language

Jasim (2015) aimed to establish the overall trends, description and emphasis of research regarding Arabic-English MT systems. In other words, it looked into the type of publication, type of translation, genre, text type, MT system used, translation direction, length of text (including number of words and pages), study design, year of publication, source tool (source dictionary used in the MT system), and translation linguistic level in Arabic-English MT studies. In order to gather and analyze data, the study employed a Meta-analysis research design. The sample of the study included 50 journal papers, conference presentations, and graduate theses published between 2000 and 2015. A meta analysis checklist was employed as the instrument of the study. To determine if there were statistically significant differences between frequencies, the nonparametric test Chi-square was utilized. The nonparametric test Chi-square was performed to determine if there were statistically significant differences in the frequency of certain attributes. The findings demonstrated statistically significant variations in the frequency of MT studies based on publication type in favor of journal articles. The translation type MT of studies on Arabic-English MT systems was the most common. The frequency of use of common core English in text type was the greatest in the sample studied. Google Translate was the MT system utilized in studies on Arabic-English MT systems. The most frequent translation direction was Arabic into English. In studies on Arabic-English MT systems, the text length category of 1-10 pages (220-2200 words) received the most frequencies. The comparison received the greatest frequency in studies regarding Arabic-English MT systems. The study findings also revealed that there were no changes in the frequency of MT studies based on the year of publication. The year with the highest frequency was 2010. BLEU was the most often used source tool (source dictionary) in studies on Arabic-English MT. According to the findings, the “sentence” received the greatest frequency of all translation linguistic levels.

Ayaz and Şekerci (2015) investigated the effects of the constructivist learning approach on learners' academic achievement, including linguistic achievement. The researchers conducted an extensive search across international databases, national articles, master's theses, and doctoral dissertations published between 2003-2014 in English and Turkish. After a thorough literature review, 53 studies that met the inclusion criteria and had significant statistical data were included in the meta analysis. The moderator analysis revealed that the most substantial effect values were observed in master's theses, particularly in subjects related to language instruction at the college level. These findings have important implications for educators and policymakers seeking to optimize academic achievement through constructivist learning approaches.

Nematollahi et al. (2017) conducted a comprehensive meta analysis of 30 cutting-edge research projects investigating the vocabulary learning strategies of EFL learners. The study design was both the descriptive and qualitative parameters. It was aimed at assessing the effectiveness of treatments within the context of second language learning. By carefully examining factors such as context, care, research method, and vocabulary learning, along with the use of strategies, the study revealed some crucial insights. It was found that highly successful learners relied on cognitive, memory, meta-cognitive, and social strategies and displayed unwavering commitment towards achieving their goals. Furthermore, contextualization and the use of a dictionary were identified as highly favored techniques. In addition, the study explored the intricate relationship between context, methodology, and treatment with respect to vocabulary learning approaches, highlighting important considerations for educators and policy makers.

Boulton and Cobb (2017) conducted a systematic meta analysis to provide a comprehensive summary of the experimental and quasi-experimental studies exploring the effectiveness of corpus linguistics tools and techniques in second-language learning or use, commonly referred to as data-driven learning (DDL). This thorough analysis of 64 distinct studies, representing 88 unique samples with sufficient data, revealed that DDL approaches had a significant overall effect for both control/experimental group comparisons (d=0.95) and pre/post-test designs (d=1.50). Furthermore, the examination of moderator variables uncovered that small effect sizes were primarily associated with small sample sizes. Despite significant progress in DDL research, there are still essential areas that require further investigation, such as the longevity/transfer of learning through delayed post-testing. The study recommends further functional and reporting improvements to continue advancing this field of research. This groundbreaking research has profound implications for the field of second-language learning and paves the way for future research to optimize the potential of DDL approaches.

San et al. (2018) determined the overall effect size of the traditional methods on academic achievement in the experimental studies on teaching English. For this purpose, the data were collected from the master's and doctoral thesis carried out in Turkey. The aim of meta analysis is to compare and combine the results of studies on a subject. Ten doctoral and 40 master theses between the years 2005-2018, meeting the inclusion criteria, were included in the study. Results show that traditional methods have large effect d=0,98 0,83; 1,12 on English academic success. This result means traditional methods increases academic success in teaching English, but this result does not mean that traditional method is more successful than modern approaches.

Al-Jumaily (2018) aimed to discover broad patterns, describe, and concentrate research on the effectiveness of applying mind mapping tools in English language instruction. A meta analysis checklist was employed as the instrument of the study. The nonparametric examination, including Chi-square test was done to see if there were any changes in the frequency of the different attributes. The findings demonstrated statistically significant variations in the frequency of mind mapping research based on publication style, with journal articles outperforming other formats. The experimental design of research on mind mapping methods received the most attention. Moreover, the largest significant frequency for abilities and regions was for reading in research concerning mind mapping methodologies. In the studied sample, the participant type and level (EFL learners, school, and 15 participants and more) got the greatest frequencies. The year of publishing with the highest frequency was 2016. Mind mapping is more successful than other approaches in terms of efficacy, according to the highest frequencies. In terms of study tool, test had the most frequency in the studies. The feature mind mapping (regular) approach was the most often employed strategy in the research. In tests on mind mapping procedures, the text length of 11 to 20 pages (5001-10000 words) received the most frequency.

Alsoufi and AbuSeileek (2019) examined the general trends, description, and focus of research on the effectiveness of games as a strategy in English language teaching and learning. Specifically, the study investigated the strategies used, instrument, year of publication, publication type, participants, design of the study, skills and areas analyzed in the study, and length of text in studies about the effectiveness of the games method. to achieve this, a meta analysis research design was employed for data collection and analysis, using a sample of 70 journal articles, conference proceedings, and graduate theses and dissertations published between 2000 and 2018. a meta analysis checklist was used as the research instrument, and descriptive statistics such as frequencies and percentages were used to identify any significant differences between the various features examined. the findings revealed that the most frequently used strategy in the studies analyzed was the regular games method, and the test instrument had the highest frequency in the sample studies. However, the year 2016 had the highest frequency for the year of the study. Conference proceedings had the next highest frequency among publication types. In terms of participants, EFL learners, school students, and studies with 16 participants or more had the highest frequencies in the study sample. The experimental design of studies about games strategies received a high frequency, and the most frequently analyzed skill or area was reading. The feature of games being more effective than other methods had the highest frequency, and the text length of 11 to 20 pages (2,645-4,729 words) category had the highest frequency in the studies about games strategies.

Alsowat (2020) analyzed the effect of English language teaching practices on language outcomes. In this study, a literature search yielded 90 meta analyses published between January 1995 and December 2019. The analysis encompassed 3,496 studies, 7,870 effect sizes, and approximately 700,000 students. Three moderator variables were examined: year of publication, setting, and educational level. The results indicated that language learning strategies had a moderate effect on language outcomes overall, with the greatest effect on speaking. Technology-based language learning had a moderate effect on language outcomes overall, with the largest effect on vocabulary. Explicit instruction had a moderate effect on language outcomes overall, with the greatest effect on grammar. Mobile-based language learning had a small effect on language outcomes overall, with the largest effect on listening. The effect of teaching practices on language outcomes was significantly moderated by the setting and educational level. The implications of these findings were discussed, and suggestions for future research were proposed.

Alsoufi and AbuSeileek (2020) investigated the general trends, descriptions, and research focus regarding the effectiveness of using smartphones in English language teaching and learning. The research instrument used was a Meta Analysis checklist, and descriptive statistics were used to identify any significant differences between the various features examined. The results showed that the experimental design of studies about smartphone strategies received the highest frequencies, and the highest frequency for skills and areas was for listening. Additionally, the highest frequency for the year of publication was 2018, and the effectiveness of smartphones received the highest frequency. The participant type and level (EFL learners, school, and 15 participants or more) received the highest frequencies in the analyzed sample, and the length of text of 1 to 15 pages (1-2800 words) was the most frequent. The feature "smartphones (regular)" method received the highest frequency in the strategies used in the studies. In terms of the instrument of the study, tests received the highest frequency in the studies. Furthermore, there were differences between the frequency of smartphone studies due to the type of publication, with journal articles receiving higher frequencies.

Rahmati et al. (2021) investigated the effect of educational technology in English language teaching by studying 67 articles and theses (from 1000 studies that were relevant in title and abstract). All articles and theses were included from 2009 to 2020 and 7 articles were excluded from this study due to insufficient information. Furthermore, two instruments, SPSS (mainly its sub-branch Kruskal-Wallis test) and CMA were used to calculate and evaluate data in this research. The total effect size calculated for studies under both fixed and random models was statistically significant and also the study of effects by year of publication, instruments used in research and research methods showed that their effect size was significant. Teaching English with the help of technology has an effective effect size and has shown the success of this technology in language learning.

Al Droubi and AbuSeileek (2023) examined the general trends, descriptions, and research focus on audiovisual studies in English language teaching and learning. Descriptive statistics, such as frequencies and percentages, were used to identify differences between various features. The findings of the study revealed that the meta analysis design is highly useful in determining the effectiveness of audiovisual chatting in teaching and learning the English language. Additionally, most participants were male undergraduates, with more EFL learners than ESL learners. The study sample consisted of over 15 individuals, and most studies focused on audiovisual tools for teaching integrated language skills and areas, rather than a single skill or area. The study designs were primarily descriptive, based on questionnaires, and the majority of the study were published between 2015 and 2019.

## Related Studies About Meta Analysis in Robot Chat

Winkler and Sollner (2018) conducted a rigorous systematic literature review using a multi-perspective framework. Their intense scrutiny of 1405 articles from diverse fields, including management, education, information systems, and psychology, culminated in the careful coding of a highly relevant subset of 80 articles. Astonishingly, their findings revealed that robot chats are only just beginning to be harnessed in education. While some studies have indicated the tremendous potential of robot chats in improving learning processes and outcomes, past research has also revealed that their effectiveness in education is highly complex and influenced by a myriad of factors. This research is a wake-up call for the education community to recognize the vast untapped potential of robot chats and invest in research to fully understand their capabilities and limitations.

Kuhail et al. (2022) reviewed 36 papers to explore the integration of robot chats in education across seven dimensions including educational field and interaction styles. The authors found that most robot chats focused on language and general education. A majority of the robot chats acted as teaching agents, while others functioned as peer agents. The majority of robot chats followed predetermined conversational paths, but some used personalized learning, experiential, and collaborative learning. Results from experiments on over a third of the robot chats showed improved learning and subjective satisfaction. Future studies should examine the effect of robot chat personality and localization on subjective satisfaction and learning effectiveness.

Chinedu et al. (2020) analyzed 53 articles about from recognized digital databases. The review results provide a comprehensive understanding of prior research related to the use of Robot chats in education, including information on existing studies, benefits, and challenges, as well as future research areas on the implementation of Robot chat technology in the field of education. The implications of the findings were discussed, and suggestions were made.

After reviewing previous studies related to the subject of the study, the researchers find that many studies dealt with the effect of using interactive robot chats. The studies dealt with many issues that evaluate the effect of using robot chats, and a number of studies required meta analyses. Previous descriptive analyzes covered about teaching English a wide range of the effect of a variety of teaching practices on different language outcomes, and addressed the effect of the use of robot chats on education, and there is a request to combine these efforts to build clear and research-based foundations for language learning. The research gap in the teaching literature lies in the lack of a combination of meta analyses on the effect of English language instruction on language outcomes, and this meta analysis is conducted to search for clear evidence of the use of robot chats on English language instruction.

##

## Method

## Design of the Study

Because of the nature of the study, the researchers used the meta analysis approach which is concerned with conducting an analysis of the results of studies conducted on a specific topic, by collecting previous quantitative data related to the of the study objectives and measuring the size effect. Meta analysis results can also be used to determine the efficacy of a specific program or intervention. Size effect is a method that reveals the strength of the influence of the independent variable on the dependent variable by comparing, measuring, and collecting appropriate quantitative data obtained from experimental and quasi-experimental studies using statistical methods appropriate to the used statistical tests. The current dimensional analysis sample with the aim of calculating the average size of the effect caused by the experimental variable (robot chat strategies) on the dependent variables (English language skills and areas), using appropriate statistical methods in organizing and extracting data from the results of previous research and studies.

## Sample of the Study

The researchers used certain exclusion criteria for studies in this field. The sample included 50 resources published between 2000 and 2023. The sample used in this study were publicly available, including journal articles, conference proceedings, and graduate theses and dissertations, including publication type, design of the study, the skills and areas, instrument of the study, participants, effectiveness of robot chat, participants gender, year of publication, text length, robot used in the study, and chat type.

## Instrumentation

 The researchers reviewed the most commonly used scientific databases for publishing studies related to robot chat strategies. These databases included those available at Universities Database, Al Mandhomeh, Eric, and Shamaa. The search sample was limited to researches published between 2000 and 2023. These databases provide access to a range of international sources and journals, and the sample research for this study was sourced from a variety of journals and sources.

 If the following requirements are met, the study sample was taken into account in the meta analysis of this study:

1. Robot chat strategy effect on the English language
2. The participants are only EFL or ESL learners.
3. It was released and published between 2000 and 2023.
4. The design of the study is experimental, quasi-experimental, descriptive, and/or qualitative; data to determine the effect of robot chat strategies can only come from research that experimentally and/or descriptively examine the efficacy of particular treatments.

 The researchers created a meta analysis checklist, It is a special model specifically for coding studies and it employed coding models that have been described in academic literature and earlier research. Coding models are the study instrument in meta analysis investigations. The 12 components of the coding model were as follows (Appendix B):

* Publication type: It includes journal article, conference proceedings, and thesis/dissertation.
* Design of the study: it includes control/experimental pre/post–tests, one–group pre/post–tests, descriptive (e.g., questionnaire), qualitative (e.g., open–ended interview), both qualitative and quantitative (test and / or questionnaire, and open – ended interviews), experimental and descriptive, and quantitative and qualitative.
* The skills and areas: They include grammar, writing, listening, pronunciation, reading, speaking, vocabulary, and integrated language skills and areas.
* Instrument of the study: It includes test, observation checklist, open – ended interview, questionnaire, and mixed instruments.
* Participants: It includes type (EFL and ESL), level (school, undergraduate and graduate), number (1-14 and15 and more).
* Effectiveness of robot chat: It includes robot chat is more effective than other methods, robot chat is less effective than other methods, and robot chat is as effective as other methods.
* Participants’ gender: It includes male/ female.
* Publication Year: It includes the following periods 2000-2005, 2006 – 2010, 2011–2015, 2016–2020, and 2021–2023.
* Text length: It includes 1 -10 pages (250-5000 words), 11-20 pages (5001-10000 words), 21-30 pages (10001-15000 words), More than 30 pages (More than 15000 words)
* Robot: It includes Marvin, Siri, Google Dialogflow, Kuki, RALL, Elbot, TPBOT, Echodot, EnglishBot, Ellie, CSIEC, MultiWOZ, AsasaraBot, ELIZA and Alexa.
* Chat type: It includes text only, voice only, and both text and voice.

 The instrument of the study was presented to 9 English language curricula and instruction specialists, as well as English language specialists, from various private and public Jordanian universities (Appendix C). The jury were requested to evaluate the assessment tool based on various parameters such as the strategies employed, year and type of publication, participants involved, study design, areas and skills examined, and text length. Feedback was provided on improving the rubrics and modifying certain aspects of the study, including the research design and the assessment instruments utilized. The comments and suggestions were taken into consideration, and mistakes were corrected by the researchers. To achieve the instrument reliability, the reliability coefficients for the meta analysis were calculated using two independent raters. They were provided with the samples of the collected studies and were instructed to use the established instrument and features of the study to rate them. The meta analysis yielded an inter-rater reliability score of 0.92, which indicated that the study was reliable.

## Procedures of the Study The methods employed in this dimensional analysis of the study were based on the following steps:

1. The current study subject is represented in a meta analysis of the research on the effectiveness of using robot chat strategies in English language teaching, which is the first step in choosing the research topic.
2. Compiling research and studies from a variety of publishing sources (conferences proceeding, and journals and thesis) in order to achieve the strength of results and avoid bias. The previous studies and research collected are relevant to the topic of the research, as well as those that dealt with the effectiveness of using robot chat strategies and achieving different outputs.
3. Review and analysis of previous studies and research: Each previous study and research was examined to make sure it is relevant to the research topic and meets the inclusion criteria, and then anything that is incompatible with the research subject or contravenes any of the inclusion criteria excluded from it.
4. Calculating and tabulating data: The data collated, evaluated, and categorized in accordance with the research variables, and a model for coding current research and prior studies was developed. It described the features of each study in terms of publication type, design of the study, the skills and areas, instrument of the study, participants, effectiveness of robot chat, gender of participants, year of publication, length of text, robot, and type of chat in the analysis. The frequencies and percentages for the 12 features were computed and listed them in Tables.
5. To obtain the results, appropriate descriptive statistical analyses were carried out.

##

## Data Analysis

 In this study, the method for data analysis was meta analysis which is a well-established approach for analyzing quantitative research data. Descriptive statistics such as frequencies and percentages were used to identify significant differences in the frequencies of the twelve primary features and their sub-variables. These features included publication type, study design, areas and skills studied, study instrument, participants, effectiveness of robot chat, gender of participants, year of publication, length of text, robot type, and type of chat.

**Findings**

 The study question focused on exploring general trends and descriptions of the use of robot chat strategies in teaching and learning English language. To answer this question, the fifty studies were categorized by type of publication. Frequencies for the type were calculated for each study, and then frequencies and ratios were calculated as shown in Table 1.

**Table 1: Frequencies and Percentages of Publication Type** **for Research on the Use of Robot Chat Strategies in Teaching and Learning English**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rank** | **Publication Type** | **Frequency** | **Percentage (%)** |
| 2 | Conference Proceedings | 8 | 16 |
| 3 | Thesis/Dissertation  | 1 | 2 |
| 1 | Journal Article | 41 | 82 |
| Total | 50 | 100 |

As can be seen from Table 1, the journal article has the highest frequency (41, 82%) in research on the use of robot chat strategies in teaching and learning English. Conference proceedings received the second highest frequency (8, 16%), while the thesis/dissertation had the lowest frequency (1, 2%).

The study also focused on the design of the study for research on the use of robot chat strategies in teaching and learning English. To answer this question, each mode was classified into 50 coded studies by including control/experimental pre/post–tests, one–group pre/post–tests, descriptive (e.g., questionnaire), qualitative (e.g., open–ended interview), both qualitative, and quantitative (test and questionnaire), experimental and descriptive, and quantitative and qualitative as shown in Table 2.

**Table 2: Frequencies and Percentages for the Design** **of Studies for Research on the Use of Robot Chat Strategies in Teaching and Learning English**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rank** | **Design of the Study** | **Frequency** | **Percentage (%)** |
| 1 | Control/experimental pre/post–tests | 15 | 30 |
| 7 | One–group pre/post–tests | - | - |
| 4 | Descriptive e.g., (questionnaire) | 8 | 16 |
| 2 | Qualitative (e.g., open–ended interview) | 13 | 26 |
| 5 | Both qualitative and quantitative (test and / or questionnaire, and open – ended interviews) | 3 | 6 |
| 6 | Experimental and descriptive | 2 | 4 |
| 3 | Quantitative and qualitative | 9 | 18 |
| Total | 50 | 100 |

As can be seen from Table 2, the control/experimental pre/post–tests had the highest frequency (15, 30%) for the design of the study on research about the use of robot chat strategies in teaching and learning English, the experimental and descriptive design had a low recurrence (2, 4%), while one–group pre/post–tests had no recurrence.

The study also focused on the skills and areas on the skills and areas under investigation of research on the use of robot chat strategies in teaching and learning English. To answer this question, skills and areas were classified into grammar, writing, listening, pronunciation, reading, speaking, vocabulary, and integrated language skills and areas. Both frequency and percentage for each variable were calculated as shown in Table 3.

**Table 3: Frequencies and Percentages for Skills and Areas of Research on the Use of Robot Chat Strategies in Teaching and Learning English**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rank** | **Skills and Areas** | **Frequency** | **Percentage (%)** |
| 5 | Grammar | 2 | 4 |
| 2 | Writing | 10 | 20 |
| 4 | Listening | 3 | 6 |
| 3 | Pronunciation | 4 | 8 |
| 5 | Reading | 2 | 4 |
| 2 | Speaking | 10 | 20 |
| 6 | Vocabulary | 1 | 2 |
| 1 | Integrated language skills and areas | 18 | 36 |
| Total | 50 | 100 |

 As can be seen from Table 3, integrated language skills and areas had the highest frequency (18, 42%), vocabulary (1, 2%), for research on the use of robot chat strategies in teaching and learning English.

 The study also focused on the instrument in studies about the use of robot chat strategies in teaching and learning English language. To answer this question, each mode was classified into 50 coded studies by including test, observation checklist, open – ended interview, questionnaire, and mixed instruments. Both frequency and percentage for each variable were calculated as shown in Table 4.

**Table 4: Frequencies and Percentages for Instrument of** **Research on the Use of Robot Chat Strategies in Teaching and Learning English**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rank** | **Instrument of the study** | **Frequency** | **Percentage (%)** |
| 1 | Test | 15 | 30 |
| 5 | Observation checklist | - | - |
| 2 | Open – ended interview | 13 | 26 |
| 4 | Questionnaire | 10 | 20 |
| 3 | Mixed instruments | 12 | 24 |
| Total | 50 | 100 |

 As can be seen from Table 4, the test had the highest recurrence rate (15, 30%) in research about using robot chat strategies in teaching and learning English. The questionnaire ranked second in terms of frequency (10, 20%), while the observation checklist had no frequency.

The study also focused on participants in research about the use of robot chat strategies in teaching and learning English. To answer this question, the participants in the 50-study sample were coded. Studies were categorized by including level, type and number of participants, and then the frequency and percentage were calculated as shown in Table 6.

**Table 5: Frequencies and Percentages for the Participants' Level, Type, and Number** **for Research on the Use of Robot Chat Strategies in Teaching and Learning English**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rank** | **Participants** | **Frequency** | **Percentage (%)** |
| 2 | Type | EFL learners | 32 | 64 |
| 1 |
| ESL | 18 | 36 |
| 3 |
| 3 | Level | School | 13 | 26 |
| 1 | Undergraduate | 20 | 40 |
| 2 | Graduate | 17 | 34 |
| 2 | Number | 1-14 | 7 | 14 |
| 1 | 15 and more | 43 | 86 |
| Total | 50 | 100 |

As can be seen in Table 5, EFL participants scored the highest frequency (32, 64%) relative to research on the use of robot chat strategies in teaching and learning English while ESL learners scored the least frequency (18, 36%). They also had the highest repetition rate at the undergraduate level (20, 40%), while the school level got the lowest (13, 26%). The number of percentages “15 and over” had the highest frequency (43, 86%) while the number “1-14” had the lowest frequency (7, 14%).

 The study question focused on identifying general trends and description and focus for research on the use of robot chat strategies in teaching and learning English. To answer this question, the fifty studies were classified according to the following: Robot chat is more effective than other methods, robot chat is less effective than other methods, robot chat is as effective as other frequencies were calculated for the effectiveness of each study, and then the frequencies and percentages were calculated as shown in Table 7.

**Table 6: Frequencies and Percentages** **for Research on the Effectiveness of Robot Chat Strategies in Teaching and Learning English**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rank** | **Effectiveness of Robot Chat** | **Frequency** | **Percentage (%)** |
| 2 | Robot chat is more effective than other methods | 50 | 100 |
| 2 | Robot chat is less effective than other methods | - | - |
| 1 | Robot chat is as effective as other methods | - | - |
| Total | 50 | 100 |

As can be seen from Table 6, the option “robot chat is more effective than other methods” obtained all frequencies (50, 100%) for research on the use of robot chat strategies in teaching and learning English, while the other options did not receive any rate.

The study also focused on the gender of participants in research on the use of robot chat strategies in teaching and learning English. To answer this question, each situation was classified into 50 coded studies by including female and male. Both frequency and percentage for each variable were calculated as shown in Table 7.

**Table 7: Frequencies and Percentages for the Gender of Participants** **for Research on the Use of Robot Chat Strategies in Teaching and Learning English**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rank** | **Gender of Participants** | **Frequency** | **Percentage (%)** |
| 1 | Female | 27 | 54 |
| 2 | Male | 23 | 46 |
| Total | 50 | 100 |

 As can be seen in Table 7, females had the highest frequency (27, 54%) in research on the use of robot chat strategies in teaching and learning English, while males had the lowest frequency (23, 46%).

 The study also focused on the year of publication in studies for research on the use of robot chat strategies in teaching and learning English. To answer this question, each mode was classified into 50 coded studies by including 2000 – 2005, 2006 – 2010, 2011 – 2015, 2016 – 2020, and 2021-2023. Both frequency and percentage for each variable were calculated as showed in Table 8.

**Table 8: Frequencies and Percentages for Publication Year** **for Research on the Use of Robot Chat Strategies in Teaching and Learning English**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rank** | **Year of Publication** | **Frequency** | **Percentage (%)** |
| 5 | 2000 – 2005 | 1 | 2 |
| 3 | 2006 – 2010 | 7 | 14 |
| 4 | 2011 – 2015 | 2 | 4 |
| 2 | 2016 – 2020 | 18 | 36 |
| 1 | 2021 – 2023 | 22 | 44 |
| Total | 50 | 100 |

As can be seen from Table 8, the period 2021-2023 had the highest frequency (22, 44%) for research on the use of robot chat strategies in teaching and learning English, while 2000 – 2005 had the lowest frequency (1, 2%).

The study also focused on finding the text length in studies on the use of robot chat strategies in teaching and learning English. To answer this question, all ratings of the length of text in the 50 studies were coded by including 1-10 pages (250-5000 words), 11-20 pages (5001-10000 words), 21-30 pages (10001-15000 words), and more than 30 pages (more than 15000 words). Frequency and percentage for each variable were calculated as shown in Table 9.

**Table 9: Frequencies and Percentages for the Length of Text for Research on the Use of Robot Chat Strategies in Teaching and Learning English**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rank** | **Length of Text** | **Frequency** | **Percentage %)** |
| 3 | 1-10 pages (250-5000 words) | 11 | 22 |
| 1 | 11-20 pages (5001-10000 words) | 22 | 44 |
| 2 | 21-30 pages (10001-15000 words) | 12 | 24 |
| 4 | More than 30 pages (More than 15000 words) | 5 | 10 |
| Total | 50 | 100 |

 As can be seen from Table 9, texts ranging between 11-20 pages (5.001–10.000 words) had the highest frequency (22, 44%) for research on the use of robot chat strategies in teaching and learning English, while texts of more than 30 pages (more than 15,000 words) had the least frequency (5, 10 %).

The study also focused on finding the robot type for research on the use of robot chat strategies in teaching and learning English. To answer this question, all ratings of the length of text in the 50 studies, and frequencies and percentage for each variable were calculated as shown in Table 10.

**Table 10: Frequencies and Percentages** **of the Robot Type for Research on the Use of Robot Chat Strategies in Teaching and Learning English**

| **Rank** | **Robot Type** | **Frequency** | **Percentage (%)** |
| --- | --- | --- | --- |
| 4 | Marvin | - | - |
| 3 | Siri | 2 | 4 |
| 1 | Google Dialogflow | 21 | 42 |
| 2 | Kuki | 3 | 6 |
| 2 | RALL | 3 | 6 |
| 3 | Elbot | 2 | 4 |
| 3 | TPBOT | 2 | 4 |
| 3 | Echodot | 2 | 4 |
| 3 | EnglishBot | 2 | 4 |
| 3 | Ellie | 2 | 4 |
| 2 | CSIEC | 3 | 6 |
| 3 | MultiWOZ | 2 | 4 |
| 3 | AsasaraBot | 2 | 4 |
| 3 | ELIZA | 2 | 4 |
| 3 | Alexa | 2 | 4 |
| Total | 50 | 100 |

 As can be seen from Table 10, the robot Google Dialogflow had the highest frequency in research on the use of robot chat strategies in teaching and learning English (21, 42%); Marvin did not have any repeat.

The study also focused on finding the type of chat for research on the use of robot chat strategies in teaching and learning English. To answer this question, all ratings of the type of chat in the 50 studies were coded by including text only, voice only, and both text and voice. Frequency and percentage for each variable were calculated as shown in Table 11.

**Table 11: Frequencies and Percentages of the** **Type of Chat for Research on the Use of Robot Chat Strategies in Teaching and Learning English**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rank** | **Type of Chat** | **Frequency** | **Percentage (%)** |
| 2 | Text only | 13 | 26 |
| 1 | Voice only | 8 | 16 |
| 3 | Both text and voice | 29 | 58 |
| Total | 50 | 100 |

 As can be seen from Table 11, the “both text and voice” chat had the highest frequency (29, 58%) in studies about the use of robot chat strategies in teaching and learning English, while the “voice only” had the lowest frequency (8, 16%).

**Discussion**

This section deals with the discussion of the results of the research aimed at identifying the general trends, description and focus related to using robot chat strategies in English language teaching and learning. It seeks to provide a meta analysis of research examining the effectiveness of using robot chat strategies in teaching and learning English, publication type, design of the study, the skills and areas, instrument of the study, participants, effectiveness of robot chat, participants’ gender, publication year, text length, robot, and chat type.

The results of the study revealed that the journal article had the highest frequency in research on the use of robot chat strategies in teaching and learning English. This result can be attributed to the fact that journal articles are often considered to be reliable and authoritative sources of information, particularly in academic research. They typically undergo a rigorous peer-review process before publication, which can enhance their credibility and validity. In addition, journal articles tend to provide more in-depth and detailed analyses of research findings, which can be particularly useful in a research paper that aims to explore the effectiveness of robot chat strategies in language teaching and learning. It is also worth noting that the use of journal articles in academic research is often seen as a way to demonstrate a thorough and rigorous approach to the research process. By citing a range of journal articles and other scholarly sources, the researchers can show that they have engaged with the relevant literature in their field and are building their research on a solid foundation of existing knowledge. This finding is in line with Al Droubi and AbuSeileek (2023) and Al Soufi and AbuSeileek (2021) and Al-Jumaily (2018) that all studies are based on the journal article. This finding is not in line with Ayaz and Şekerci (2015) which was conducted in different conditions.

The thesis/dissertation had the lowest frequency in the sample studies analyzed. The relatively low frequency of thesis/dissertation in this study may reflect the fact that the researchers primarily did not focused on thesis/dissertation. These are often produced by graduate students as part of their degree requirements, and may therefore be less likely to be published or widely disseminated than other types of sources. As a result, they may not always be as readily available or accessible as other types of publications. Finally, it is possible that the low emphasis on thesis/dissertation in this study may simply reflect the preferences and research practices of the researchers themselves. Different researchers may have different preferences for the types of sources they use in their work, and may prioritize certain types of publications over others based on factors like quality, relevance, or ease of access.

The results of the study indicated that the quasi-experimental pre/post–tests were the most frequently used research design in studies on the use of robot chat strategies in teaching and learning English, accounting for 30% of the study. This type of research design involves comparing the performance of a group that receives a treatment (experimental group) with that of a group that does not receive the treatment (control group) before and after the treatment is given. The use of this design allows researchers to determine if the treatment has a statistically significant effect on the outcome of interest. This finding is in line with Al-Jumaily (2018) study that focused on the quasi-experimental design.

On the other hand, the experimental and descriptive research designs had a lower frequency, with a low recurrence for the experimental research designs involving manipulating an independent variable to see if it has an effect on a dependent variable, while the descriptive research designs aim to describe and understand a phenomenon without manipulating any variables.

Moreover, the one-group pre/post–tests had no recurrence in the studies, which means that this research design was not used in any of them. This type of research design involves measuring the performance of a group before and after a treatment is given, without the use of a control group. One-group designs are considered weaker than designs with a control group because they do not account for extraneous variables that may affect the outcome of interest.

The result indicated that the focus of the sample studies was more on integrated language skills and areas in research on the use of robot chat strategies in teaching and learning English. This suggests that the use of robot chat has been explored as a tool to enhance various language skills and areas such as listening, speaking, reading, and writing, as well as language areas such as grammar and pronunciation. The high frequency of studies focused on integrated language skills and areas, indicating that researchers and educators view robot chats as a tool to enhance the overall language proficiency rather than just an isolated language skill or component. By integrating language skills and areas, robot chat-based activities and tasks can simulate real-life language use, providing learners with authentic and engaging language learning experiences. This finding is in line with Al Droubi and AbuSeileek (2023) and Al Soufi and AbuSeileek (2020) that sample studies focused on integrated language skills and areas in teaching and learning English.

Moreover, the use of robot chats can provide learners with personalized and adaptive learning experiences, allowing learners to receive instant feedback and adjust their learning pace and level based on their individual needs and preferences. This can further enhance the effectiveness and efficiency of language learning, which may explain the interest of researchers and educators in exploring the use of robot chat in language teaching and learning. The low frequency of studies focusing solely on vocabulary may suggest that the use of robot chat in vocabulary learning has not been extensively explored in the context of teaching and learning English.

The results also showed that tests were the most commonly used instrument for data collection in research studies on the use of robot chat strategies in teaching and learning English. This suggests that researchers in this field prefer to use tests as a way to measure students' learning outcomes and assess the effectiveness of robot chat strategies in improving their language skills and areas. This finding is in line with Al-Jumaily (2018), Boulton and Cobb (2017), Al Droubi and AbuSeileek (2023), and Jasim and Jassim (2015) that focused on the quasi-experimental approach based on test.

On the other hand, the second most commonly used instrument was the questionnaire, which suggests that researchers were also interested in gathering students' opinions and perceptions about the use of robot chat strategies in their language learning. However, the observation checklist had no recurrence, which may indicate that researchers in this field did not find it as useful or relevant for their studies. It is important to note that the choice of data collection instruments may vary depending on the research question, research design, and the population being studied. Therefore, researchers should carefully consider the strengths and weaknesses of different data collection methods and choose the ones that best fit their research objectives.

The results also showed that the majority of research studies on the use of robot chat strategies in teaching and learning English focused on EFL learners. This is likely due to the fact that robot chats can provide language learners with opportunities to practice their language skills and areas in a safe and supportive environment, which is especially important for EFL learners who may not have many opportunities to practice speaking English outside the classroom. This finding is in line with Al Droubi and AbuSeileek (2023) that most studies are based on EFL learners.

On the other hand, the relatively low frequency of research studies focusing on ESL learners may be due to the fact that robot chat strategies may not be as relevant or effective for learners who are already proficient in English. Additionally, ESL learners may have different language needs and goals compared to EFL learners who may require different instructional strategies.

The result can be interpreted to mean that undergraduate students were the most targeted group in research studies on the use of robot chat strategies in teaching and learning English, with 20 out of 50 studies focusing on this group. On the other hand, school students were the least targeted group, with only 13 studies out of 50 focusing on this group. This could be because undergraduate students are more likely to have greater exposure to English and a higher level of proficiency, which makes them a more suitable target for research studies that involve robot chat strategies in teaching and learning English. Additionally, researchers may find undergraduate students more accessible and easier to recruit for studies compared to school students. This finding is in line with Al Droubi and AbuSeileek (2023), and Al-Jumaily (2018) that most studies are based on male undergraduate learners

Concerning the number of participants, the option “15 and over” had the highest frequency while “1-14” had the lowest. This result can be explained by the group size which may be of decisive importance in the research findings and their validity and reliability. A larger group size increases the probability of obtaining more accurate and reliable results, since larger samples allow for the reduction of random factors or sampling error, and improves the representativeness of the final results. Thus, this approach may be more effective in determining the effectiveness of the use of robots in teaching and learning, and in providing more valid information about the effect of this technology in improving educational performance.

Robot chat is more effective than other methods in teaching and learning English in the sample study. This suggests that robot chat is a highly effective method for this purpose as it is able to engage students in interactive and personalized conversations, which can help them practice their English language skills and areas in a fun and engaging way. It is also likely that the use of robot chat provides students with immediate feedback, which can help them identify their strengths and weaknesses and improve their language skills and areas more effectively. The fact that other methods did not receive any recurrence may suggest that they are less effective and functional than robot chat. This finding is in line with Winkler and Sollner (2018) that robot chat was very helpful in improving learning processes and outcomes.

The result shows that females had a higher frequency in research on the use of robot chat strategies in teaching and learning English, while males had a lower frequency. This could be attributed to various factors, such as differences in learning styles and preferences, cultural background, and social expectations. It is possible that female students are more inclined to use technology in their learning and are more receptive to robot chat-based strategies. Additionally, the gender composition of the research sample could have influenced the results.

The period 2021-2023 had the highest frequency for research on the use of robot chat strategies in teaching and learning English, while 2000 – 2005 had the lowest frequency. The highest frequency of research on the use of robot chat strategies in teaching and learning English in the period 2021-2023 could be attributed to several factors. First, advances in technology have made it easier and more accessible to implement robot chats in language learning. Second, the COVID-19 pandemic has led to a shift towards online and remote learning, which has increased the demand for digital tools like robot chat. Finally, there may be a growing recognition among educators and researchers of the potential benefits of robot chat for language learning, leading to an increase in research in this area.

The low frequency of research on the use of robot chat strategies in teaching and learning English during the period 2000-2005 could be attributed to the fact that robot chat technology was not yet widely used in education at that time, and researchers were still exploring and testing its potential applications. As technology advances and becomes more accessible, more researchers become interested in exploring its use in education, leading to a higher frequency of research in recent years.

The results suggest that the majority of research studies on the use of robot chat strategies in teaching and learning English tend to have a moderate length. Texts ranging from 11-20 pages, (5.001-10.000 words) could indicate that researchers aimed to present a thorough analysis of their study while still being concise and focused on the main points. On the other hand, the low frequency of texts over 30 pages (more than 15,000 words) may suggest that researchers aim to avoid unnecessary details and instead aim for a more targeted and succinct presentation of their research findings. It is important to note, as it may be the reason for the conditions that journals set for publishing research, as they specify the length of the text and the number of words, so researchers are committed to a specific number of words. This finding is not in line with Al Soufi (2020) that the length of text of 1 to 15 pages.

The results showed a frequency of different robot chat types used in research on the use of robot chat strategies in teaching and learning English. According to findings of the study, "Google Dialogflow" robot had even higher frequency, suggesting that Google Dialogflow is a popular robot chat application in the field of education for several reasons: Ease of use of Dialogflow provides an application programming interface (API) and visual interface building tools. This allows developers and educators to easily create robot chats without advanced programming knowledge, and integration with other platforms. Dialogflow seamlessly integrates with other various educational platforms and technological tools such as Learning Management Systems (LMS), e-learning applications, websites, and natural language processing (NLP) capabilities. Dialogflow utilizes advanced NLP techniques to understand texts and provide intelligent and logical responses. This enables this robot chat to understand students' inquiries and respond in a meaningful way, customization and modification: educators can customize and modify the behavior and responses of the robot chat according to their needs and curriculum requirements, global availability, and Google offers Dialogflow on a global scale, making it accessible and used in many countries and educational institutions. On the other hand, Marvin did not appear at all in the studies analyzed, which means that this robot chat type was not used in any of the studies included in the review.

The results of related to the type of chat in research about using robotic chat strategies in teaching and learning English showed that both text and voice chat had a higher frequency. When students learn English using robots, the use of both text and voice can be an effective way to convey information and linguistic concepts. The robot chat can create written texts and present them to students, allowing them to easily read and understand the content. In addition, the robot can also produce written texts and read them for students, enabling them to listen, practice conversations, and improve pronunciation skills. However, the 16% frequency of sound may be explained by the fact that the use of voice only chat may be less common when compared to “both written and voice” texts. This could be due to several possible factors, such as the ability of robots to generate typed texts faster and more accurately, and possibly students' preference for using texts in communication and learning. The robot may also translate the text for students into their first language.

**Conclusions**

Integrated language skills and areas were the most frequently studied topic in research on the use of robot chat strategies in teaching and learning English. The test was the most commonly used instrument for data collection in research on the use of robot chat strategies in teaching and learning English. EFL learners were the most frequently studied group in research on the use of robot chat strategies in teaching and learning English.

Robot chat was the most effective method for teaching and learning English using robot chat strategies. Most sample research focused on females as participants of the studies. Research on the use of robot chat strategies in teaching and learning English has increased in recent years, during the period 2021-2023 having the highest frequency of publications. Texts ranging from 11-20 pages (5.001-10.000 words) were the most frequently published in research about the use of robot chat strategies in teaching and learning English. The text and voice robot chat was found to be the most frequently robot chat mode used in research on the use of robot chat strategies in integrated language skills and areas.

 In light of the study findings, it is recommended that teachers can use robot chat as a tool to enhance the teaching and learning experience. Robot chat can be used to engage students, provide instant feedback in teaching and learning English language. As the research shows, integrated language skills and areas are the most frequently researched area in studies about the use of robot chat strategies in teaching and learning English. Therefore, teachers can focus on developing robot chat strategies that can support the development of integrated language skills and areas. The research indicates that using robot chat is an effective method for teaching and learning English. Therefore, teachers can consider incorporating robot chat as a useful strategy in English language teaching. The research shows that female students have a higher frequency of engagement with robot chat strategies in teaching and learning English. Therefore, teachers can focus on developing robot chat strategies that appeal to males students.

Robot chat strategies can be an effective tool for enhancing language learning. Therefore, students should be encouraged to use robot chat strategies as a tool for supporting their language development. While Google Dialogflow is the most effective type of robot chat. Students should be open for exploring other types of robot chats as well. As the research indicates, integrated language skills and areas are the most frequently researched area in the use of robot chat strategies in teaching and learning English. Therefore, students should focus on developing their integrated language skills and areas, and using robot chats as a tool for supporting their development.

Incorporating robot chats in language learning curricula, robot chat can be a useful tool for language learners to practice their skills in a fun and engaging way. Therefore, curricula developers should consider integrating the robot chat strategy in language learning courses to enhance the students' language learning experience. Providing training for teachers on robot chat implementation, curricula developers should provide training for teachers on how to effectively use robot chat in the language classroom. This may enable teachers to design robot chat activities that are aligned with the curricular objectives, and cater for the learners’ needs.

Given the limited number of studies available on this topic, researchers should conduct more studies to explore the effectiveness of robot chat strategies in different teaching and learning contexts. Using a variety of research methods, researchers should use a variety of research methods to explore the use of robot chat strategies in teaching and learning, including qualitative and quantitative methods. Focusing on different age groups and proficiency levels, the existing studies have focused mostly on college-level students and EFL learners. More research is needed to explore the effectiveness of robot chat strategies for different age groups and proficiency levels.

The current study has a number of limitations. The scope of the study was restricted to a meta analysis of research examining the effectiveness of using robot chat strategies in teaching and learning English language. This study included research conducted during the period 2000 – 2023 where the sample was selected intentionally, from master's theses, research and previous studies published in scientific journals. Participants in the sample were limited to ESL learners and EFL learners; studies about English native speaker participants are excluded. The current study method was limited to a meta analysis of research on the effectiveness of using robot chat strategies in English language teaching and learning. The results of this study were determined by the validity of the tool, and the degree of reliability required in them. Also, the results were not generalized except to the community from which the sample of the study was taken, and similar communities, and the results were determined in the light of the honesty and objectivity of the raters when getting data used in the study.

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