Potential of Visual Mind Mapping in Language Learning: A Systematic Review

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Abstract
In the era of globalization, language skills become important regardless of whether it is in one's community or internationally. Language learning is one of the learnings we must learn to communicate and gain knowledge in the 21st century. Therefore, the conventional teaching and learning approach in the subject of language needs to be improved to enable students to master the elements of language learning better. Nevertheless, language learning is not easy. It includes various elements which need to cover by students in the process of language learning. Teaching and learning languages are full of challenges. This study is conducted to make a systematic literature review to analyze in detail the potential of visual mind mapping as a language learning tool. This systematic literature review used Scopus as the database search engine to select articles that are related to the title. The selected articles for this study are from 2018 to 2021. There are 10 articles selected as samples among 158 articles found based on the keywords and limitations. PRISMA is used in the process of selecting articles. The results show that most of the studies focused on non-native language learning and found that visual mind mapping has shown high potential as a tool to help students in the process of language learning. Visual mind mapping has a positive influence on vocabulary learning, grammar learning, speaking ability, reading ability, and writing skills. This systematic review helps readers identify the potential of visual mind mapping in language learning.
Keywords: Potential, Visual Mind Mapping, Language Learning, Systematic Review

Introduction
Language learning is one of the mandatory learning for us to communicate and gain knowledge in the 21st century. Therefore, conventional teaching and learning approaches in language subjects need to be improved to enable students to master the elements of language learning better. The main elements in language learning are divided into listening, speaking, reading, and writing (Salem & Omran, 2020). There are many ways to teach and learn a language, language teachers need to put effort to develop and improve the language proficiency of their students. There are native languages and non-native languages in the process of language learning. No matter the situation, language learning is full of challenges.

With the conventional teaching method, teachers often use the chalk and talk method during the teaching and learning sessions. Rafat (2019) states that conventional teaching methods are often used to impart knowledge to students, but there is no guarantee that such knowledge has been successfully imparted. In addition, conventional teaching methods usually only involve one-way communication, that is, from the presenter (teacher) to the recipient (students) during teaching and learning will cause students to be less able to think creatively and critically. According to Hector (2011), lecturers in universities often have lectures with the help of PowerPoint slides as the main presentation tool to impart teaching and learning content. Lecture materials are displayed in slides full of words, slide ornaments that are not related to the topic of the lecture will cause students to be bored and difficult because they are only able to learn little from the slides. He also argues that lectures and slides full of text are linear presentations that have hidden the relationship between the concepts that should be presented and learned by students.

As claimed by Kalyanasundaram et al (2017), changes in terms of teaching and learning strategies are needed to cultivate and maintain students' interest in learning while cultivating self-learning and critical thinking skills. The transformation of conventional teaching and learning approaches to a variety of teaching strategies in the classroom is a much-needed effort. This transformation is in line with the field of education in Malaysia (KPM, 2012).

Based on the Arends's (2012) writing, noted Ausubel (1963), an educational psychologist stated that the basic responsibility of an educator is to present teaching and learning materials in a meaningful form, not in the form of lists only. Arends (2012) proposed visual maps as a meaningful learning tool by allowing students to relate new knowledge in existing cognitive. A visual map is a focused presentation of information in graphic form and meaningful learning supports the visual map approach because this approach helps students focus on their ideas (Ali & Amin, 2019). In addition, a quote from Rafat (2019) noted that visual maps allow students to test and explore different concepts by combining the relationship between the main topic and sub-topics. Marzano (2000) stated that well-planned nonlinguistic presentations, questions, cues, and graphics are elements that will correlate with effective learning.

The presentation of data in graphical and synthetic forms would be well correlated with human cognition, the visual map approach allows one to overcome the limits of linear learning (Hector, 2011). This is because the human cognitive will synthesize visual input with relationships between various components. Recognizable visual forms allow someone to know the meaning, understand, make comparisons, and test relationships (Mitchell & Rands, 2012). The statements submitted are in line with the goal of the Ministry of Education (MOE) Malaysia which wants to produce a generation with high-level thinking skills (MOE, 2014). The visual map approach in facilitation and learning is one of the programs that have been implemented in Malaysian education. In 2012, the MOE encourages all teachers to cultivate thinking skills by using the visual map approach (MOE, 2012). Visual maps that each have different functions have been introduced so that teachers can adapt and apply them during daily teaching and learning.

In that regard, the purpose of this systematic literature review is to analyze the literacy of language subject learning by using the visual map approach. This is because there is still a lack of systematic reviews focusing on this topic. The objective of this systematic literature review

is to help readers identify the potential use of visual maps in language subject learning. In addition, this paper also looks at the studies' trend of the use of visual maps in language subjects. Accordingly, this paper will answer the research questions as follows:

1. What is the study design that has been used in the selected studies?
2. What is the sample size of the study that has been used in the selected studies?
3. What focus or elements of language learning have been studied in selected studies?
4. To what extent does the potential of visual maps in language subject learning?

Methodology

The researcher used PRISMA to search for articles from the Scopus database to conduct a systematic survey. According to Liberati et al (2009), systematic surveys and meta-analyses are essential tools for formulating evidence accurately and reliably. The advantage of using PRISMA in reviewing the literature is that it can save researchers time in reviewing the pieces of literature, search data through keywords in a specific field, and help increase the results of literature systematically and in detail (Page et al., 2021). Furthermore, the PRISMA protocol which is transparent helps researchers review a topic fairly and report something perfectly. According to Shaffeil et al (2018), the PRISMA guide covers 4 main phases, which are identification, screening, eligibility, and inclusion.

Researchers follow the PRISMA checklist to ensure the reliability of the reviews produced on the selected titles. The inclusion criteria, the limitations determined, the steps of the survey process, the data obtained and the analysis will be clearly reported in this paper. The choice of the Scopus database as a search source is because it is a database that is highly indexed, high quality, and certified by researchers.

Identification Phase

In the identification phase, the search is conducted based on keywords that have been set based on the objectives of the study. The first-time search strings applied in the Scopus search database included titles, abstracts, and keywords, a total of 158 articles were found. Researcher entered keywords and synonymous words to find the article. Among the keywords used are "use of", "mind map*", "education*" and "language". Table 1 shows the keyword synonyms entered when using the advanced search function in the Scopus database. The * symbol is used in the search string because the researcher wants to expand the article search space. For example, effect* includes the words "effect, effective, effectively, effectiveness" and so on. In addition, the researcher chose AND for all four keywords means that the data search must be confined to all four selected keywords while OR means that any keyword substitutes entered will be selected.

Table 1
Keywords Substitute

Keyword	Keywords Substitute
Use of	Effect*, potential
Mind map*	Concept map, thinking map
Education*	Learn*
language	-

Screening Phase

In the screening phase, the researcher applied limitations to refine results on article search. Among the limitations included are articles of all open access published in the last 5 years, that is from 2018 to 2022. The researcher analyzed the articles of the last 5 years in order to obtain the latest information on the topic. The selected document type is the type of article that is in the final stages. The type of source chosen was a journal in English. After entering the limit to make a filter on 158 selected articles, a total of 21 articles were selected through the screening after limitations applied. The last date for articles search through the Scopus database is March 25, 2022. Table 2 and Table 3 below are the key strings of article filtering and the criteria for inclusion and exclusion (limitations) in the articles selection process.

Table 2

*Criteria For Inclusion And Exclusion In The Articles Selection Process*

Criteria	Inclusion	Exclusion
Assessment	All open access	*Gold, Hybrid Gold, Bronze, Green*
year	2018 - 2022	Before 2018
Document type	Artikel	Conference paper, conference review, chapter in book, review
Publication stage	Final	Article in press
Source type	Jurnal	Conference proceeding, book series, book, trade journal, report undefined
Language	English	Except for English

Eligibility Phase

After the screening process, the requirements data were exported to MS Excel to proceed to the eligibility phase which involves the process of reading the title and abstract that meet the objective criteria of the study. According to Xiao and Watson (2019), article censorship needs to be implemented by two researchers independently and in parallel. In this study, two researchers screened the title and abstract separately. After censoring the article a second time, discussions were conducted so that there were no disagreements. If such disagreements remain unresolved, then it may involve a third researcher to discuss the problems encountered (Booth et al., 2016).

Inclusion Phase

The flow diagram with the PRISMA protocol guide displayed shows the researcher's process of finding articles that meet the objective criteria of the study. After filtering 158 articles and finally the researcher got 10 articles to be studied systematically and without bias.
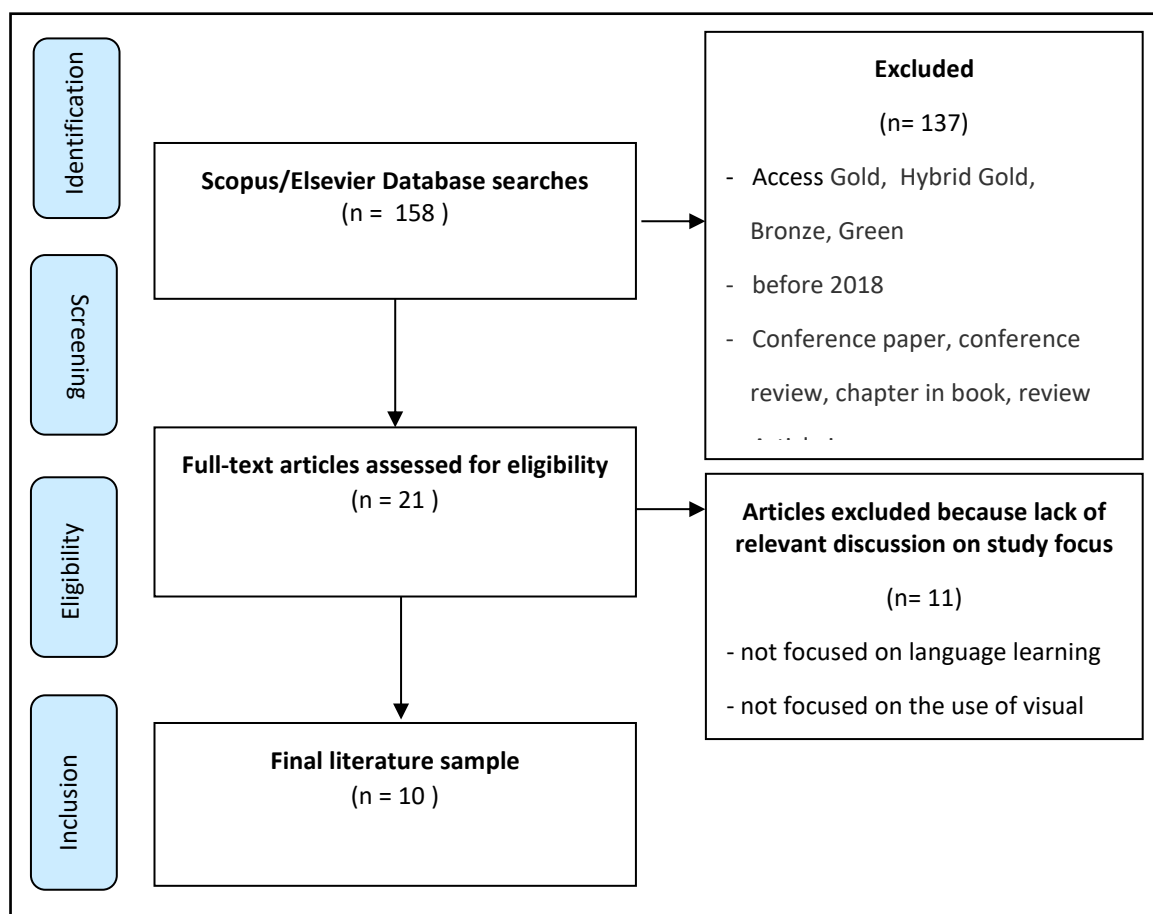
Flow Diagram 1: The PRISMA Flow Diagram for The Systematic Review
Adaption: Liberati et al 2009

General Findings

Table 3.1 (attached in Appendix A) shows the information of selected articles arranged in chronological order from 2018 to 2021. The researcher has limited the year of publication of the article but the location of the study is not restricted. This is because researchers want to see the trends of studies that have been conducted over the past 5 years around the world in addition to seeing the potential of mind maps in language subject learning in the Scopus database.
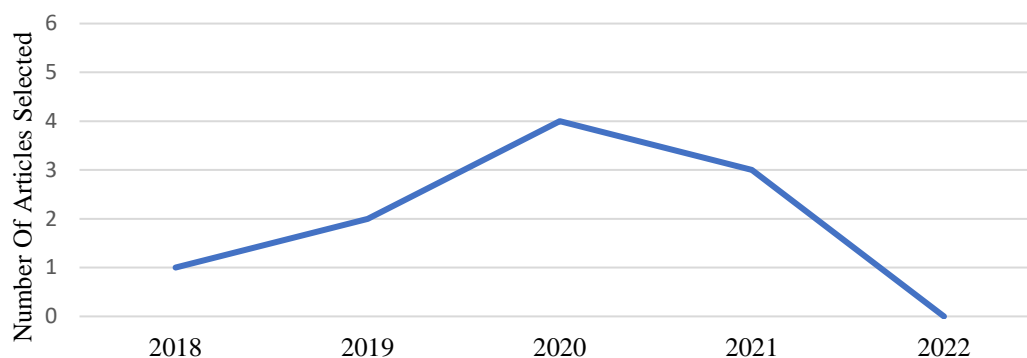
Figure picture 3.1: Selected Year of Publication

Based on figure 3.1, the year 2020 has the most article contributors, which is 4 selected articles. Followed by 2021 which contributed 3 selected articles, 2 articles in 2019, and 1 article in 2018. Although the researcher made limitations from 2018 to 2022, but no articles were selected in 2022. Among the selected articles, it was found that all articles were from Asian countries. West Asia was the main article contributor to this study. A total of 7 (70%) articles were selected from Iran, Saudi Arabia, and the United Arab Emirates. China, Malaysia, and Japan each contributed 1 article.

Design of Selected Studies
All selected articles stated that the researchers used experimental studies as the basis of their study design. This indicates that the experimental design is a very suitable method to test the effectiveness of the interventions that have been implemented by the researchers in the experimental group. An experimental study is a very unique study because it can produce a cause and effect relationship, conducted in a controlled environment, where one or more variables are manipulated by the researcher to see its effect on another variable (Noraini 2013).

In addition, the data showed that quantitative research methods are a very suitable method for conducting experimental studies. There are ten studies that involved quantitative methods and only one study used mixed quantitative and qualitative methods. This was because the study wanted to detect differences in discussion between two groups of respondents other than testing the effectiveness of the intervention.

Sampling Size and Focus of Selected Studies
Among the respondents involved in the study, it was found that 9 out of 10 studies conducted were focused on non-native language learning and only 1 study was not clearly recorded. From the study that focused on non-native students, it was clearly recorded that 66.67% were English as a Foreign Language (EFL) students, 11.11% were English as a Second Language (ESL) students and 22.22% were non-native language students. It can be said that non-native students are the main focus when the researchers make the sampling. Besides, it was found that studies conducted in West Asia are more inclined to conduct same gender sampling. 4 out of 7 articles stated that the study respondents were female respondents only.

The sample in a study is a group of respondents who are contributors to the necessary information. Found that 9 articles involving a sampling size not exceeding 30 respondents in

each group after reviewing selected studies (Ghuzayyil, 2019; Ali & Amin, 2019; Bita & Vahideh, 2020; Liu & Yuizono, 2020; Salem & Omran, 2020, Rafidah et al 2021, Pinandito et al 2021, Wafa' & Moath 2021). The sampling size between the selected studies was similar. Only one study has involved a total of 517 respondents (Banan & Amal, 2020). Eight studies seperated respondents into two groups, one control group and one experimental group. However, there are also two studies that have involved one control group and two experimental groups at the same time.

Focus or Elements of Language Learning in Selected Studies
After detailing the findings of the studies, the learning elements studied in language subjects can be categorized into 5 aspects, which are vocabulary, grammar, oral, writing, and reading.

Vocabulary
There are two studies focusing on visual map interventions in vocabulary learning. Games, mind-mapping, and Twitter Hashtags (GMT) are effective strategy approaches compared to conventional teaching approaches (Banan et al., 2020). GMT has a positive effect in encouraging students to be active during vocabulary learning. The findings of the study also showed that the level of respondents' preferences for the three strategies in GMT was the use of Twitter Hashtags (85.9%), followed by games (80%) and mind maps (66.3%). Mind maps are the last choice of user preferences when learning English vocabulary. Moreover, the effectiveness of visual maps was compared in contrast to the use of notebooks in which important notes were clearly recorded (Naderifar, 2018). The results of the study showed that the effect between the two approaches was similar. It can be concluded that visual maps are potential in vocabulary learning elements but gamification and social media strategies are more preferred by users.

Grammar Learning
In the aspect of grammar learning in English and Arabic subjects are studied in the article. Teaching Arabic grammar with visual maps displayed in PowerPoint can attract users' interest (Salem & Omran, 2020). Visual maps showed high potential while learning Arabic grammar. It helps users achieve high achievement compared to those who simply use books, exercises and memorization. For English grammar learning, the use of phrase tables complete with definitions, translations, and example sentences achieved the same improvement as mind map users for non-native non-nativeayyil, 2019). The mind map fails to show its effectiveness in helping users understand better about the content of learning English grammar.

Writing Skills
English as a foreign language (EFL) students and English as a second language (ESL) students were involved in a study that focused on elements of writing skills. The findings of the study indicate effective visual maps in writing skills. Visual maps can improve users' ability to organise writing in non-native languages but they have less impact on the development of writing styles (Bita & Vahideh, 2020).

The effectiveness between ordinary mind maps (self-drawing mind maps) and Mobile-assisted mind mapping (MAMMAT) was compared in the achievement of writing skills. Data shows that the production of mind maps through MAMMAT is more effective than self-

drawing mind maps in an effort to improve writing skills (Rafidah 2021). Mind maps have higher potential if the latest technological are applied.

Verbal Accuracy and Complexity

The concept map approach and the rehearsal approach in the teaching of oral accuracy are positively effective on students. Both of these approaches are equally effective in the aspect of verbal accuracy. This is because this element requires a lot of oral practice in order to be able to speak fluently with the correct pronunciation. In terms of verbal complexity, the findings showed that mind maps are effectively positive but rehearsals are not. The effect of the rehearsal approach is similar to that of conventional teaching in the oral complexity aspect. Mind mapping is an effective and potential approach in learning verbal accuracy and complexity (Ali & Amin 2019).

Reading Ability

Reading ability was the most studied element among these 10 selected articles. The mind map approach was applied in an effort to improve reading ability in Japanese and English. Among them, a study conducted in China has used techniques that are quite different from other studies in the process of identifying the effectiveness of the mind map approach in Japanese reading ability (Liu & Yuizono, 2020). This study uses eye movement detectors to analyze and detect foreign language reading ability among respondents. It was found that mind maps helped to improve Japanese reading skills among non-native respondents.

Aside from that, there was an article that presents a study of different types of concept map formats. The effects of Kit-Build concept maps and common open-end concept maps are compared in the reading element. After making a comparison, it was found that the Kit-Build concept map had a better effect in the collaborative learning of English language comprehension and reading (Pinandito et al., 2021).

MindMeister mind mapping as a visual map production application showed a positive effect on the improvement of critical thinking skills and English reading skills among non-native respondents (Wafa & Moath, 2021). MindMeister maps have proven to be suitable for use in improving critical thinking skills that help someone to interpret, analyze, reason, explain and evaluate things.

Potential of Visual Maps in Language Subject Learning

Based on the results of the analysis of ten selected articles, it is proven that visual maps have high potential to help students in learning language subjects. Visual maps users achieve better results compared to conventional teaching and learning strategies (Bita & Vahideh, 2020; Banan et al 2020; Salem & Omran, 2020; Wafa' & Moath 2021). In the other words, the use of visual maps has a positive impact on the learning of language subjects. It has high potential in stimulating users to learn collaboratively, think critically and cognitively. Visual maps can help students to process information, generate new ideas, improve learning methods and increase creative thinking (Naderifar, 2018; Ali & Amin, 2019; Bita & Vahideh, 2020; Pinandito et al., 2021). Visual maps are a useful resource for developing and implementing activities that stimulate students' thinking at various levels (Wafa' & Moath, 2021).

Conclusion

The systematic review conducted aims to see the potential of the visual map approach to language subject learning. Overall, all studies showed high potential visual maps in enhancing language subject learning. The findings of the study proved that the visual map approach is 100% positively effective in learning language subjects. However, the listening element could not be analyzed because it was not included in the focus of the selected studies.

The implementation of the visual map intervention of language subject learning can be carried out by different methods. That is producing the visual map and displaying the visual map which has been produced. Drawing visual maps, visual maps in mobile phone applications and visual maps of different formats in computer software have different effects too. It can be argued that visual maps in mobile phone applications and in software are potentially higher than hand-drawn visual maps (Salem & Omran, 2020; Rafidah et al., 2021; Pinandito et al., 2021; Wafa & Moath, 2021).

Visual maps are an effective and beneficial strategy for users because they can guide users towards active learning by encouraging someone to explore something new, analyze information, synthesize, knowledge linked, share ideas, organize information, and interconnect concepts (Santiago, 2011). However, it is undeniable that notebooks and tables which jotted down main points clearly, learning through games, rehearsal exercises, and learning on the application of technology help students in learning language subjects too.

In the era of globalization, as an educator it is necessary to advance themselves with teaching and learning approaches with the help of technology constantly so that students are not left behind while they can optimize learning outcomes. The visual map approach is suitable for students in learning language and allows the learning objectives to be achieved optimally.

Discussion

In the sampling part of the study, according to the book Research in Education (Noraini, 2013) suggested that 30 people for each group for an experimental study. However, it was found that the total sample group of most studies was less than 30 people. According to Lenth (2001), sample size does not have the same importance in all studies and not all sample size problems are the same. Therefore, a quasi-experimental design study that does not involve the respondents' selection randomly, the sample size depends on the study location and the existing sampling size.

Besides that, several studies conducted in West Asia noted that their respondents were in same gender. One West Asian study stated the likelihood of female respondents achieving higher than males was that female students wanted to prove that they qualified for a university degree, female students had more time at home, and women were more serious on tests. However, the reasons given by the researcher in the study were not proven in the study findings. Accordingly it is suggested that gender factors can be studied in the future whether gender will influence the potential use of visual maps or not. In addition, it was found that respondents in selected studies were more inclined to adult students, especially students in colleges and universities. Therefore, a literature review on the potential of visual maps among younger respondents is also needed.

The suggestion of this systematic literature review is that educators can adapt the visual map approach while facilitation and learning are carried out. Educators should attend workshops or courses on learning with visual maps whether online or face-to-face so that the learning process of students 'language subjects will be smoother. Apart from the visual map approach, educators also need to be sensitive to other ways in helping students learn language subjects while improving students' level of thinking.

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Appendix A

Table 3.1

Content Analysis of Ten Selected Articles

No	Study (Researcher / Year / Country)	Research Objective	Research Design	Study Sampling	Data Collection Instruments / Data Analysis Methods	Findings	Implications of the Study
A1	Aliasghar Naderifar - 2018 - Iran	Identify the effectiveness of concept maps and notebooks on self-regulation in vocabulary learning	Quasi-experiment - Quantitative	A total of 90 female Iranian EFL respondents Control group (CG) - 30 Experiment group (EG)1 (notebook) – 30 EG 2 (mind map) – 30	Test of English as a Foreign Language (TOEFL) One-Way ANOVA, Kolmogorov-Smirnov, Tukey Test	The concept map approach and vocabulary notebook are effective in engaging students in vocabulary learning in order to achieve the specified objectives.	Students need to develop sufficient self-regulatory capacity to manage vocabulary learning strategies. Both concept map techniques and notebooks help students remember the words they have learned.
A2	Ghuzayyil Mohammed Al-Otaibi - 2019 - Saudi Arabia	Identify the effectiveness of the cognitive approach proposed by Rudzka and	Quasi-experiment - Quantitative	A total of 51 female respondents EFL CG - 25	Test Paired t-test, Two-Way ANOVA	The use of phrase tables that include definitions, translations, and example sentences	The cognitive approach in teaching polysemous words is more suitable

		Ostyn in the teaching of English phrases (EFL)		EG (mind map of practical phrases) – 26		achieved similar improvements to the use of mind maps. There was no interaction between teaching style and student achievement on the test.	for English native learners. Analytic thinking is important to second language learners. Implementing the cognitive approach by using a list of frequent phrasal verbs with different particles will help students to understand more.
A3	Ali Kazemi & Amin Moradi - 2019 - Iran	Identify the effectiveness of concept maps and rehearsals on the accuracy and complexity of oral EFL among Iranian students.	Experimental - Quantitative	A total of 60 EFL respondents through the Quick Placement Test CG – 20 EG1 (concept map) – 20 EG2 (rehearsal) - 20	Oral test Questionnaire Pearson's correlation coefficient, t-test, analysis of variance (ANOVA)	The concept map and rehearsal approaches are equally effective in the verbal accuracy element. The concept map approach is effective in the verbal complexity element but rehearsals are not.	The concept map approach is more suitable for use in achieving accurate and complex oral content.
A4	Bita Naghmeh-Abbaspour & Vahideh Rastgo - 2020 - Iran	Identify the effectiveness of mind maps in the development of EFL writing skills among middle-level Iranian students.	Experimental - Quantitative	A total of 30 female respondents EFL CG – 15 EG – 15	Scoring rubric Independent t-test	Mind maps have a significant impact on the development of intermediate-level EFL writing organizing skills. Mind maps do not have a significant impact on the development of the mid-stage EFL writing style.	The use of mind maps is suitable for use in writing classes because it helps students in organizing writing effectively. Mind maps guide students to plan, organize and relate ideas.
A5	Banan Hassan Alhajaji, Jalila Saleh Algmadi & Abdelsattar Metwally - 2020 - Saudi Arabia	Identify the effectiveness of games, mind -mapping and Twitter Hashtags (GMT) techniques in teaching English grammar – EFL.	Experimental - Quantitative	A total of 517 female respondents EFL CG – 299 EG – 218	Electronic questionnaires, open-end questions Independent t-test Inductive coding	GMT techniques are effective in encouraging students to be active, motivated, and interact in vocabulary learning. Percentage of positive effects shown by respondents through games - 80% mind map - 66.3% Twitter hashtags - 85.9%	The combination of education and entertainment helps to learn English vocabulary. The GMT technique creates a relaxed environment and increases student learning motivation.
A6	Ting Liu & Takaya Yuizono - 2020 - China	Identify the effectiveness of mind maps in Japanese reading learning.	Experimental - Quantitative	A total of 40 non-native languages respondents CG – 20 EG – 20	Japanese International Proficiency Test N2, Tobii T120 eye tracker	The use of mind maps can improve reading ability in a shorter time, easier to understand reading material, can obtain a lot of	Eye movements can reflect the reading process and prove the effectiveness of mind maps in reading skills.

					t-test, Eye movement indicators	information from reading material, more focused and more stimulating cognitive processes.	
A7	Salem Khalil Al Aqtah & Omran Ahmad Musleh - 2020 - United Arab Emirates (UAE)	Identify the effectiveness of the use of concept maps in learning Arabic grammar.\n\nIdentify whether gender factors influence the achievement of Arabic grammar.	Quasi-experiment - Quantitative	A total of 56 respondents\n\nCG – 27\nEG – 29	Grammar tests before and after the intervention, objective selection questions.\n\nIndependent sample t-test	Concept maps are suitable to use in learning Arabic grammar.\n\nThe achievement of female students is higher than the achievement of male students.	Teaching using concept maps displayed in the form of PowerPoint is more effective than traditional teaching using books, memorization, and exercises.
A8	Rafidah Abd Karim, Airil Haimi Mohd Adnan, Abdul Ghani Abu, Noorzaina Idris & Izwah Ismail - 2021 - Malaysia	Identify the effectiveness of MAMMAT on learning English as a second language among university students in Malaysia.	Quasi-experiment - Quantitative	A total of 45 university ESL respondents\n\nKK – 22\nKE – 23	Result of argumentative writing\n\nAnalysis of Covariance (ANCOVA)	MAMMAT improves students' skills in argumentative writing and develops an interest in car learning.	Mobile technology facilitates the process of acquiring learning materials, increasing student learning focus, developing student skills, and fostering student acceptance of learning through cars.\n\nMobile learning can start at an early age in the Malaysian context.
A9	Aryo Pinandito, Yusuke Hayashim & Tsukasa Hirashima - 2021 - Jepun	Identify the effect of using Kit-Build concept maps in collaborative learning of EFL reading compared to regular open-end concept maps.\n\nDetect discussion differences between students using Kit-Build concept maps and collaborative scratch mapping.	Experimental - Quantitative - Qualitative	A total of 40 EFL respondents\n\nCG (Collaborative Scratch Mapping, CSM) – 20\nEG (Collaborative Kit-Building, CKB) – 20	Objective questions, Advanced Interaction Analysis for Teams (act4teams) coding scheme\n\nNon-parametric Mann-Whitney U test, Spearman's correlation test	Both concept maps are effective in collaborative learning, however Kit-Build concept maps are more effective in online learning.\n\nThe discussions conducted in the CKB group were more meaningful compared to the CSM.	English comprehension and reading (EFL) can be further enhanced through collaborative learning with the use of online Kit-Build concept maps.\n\nThe new Kit-Build concept map is ideally used for many students at the same time for online collaborative learning.
A10	Wafa' A. Hazaymeh & Moath Khalaf Alomey - 2021 - United Arab	Identify the effectiveness of visual mind mapping strategies in enhancing students 'critical thinking and reading	Quasi-experiment - Quantitative	A total of 42 non-native English-speaking respondents\n\nCG – 21\nEG – 21	The California Critical Thinking Skills Test (CCTST)\n\nSPSS t-test	The use of visual mind maps is particularly effective in improving critical thinking skills in language subject learning and the ability to write.	Mind maps encourage students to practice, generate and stimulate ideas and thoughts.

	Emirates (UAE)	ability in an English context.		862		Visual mind maps are effective in improving comprehension of the reading text with accurate information, discussion of respective ideas and relating to the main ideas of the reading text, supporting the ideas of the text and formulating.	