

**| RESEARCH ARTICLE****Effectiveness of Mind-mapping on Multiple English Language Skills in the Saudi Context: A Systematic Review****Reima Al-Jarf***Full Professor of English and Translation Studies, Riyadh, Saudi Arabia***Corresponding Author:** Reima Al-Jarf **E-mail:** [reima.al.jarf@gmail.com](mailto:reima.al.jarf@gmail.com)**| ABSTRACT**

This study conducted a systematic review (SR) of the author's research on the integration of mind mapping software in teaching reading, writing, vocabulary, spelling, medical terminology, and Greek and Latin roots published between 2009–2021. The review draws on a closed, author bounded corpus consisting of one thematic cluster, "mind mapping software in language and terminology instruction (Al Jarf, 2009–2021)." Across all six studies, mind mapping proved to be a powerful cognitive, organizational, and mnemonic tool that enhances students' performance across multiple language skills. All studies reported significant gains for the experimental mind mapping groups compared to control groups receiving traditional instruction based solely on the assigned textbook. Improvements were observed in idea generation, organization, comprehension, visualization and clarification of relationships, strengthening semantic networks, enhancing long term retention and application of Greek and Latin roots, morphological analysis, and retention of terminology. Mind mapping also helps students visualize sound–symbol correspondences and supports phonological awareness and mastery of spelling rules. The studies further demonstrated how mind mapping enhances visual processing of linguistic relationships and facilitates deeper connections among lexical, phonological, and semantic elements. It transforms learning from a sequential, text bound activity into a multimodal, relational process. This shift empowers EFL learners to navigate linguistic complexity with greater autonomy, confidence, and metacognitive awareness, ultimately fostering more long term and transferable learning outcomes. In all six studies, freshman and pre medical students expressed highly positive attitudes toward mind mapping. They found mind mapping enjoyable, motivating, and helpful for visualizing relationships among ideas and linguistic components. They valued its flexibility, personalization features, and ability to make complex information more accessible and memorable. Despite initial unfamiliarity with the software interface, students rapidly developed confidence and fluency in using mind maps, integrating them into their weekly study routines and even relying on hand drawn maps during exams. This review underscores the value of mind mapping in EFL and ESP instruction and provides a consolidated foundation for future research on visual learning tools in language education.

**| KEYWORDS**

Systematic review (SR), EFL instruction, mind-map central ideas, mind-map radiating branches, writing mind-maps, reading mind-maps, vocabulary mind-maps, spelling mind-maps, medical terminology mind-maps, Greek and Latin roots mind-maps.

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A mind map<sup>1</sup> is a visual diagram that organizes information hierarchically around a central concept, using a non-linear layout with branches, keywords, colors, and images to show relationships between ideas, making it excellent for brainstorming, note-taking, problem-solving, and enhancing memory by working with the brain's natural way of thinking. It starts with a main topic in the

<sup>1</sup> [https://en.wikipedia.org/wiki/Mind\\_map](https://en.wikipedia.org/wiki/Mind_map)

center, with related subtopics branching out and smaller details branching from those, creating a radiant structure that helps in understanding complex subjects and generating creative solutions. While mind maps can be hand-drawn, many digital tools allow for real-time collaboration and easy reorganization. Popular software includes MindManager, Miro, Mind Meister, and Canva<sup>2</sup>.

Mind maps are characterized by having (i) a central idea, i.e., a core topic placed in the middle of a blank page or screen; (ii) radiating branches: Lines connecting the central idea to main themes, with further branches for subtopics; (iii) keywords & images that use concise words, symbols, and pictures instead of long sentences for clarity and recall. (iv) Visual Elements that incorporates colors, shapes, and varying line thicknesses to group ideas and make the map engaging. They are used for brainstorming, note-taking, planning, problem-solving and learning and memorization such as generating and exploring ideas freely without a strict structure, capturing key points from lectures or meetings visually, outlining projects, reports, or presentations; visualizing complex issues to find creative solutions; connecting facts and concepts for better retention.

Mind maps are commonly used by instructors and students, creative professionals (writers, designers, marketers), business leaders, and engineers to enhance brainstorming, organize complex information, and improve memory. These visual tools help structure thoughts for project planning, note-taking, and problem-solving, used by over 250 million people worldwide<sup>3</sup>.

Due to the popularity of mind maps in education, numerous studies in the literature conducted systematic reviews (SRs) and meta-analyses (MAs) on the effect of mind mapping on general learning, general academic performance, critical thinking, creativity and creative thinking. These include: an SR of selected SSCI publications on concept maps in technological contexts of higher education (Chu, Chang, & Tu, 2025); the efficacy of e-mind mapping on the improvement of students' academic performance (Alderbashi, 2024; Pangandaman et al., 2024); the effect of mind mapping on students' creative thinking skills (Apriani, Hidayah, & Ningrum, 2025); use of mind maps to improve students' creative thinking abilities (St Asyah Alya Faradiba & Bahri, 2024); the effects of mind mapping-based instruction on students' cognitive learning outcomes (Shi, Y., et al., 2023); mind mapping techniques and traditional learning methods (Batdi, 2015); the effect of mind mapping on teaching and learning (Liu, et al., 2014); a mixed-methods design and its application to mind map research (Hua, 2023); and methodological gaps and research directions in concept mapping and critical thinking (Jeong, Wong, & Mbanzabugabo, 2025).

Another group of studies focused on SRs and MAs of mind maps in STEM, science education, medical and nursing education such as an SR of mind maps in STEM education, algorithmic and procedural learning (Kefalis, Skordoulis, & Drigas, 2025); mind map-assisted STEM integration to enhance students' science skills (Nurhuda, Megawati, & Agustin, 2024); mind maps and concept maps for enhancing academic performance among undergraduate medical students (Aljamal et al., 2025); a BEME SR of the effectiveness of concept mapping as a tool for developing critical thinking in undergraduate medical education (Fonseca et al., 2024); advantages and challenges of using the mind mapping method in medical education (Sajadi et al., 2024); problem-based learning and teaching, mind mapping and nursing teaching (Gao et al., 2022); and virtual learning environments in the light of mind maps and flashcards (Weiand, Ludovico, & Barcellos, 2019).

In language teaching and learning. Several SR and MA studies focused on the use of mind maps in developing general language learning, reading comprehension, writing skills, vocabulary acquisition and multiple foreign language learning skills. These studies include an SR of research on mind mapping and concept mapping to develop reading comprehension (Nehru, 2019); mind mapping technique in English writing teaching: a systematic literature review (Xueting & Alias, 2025); the impacts of mind mapping technique on EFL students' writing performance: a systematic literature review (Saraini, Karjono, & Putri, 2025); foreign language vocabulary acquisition using semantic mapping software (Rosário, 2021); mind mapping for ELT (Darajat, Afif, Sidki, & Tarihoran, 2025); the potential of visual mind mapping in language learning (Jun. & Jamaludin, 2022); a systematic review of the use of mind map and its effectiveness in different fields of foreign language learning (Haiyao, Abd Halim, & Xiaoying, 2025); mind mapping in EFL context (Arslan & Baydemir, 2017); a systematic literature review of mind mapping technique in vocabulary teaching and learning context (Syukur & Tohamba, 2025).

Although numerous SRs and MAs have examined mind mapping across a wide range of educational domains, including general academic performance, critical thinking, creativity, STEM, science education, medical education, and virtual learning environments, none of these reviews has synthesized the effectiveness of mind-mapping software across multiple English language skills within a single, unified analysis. Additionally, research on mind-mapping in language learning is scattered across different skills (reading, vocabulary, spelling, writing, terminology), different learner populations (EFL, ESP, medical, freshman), and different publication

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<sup>2</sup> <https://www.mindmeister.com/blog/why-mind-mapping>

<sup>3</sup> Mind Map

venues. No existing review integrates reading, vocabulary, spelling, writing, terminology learning, and Greek/Latin roots into a single SR. Therefore, this study aims to conduct a systematic review of the author's six studies on the integration of mind-mapping software in teaching reading, writing, vocabulary, spelling, medical terminology, and Greek/Latin roots to freshman and premedical students enrolled in first-semester EFL/ESP courses at the College of Languages and Translation, King Saud University, Riyadh, Saudi Arabia published between 2009–2021.

This SR is significant for several reasons. (i) It is the first multi-skill synthesis that consolidates a fragmented field. Most existing reviews focus on *one* skill (writing, vocabulary, creative thinking, etc.), but this study brings multiple skills together into a single, coherent evidence base, something the field currently lacks. It is the first to examine reading, vocabulary, spelling, writing, terminology, and Greek/Latin roots as a unified set of language-related outcomes. This positions mind-mapping as a cross-skill pedagogical tool, not a technique limited to one domain. (ii) The studies covered in this SR span 12 years (2009–2021), allowing the review to trace the evolution of mind-mapping pedagogy, and show consistency of effects across time. This longitudinal perspective is rare in educational technology research. (iii) By synthesizing empirical findings across multiple skills and contexts, this SR provides stronger evidence of effectiveness, clearer patterns of impact, and a more robust justification for adopting the mind-mapping strategy in EFL/ESP classrooms. This is especially valuable for teacher-training programs, textbook authors, and curriculum designers. (iv) This SR guides the next generation of researchers by identifying methodological gaps, highlighting under-studied skills, missing populations, design limitations, and opportunities for experimental or longitudinal studies. (v) This SR contextualizes the author's studies within international research, showing how the author's work shaped the field, and demonstrates the breadth of the author's impact across skills and disciplines. This is academically significant and strategically valuable for citations, visibility, and future publications. (vi) It offers a unified pedagogical model that shows how mind-mapping supports cognitive processing, why it enhances language skill development, and what instructional principles underlie its success. This elevates the review from a summary to a theoretical contribution.

Finally, the current SR is part of a broader series of SR/MA projects by the author, that has so far included an SR of studies on pronunciation instruction and practice in L2 (Al-Jarf, 2026a); English–Arabic and Arabic–English translation error studies (Al-Jarf, 2026b); Arabic–English transliteration of personal names and public signage (Al-Jarf, 2026c); children's language acquisition in Saudi Arabia (Al-Jarf, 2026d); classroom practices, writing enhancement and creativity among EFL struggling students (Al-Jarf, 2026e); an integrative analysis of empirical studies on inadequate staffing and large class sizes in Saudi EFL and translation programs (Al-Jarf, 2026f); innovative word formation and pluralization processes in Arabic (Al-Jarf, 2026g); and an SA and MA of studies on Al Arabic translation, linguistics and pedagogy (Al-Jarf, 2026h).

## 2. Methodology

### 2.1 Study corpus

The study sample consists of six studies authored by Al-Jarf and published between 2009 and 2021. Together, they form a coherent author-based cluster unified under the theme *Mind-mapping software in language and terminology instruction* (Al-Jarf, 2009–2021). This cluster includes studies that apply mind mapping to the teaching of reading (Al-Jarf, 2021), writing (Al-Jarf, 2009), vocabulary (Al-Jarf, 2015), Greek and Latin roots (Al-Jarf, 2011c), medical terminology (Al-Jarf, 2010b), and spelling (Al-Jarf, 2011d). The studies were conducted with different groups of freshmen and pre-medical students in their first semester at the College of Languages and Translation. This uniformity of level and context minimizes intervening variables related to course level, course content, disciplinary specialization, or learner proficiency, thereby enhancing the internal validity of the corpus and strengthening cross-study comparability. Despite differences in the specific language skills targeted, all six studies share a common pedagogical focus: mind mapping as the instructional intervention. They fall under language-related learning and consistently employ mind mapping as a cognitive and visual strategy to support linguistic or terminology-based instruction. Each study involves EFL freshman students or ESP pre-medical learners and follows an empirical, classroom-based design. Although the skills vary, the central pedagogical mechanism remains identical—mind mapping as a structured cognitive scaffold for learning.

### 2.2 Eligibility (Inclusion & Exclusion) Criteria

To be included in the corpus, studies had to be authored by Reima Al-Jarf, published between 2009 and 2021, and contain extractable data relevant to the use of mind maps used in teaching English language skills to EFL college students. Because the dataset is a closed, author-bounded corpus, all publications were retrieved from publicly accessible academic databases in which the author's work is fully archived. These include Google Scholar, ResearchGate, Semantic Scholar, Academia.edu, SSRN, ERIC, EBSCO, ProQuest, Scopus, Web of Science, institutional repositories such as the King Saud University repository. Together, these sources provide complete coverage of the author's publications across journals, conferences, and digital repositories. All included and excluded studies were verified manually to ensure accuracy, remove duplicates, and confirm alignment with the eligibility criteria. No external database search was required. The following types of articles were excluded:

- 1) Duplicate studies as conference presentation that have similarly published articles such as teaching medical terminology with mind-mapping software (Al-Jarf, 2010c); enhancing EFL freshman students reading skills with a mind-mapping software (Al-Jarf, 2010); and enhancing Freshman students' vocabulary skills with a mind-mapping software (Al-Jarf, 2010a).
- 2) Studies on any other tools used in developing English language students such as iRubrics and animations, as in: how EFL college instructors can create and use grammar iRubrics (Al-Jarf, 2020); empowering EFL teachers and students with grammar iRubrics (Al-Jarf, 2011b); creating and sharing writing iRubrics (Al-Jarf, 2011a), teaching and learning with medical animations and videos (Al-Jarf, 2017);
- 3) Studies that partially focus on mind-map among other teaching techniques as in multimodal teaching and learning in the EFL college classroom (Al-Jarf, 2024a; Al-Jarf, 2024b); a multiple-associations approach to teaching technical terms in English for specific purposes courses (Al-Jarf, 2022a); learning vocabulary in the app store by EFL college students (Al-Jarf, 2022b); online vocabulary tasks for engaging and motivating EFL college students in distance learning during the pandemic and post-pandemic (Al-Jarf, 2022c); and self-improvement for business, engineering and computer science students (Al-Jarf, 2018).

### **2.3 Corpus Characteristics**

The dataset in this corpus represents a closed mind-mapping research program spanning the period 2009–2021. It is both comprehensive and internally coherent, reflecting the author's sustained scholarly trajectory in using mind-mapping software to teach a variety of English language skills to EFL freshman students. Across the six studies, the methodological designs are comparable, drawing on descriptive, qualitative, and quantitative analyses. Collectively, the studies demonstrate how the same mind-mapping software was applied to the teaching of reading, writing, vocabulary, spelling, medical terminology, and Greek and Latin roots in EFL or ESP college-level contexts.

To facilitate synthesis, the six studies were organized into a single thematic cluster representing a distinct dimension of the author's research program. This cluster provides a consolidated overview of the author's contributions to the pedagogical use of mind-mapping software in EFL instruction and reflects a longitudinal exploration of instructional solutions relevant to language and terminology learning.

### **2.4 Information Sources**

The information sources were limited to platforms that index the author's complete scholarly output. No external database search was required, as the purpose of this review was not to identify all studies on mind-mapping in L2 research, but to synthesize all studies on mind-mapping within a single, self-contained research program. All records were retrieved from publicly accessible academic databases in which the author's publications are fully archived. These sources included Google Scholar, ResearchGate, Semantic Scholar, Academia.edu, SSRN, ERIC, EBSCO, ProQuest, and institutional repositories. Collectively, these sources provide comprehensive coverage of the author's publications across journals, conference proceedings, book chapters, and digital repositories. All included and excluded studies were verified manually to ensure accuracy, remove duplicates, and confirm alignment with the eligibility criteria outlined in Section 2.2.

### **2.5 Data Extraction**

For each study, the following information was extracted from the full text: publication year; target skill (e.g., reading, writing, vocabulary, spelling, medical terminology, Greek and Latin roots), participant characteristics (e.g., EFL undergraduates, freshman students, pre-medical students), methodological approach (descriptive, qualitative, or experimental), data sources (e.g., mind-mapping activities), and key findings related to skill development, and effect on attitudes. These elements were essential for thematic synthesis, given that the corpus consists primarily of descriptive and qualitative studies, with a smaller number of experimental investigations. Data coding was conducted manually to preserve conceptual accuracy and to ensure that each study was classified according to its primary mind-mapping contribution. All extracted information was entered into a structured matrix to maintain consistency across studies. Because the corpus represents a single author's research program, terminology, methodological framing, and analytical categories were highly consistent, reducing the likelihood of coding discrepancies. This systematic extraction process ensured that all included studies were analyzed using uniform criteria, enabling a coherent synthesis of findings on mind-mapping across twelve years of research.

### **2.6 Data Synthesis**

Data synthesis followed a narrative, thematic approach appropriate for an author-bounded corpus with heterogeneous but conceptually related studies. After extraction, all studies were compared to identify patterns in instructional focus, methodological design, and reported learning outcomes. Because the six studies examined different language skills but the same instructional strategy, synthesis centered on tracing how mind-mapping functioned across skill domains and how its effects manifested in reading, writing, vocabulary, spelling, and terminology learning. The synthesis process involved grouping findings according to recurring themes such as cognitive organization, idea generation, phonological awareness, morphological analysis, comprehension, retention, and learner attitudes. Cross-study comparison allowed identification of shared instructional benefits as

well as skill-specific applications of mind-mapping. Given the conceptual coherence of the corpus, no statistical meta-analysis was required; instead, a structured narrative synthesis was used to integrate qualitative, descriptive, and quantitative results into a unified account of the author's mind-mapping research program.

## 2.7 PRISMA Flow Description

Because this review is based on a closed, author-bounded corpus, the PRISMA flow (Preferred Reporting Items for SRs and MAs) reflects the process of identifying, screening, and selecting all publications authored by Al-Jarf between 2009 and 2021 that examined mind-mapping as an instructional intervention. A total of 32 records were retrieved from the author's publication archives across Google Scholar, ResearchGate, Semantic Scholar, Academia.edu, SSRN, ERIC, EBSCO, ProQuest, institutional repositories, and publisher platforms. After manual screening, 14 studies were excluded for the following reasons: (i) use of instructional tools other than mind-mapping (e.g., iRubrics, animations, multimodal techniques); (ii) partial or incidental mention of mind-mapping without using it as the primary intervention; (iii) lack of extractable data relevant to English-language or terminology instruction. A total of six studies met all inclusion criteria and were included in the final synthesis. These studies constitute a complete and coherent cluster representing the author's research program on mind-mapping in EFL and ESP instruction.

## 3. Results

### 3.1 Overview

The six studies in this SR examine the use of mind-mapping software in the teaching of reading, writing, vocabulary, spelling, medical terminology and Greek and Latin roots to EFL freshman and pre-medical students. The six studies included in this RS, were organized into one thematic cluster representing the major strand of the author's research program. The findings of each study and key contributions of the author's work to the field of mind-mapping instruction and practice are presented the following sections.

### 3.2 Study Characteristics

#### **Cluster — Mind-mapping software in language and terminology instruction (Al-Jarf, 2009–2021).**

##### **Study 1: Teaching reading to EFL freshman students with mind-mapping software (Al-Jarf, 2021)**

The results showed that freshman EFL students who received reading instruction supported by the mind-mapping software significantly outperformed those who received traditional instruction that depended on the textbook only. Students in the mind-mapping group demonstrated higher accuracy in identifying paragraph topics, main ideas, supporting details, and text-structure types, and they produced clearer outlines and more coherent summaries than the control group. They were also better able to locate signalling devices and understand how ideas in the text were organized.

##### **Study 2: A model for enhancing EFL freshman students' vocabulary with mind-mapping software (Al-Jarf, 2015)**

The results showed that EFL freshman students who used vocabulary mind-maps made significantly higher gains in vocabulary acquisition than those who received textbook-based instruction only. The mind-mapping group demonstrated stronger vocabulary knowledge, more accurate pronunciation, better connections between spoken and written forms, improved spelling, clearer understanding of parts of speech, and greater ability to categorize words by semantic, morphological, phonological, and syntactic features. Students' mind maps reflected deeper lexical organization and stronger retention of new vocabulary. Overall, the integration of mind-mapping software enhanced students' ability to learn, relate, and recall vocabulary items more effectively than traditional instruction.

##### **Study 3: Teaching Greek and Latin roots to premedical students with mind-mapping software (Al-Jarf, 2011c)**

This study showed that using mind-mapping software substantially improved premedical students' ability to learn, recognize, and relate Greek and Latin roots and the medical terms derived from them. Students became more accurate in identifying roots, prefixes, suffixes, derivatives, and singular–plural forms, and they demonstrated clearer understanding of how related terms cluster together morphologically, phonologically, semantically, and syntactically. Their mind maps revealed stronger connections among terms sharing the same base or affix, better organization of terminology knowledge, and greater ability to interpret and construct new medical terms by combining word parts.

##### **Study 4: Teaching spelling with mind-mapping software (Al-Jarf, 2011d)**

This study indicated that integrating mind-mapping software into spelling instruction helped EFL freshman students recognize and apply English phoneme–grapheme correspondences. Students were able to categorize and recall spelling patterns more accurately, including vowel and consonant variations, silent letters, vowel digraphs, double consonants, homophones, homographs, and affix-related spelling changes. Their mind maps revealed clearer grouping of words by spelling rules, stronger visual associations, and more consistent application of phonics principles in reading and writing tasks.

**Study 5: Teaching medical terminology with mind-mapping software (Al-Jarf, 2010b)**

The results showed that integrating mind-mapping software into medical terminology instruction substantially improved premedical students' ability to recognize, categorize, and retain medical terms. Students became more accurate in identifying roots, prefixes, suffixes, derivatives, and singular-plural forms, and they demonstrated clearer understanding of how medical terms relate to one another across phonological, morphological, syntactic, and semantic dimensions. Their mind maps revealed stronger connections among related terms, better organization of terminology knowledge, and greater ability to combine and interpret word parts when encountering new terms. Students also expressed positive attitudes toward the mind-mapping approach, reporting that it made terminology easier to visualize, remember, and apply.

**Study 6: Enhancing freshman students' writing skills with mind-mapping software (Al-Jarf, 2009)**

A total of 86 female freshman students participated in the study. They were divided into a control group receiving traditional textbook-based instruction and an experimental group receiving traditional instruction supplemented with mind-mapping activities. The experimental group was trained to use FreeMind as a prewriting tool to brainstorm, generate ideas, and organize supporting details. Students created weekly mind maps in class with instructors' guidance and continued using the software at home. The mapping process involved placing a central topic, generating branches and sub-branches, using colors, symbols, and keywords, and visually representing associations among ideas. The focus was on idea generation first, with organization occurring later. Posttest results showed that the experimental group achieved significantly higher gains than the control group ( $T = 22.56$ ,  $p < .01$ ) as a result of using the mind-mapping software. Paragraphs written by the experimental group contained more relevant details and better organization. Mind mapping improved multiple language and academic skills simultaneously. In writing, it enhanced idea generation, organization, coherence, and creative thinking. In reading, students reported clearer visualization of relationships between ideas, better comprehension, and more organized, engaging reading experiences. In medical terminology courses, mind mapping served as an effective mnemonic tool that strengthened understanding and long-term retention of Greek and Latin roots, making terminology easier to visualize, remember, and apply. In spelling courses, the software helped students visualize sound-symbol relationships, internalize spelling rules, and improve phonological awareness. Students also appreciated the ability to personalize their maps with colors, branches, and symbols, which increased engagement and supported memory.

Across all six studies, students consistently expressed positive attitudes toward the mind-mapping approach. They described the software as enjoyable, motivating, and helpful for generating, organizing, and visualizing ideas. Although some initially struggled with the English interface and the unfamiliarity of the technique, the activity became easier with practice, and by the end of the semester students were using the software regularly, between 1 and 4 times per week, and between 30–60 minutes creating maps. Most indicated that they intended to continue using mind mapping in future courses, and many even drew maps by hand during exams to support their writing.

Overall, the integrated findings show that mind mapping functions as a powerful cognitive, organizational, and mnemonic tool that enhances writing, reading, terminology learning, and spelling performance while simultaneously fostering strong positive attitudes toward learning across all six studies.

#### **4. Discussion**

##### **4.1 Meta-Conclusion, Interpretation, and Insights**

Across the six studies, common findings show that mind mapping functions as a powerful cognitive, organizational, and mnemonic tool that enhances students' performance across multiple language skills. It strengthens idea generation, organization, and creativity in writing; improves comprehension, visualization of relationships, and engagement in reading; and enhances long-term retention and application of Greek and Latin roots in medical terminology. It also supports phonological awareness and mastery of spelling rules by helping students visualize sound-symbol correspondences. Together, the findings demonstrate that mind mapping is not just a supportive learning strategy but also a cross-disciplinary cognitive scaffold that promotes deeper processing, long-term retention, and positive learner engagement in EFL contexts. The technique operates as a cognitive catalyst that reshapes how students process, store, and retrieve information. By externalizing complex information structures, mind mapping reduces cognitive load and frees working-memory resources for higher-order thinking. This mechanism appears to function similarly across writing, reading, terminology learning, and spelling, suggesting that mind mapping taps into universal cognitive processes rather than skill-specific strategies.

The improvements observed across all language domains point to a shared underlying mechanism: mind mapping enhances the integration of form, meaning, and structure. In writing, it supports ideational fluency and coherence; in reading, it clarifies conceptual relationships; in terminology learning, it strengthens semantic networks; and in spelling, it reinforces sound-symbol mapping. These cross-skill gains suggest that mind mapping enables learners to construct interconnected mental schemas rather than relying on linear memorization, thereby fostering more durable and transferable learning outcomes.

The studies also show that mind mapping fosters metacognitive awareness: students became more conscious of how ideas connect, how information is structured, and how meaning is built. This awareness translated into improved planning in writing, clearer conceptual mapping in reading, stronger semantic networks in vocabulary, and more accurate sound-symbol associations in spelling. Ultimately, mind mapping transforms learning from a sequential, text-bound activity into a multimodal, relational process. This shift empowers EFL learners to navigate linguistic complexity with greater autonomy, confidence, and metacognitive control, positioning mind mapping as a transferable learning habit in EFL environments.

Students across all courses expressed highly positive attitudes toward mind mapping, valuing its flexibility, personalization features, and ability to make complex information more accessible and memorable. This affective dimension appears central to sustaining long-term use, as evidenced by students' continued reliance on hand-drawn maps during exams. Despite initial unfamiliarity with the software interface, students rapidly developed confidence and fluency in using mind maps, integrating them into their weekly study routines and internalizing the technique as a dependable cognitive scaffold rather than a teacher-imposed tool.

#### **4.2 Implications**

The cross-study findings carry several important implications for EFL pedagogy, curriculum design, and assessment practices. First, the consistent improvements across writing, reading, terminology learning, and spelling suggest that mind mapping should be integrated as a core instructional strategy rather than an optional add-on. Its ability to externalize cognitive processes and reduce working-memory load indicates that it can support learners at varying proficiency levels, particularly those who struggle with linear text-based tasks. Second, the strong positive attitudes observed across all courses highlight the motivational value of mind mapping; incorporating visually rich, customizable mapping tools may enhance learner engagement and persistence, especially in demanding academic contexts such as medical terminology. Third, the spontaneous transfer of mind-mapping skills, evident in students' use of hand-drawn maps during exams, suggests that training in visual-organizational strategies can cultivate durable, self-regulated learning habits. This has implications for curriculum designers, who may consider embedding mind-mapping tasks across multiple courses to promote cross-disciplinary coherence. Fourth, the findings point to the need for teacher training so that instructors are equipped not only to use mind-mapping software but also to model how maps can support planning, comprehension, and retention. Finally, the results highlight the value of multimodal learning environments; integrating visual, spatial, and linguistic modes can create more inclusive classrooms that accommodate diverse cognitive styles and enhance long-term learning outcomes.

#### **4.3 Positioning This SR Within the Global SRs of Mind Mapping Research**

When situated within the broader international literature, the findings of this SR reinforce well-established global trends while offering contributions that extend the field in meaningful ways. Worldwide research consistently shows that mind mapping enhances idea generation, supports visual-spatial organization, and promotes deeper processing through multimodal encoding across a wide range of disciplines. Findings of the present SR align with these global patterns but add a distinctive dimension by demonstrating the technique's effectiveness across multiple EFL-specific skills—writing, reading, vocabulary, medical terminology, and spelling, within a single institutional context. This cross-skill consistency is rarely documented in international studies, which typically examine one skill or domain at a time.

Previous SRs and meta-analyses have confirmed mind mapping's value in improving academic performance, critical thinking, creativity, STEM learning, and medical education. Reviews in creativity and STEM highlight its role in fostering divergent thinking and procedural learning, while those in medical and health sciences emphasize its mnemonic and organizational benefits for mastering complex terminology. A parallel body of SRs in language education reports gains in idea generation, text organization, comprehension, and vocabulary retention, underscoring mind mapping's relevance to EFL and literacy development.

The present SR builds on these findings but advances the field in important ways. First, by synthesizing six methodologically aligned studies conducted within the same educational environment, it offers a level of internal coherence that is uncommon in the fragmented global research landscape. This unified context allows for clearer identification of cross-skill mechanisms, showing how mind mapping operates as a transferable cognitive scaffold rather than a skill-specific intervention. Second, while global SRs often emphasize cognitive outcomes, this SR highlights the equally significant affective and motivational dimensions: students' strong positive attitudes, sustained engagement, and spontaneous transfer of mind-mapping strategies to exam settings. This dual cognitive-affective impact enriches the international discourse by demonstrating how mind mapping supports not only performance but also learner autonomy and long-term strategy internalization.

Finally, by documenting consistent cognitive, affective, and metacognitive benefits across multiple EFL courses, this work expands the global understanding of how visual-organizational tools function in second-language learning contexts. It positions mind mapping as a pedagogically robust approach with strong potential for adoption across multilingual and multicultural educational systems, offering a unified perspective that previous SRs and MAs have not fully captured.

#### **4.4 Limitations of This SR on Mind Mapping in EFL Courses**

Although this SR provides a coherent SR of six methodologically aligned studies on mind mapping in EFL contexts, several limitations should be acknowledged. First, all included studies were conducted within a single institutional setting (College of Languages and Translation at King Saud University), which strengthens internal consistency but limits the generalizability of the findings to broader or more diverse educational environments. Second, the review is based on a relatively small number of studies compared with large-scale international MAs; while the depth and alignment of the studies enhance interpretive clarity, the limited sample size, and the focus on freshman and pre-medical students in their first semester of college, restricts the ability to conduct statistical MA or examine intervening variables such as proficiency level or instructional modality. Third, the studies relied heavily on self-reported attitudes and classroom-based performance measures, which may be influenced by social desirability, teacher expectations, or short-term intervention effects. Fourth, the SR focuses on EFL courses taught in the first semester of college and does not incorporate comparative data from higher-level language skills taught in Semesters 2–4 or from specialized courses offered to advanced students in the translation program at the college. Including such data could provide a richer understanding of how mind mapping functions across different proficiency levels, course difficulty levels, and learning environments.

Despite these limitations, the review offers a uniquely coherent and contextually grounded synthesis that contributes meaningfully to the global literature on mind mapping in language education.

#### **5. Recommendations**

Based on the integrated findings of the six studies, this study offers several practical recommendations for guiding educators, curriculum designers, and institutions seeking to maximize the benefits of mind mapping in the EFL contexts. First, mind mapping should be systematically integrated into EFL language skills rather than introduced as an isolated activity. Consistent exposure enables the students to internalize mapping as a habitual learning strategy. Second, instructors should be introduced to and be trained on how to model effective mind-mapping practices, scaffold map construction, and integrate mapping into pre-writing, pre-reading, and review activities. Third, institutions may adopt user-friendly digital mind-mapping tools with multilingual interfaces to reduce cognitive barriers for EFL learners and support personalization through colors, symbols, and branching structures. Fourth, assessment practices should incorporate opportunities for students to use mind maps during planning stages of exams, projects, and writing tasks, reinforcing the strategy's role as a cognitive scaffold. Fifth, collaborative mind-mapping tasks can be introduced to promote peer interaction, shared meaning-making, and collective problem-solving. Finally, educators should encourage students to transfer mind-mapping strategies into academic writing, grammar and speaking practice, exam preparation, note-taking, independent study, term paper writing to cultivate durable, self-regulated learning habits.

#### **6. conclusion**

This SR demonstrates that mind mapping is a robust, cross-disciplinary learning tool that consistently enhances EFL freshman and pre-medical students' performance across writing, reading, vocabulary, medical terminology, Greek and Latin roots and spelling. By integrating findings from six methodologically aligned studies conducted within the same institutional context, the review provides a uniquely coherent picture of how mind mapping operates as a cognitive, affective, and metacognitive scaffold. The technique not only improves idea generation, organization, comprehension, and retention but also fosters strong positive attitudes, engagement, and the spontaneous transfer of mapping strategies to exam settings and independent study.

The collective evidence indicates that mind mapping transforms learning from a linear, text-bound process into a multimodal, relational experience that reduces cognitive load and supports deeper processing. Its benefits extend beyond individual skills, revealing a transferable learning habit that empowers students to navigate linguistic complexity with greater autonomy and confidence. While the review acknowledges limitations related to context, sample size, and reliance on self-reported data, the overall findings align with and extend global research, positioning mind mapping as a pedagogically powerful and scalable strategy for EFL education. Taken together, this work underscores the value of integrating mind mapping systematically across language curricula and highlights its potential to shape more engaging, inclusive, and cognitively supportive learning environments.

Building on the findings of the current SR, several directions for future research are proposed. Large-scale, multi-site studies are needed to examine the effectiveness of mind mapping across diverse educational settings, proficiency levels, and cultural backgrounds, thereby extending the generalizability of current results. Mixed-methods and longitudinal designs would provide deeper insight into long-term retention, transfer of learning, and the evolution of students' metacognitive strategies over time. Comparative experimental studies exploring different mapping formats, digital, paper-based, collaborative, and AI-assisted, could clarify which features most effectively support specific language skills. More analyses are also needed to investigate how mind mapping interacts with learner variables such as working-memory capacity, learning styles, motivation, and prior knowledge. Additionally, research on teacher training and instructional strategies would illuminate how utilization quality shapes learning outcomes. Finally, studies conducted in multilingual and ESL environments offer valuable comparative perspectives on how mind mapping functions across different linguistic environments, potentially expanding its applicability beyond EFL classrooms.

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