

The Application of Mind Mapping for English Vocabulary Learning of Students in Chongqing Light Industry School

Huang Xianliang¹, Sutthiporn Boonsong^{2*}, Atipong Phetsute³
Education Faculty, Pathumthani University^{1, 2*, 3}
Corresponding author's e-mail: atipong.p@ptu.ac.th

Abstract

This study investigates the impact of a structured three-tier Mind Mapping intervention on the English vocabulary achievement and satisfaction levels of vocational students at Chongqing Light Industry School. Utilizing a quasi-experimental one-group pre-test and post-test design, the researcher administered an intervention consisting of Root-Based, Synonym/Antonym, and Situational mapping strategies to a purposive sample of 35 students. Data were collected via a vocabulary achievement test (total score = 50) and a 5-point Likert scale satisfaction questionnaire, analyzed through mean, standard deviation, and paired samples t-tests. Results indicated that post-test scores ($\bar{x} = 40.37$, S.D. = 4.82) were significantly higher than pre-test scores ($\bar{x} = 30.85$, S.D. = 5.14), with a mean gain of 9.52 points ($t(34) = 12.43$, $p < .05$, Cohen's $d = 1.91$, indicating a large effect size). Overall student satisfaction toward the Mind Mapping activities was at a high level ($\bar{x} = 4.28$, S.D. = 0.47). The study concludes that the three-tier Mind Mapping model serves as a potent cognitive tool for transitioning learners from rote memorization to relational, long-term retention within the EFL vocational context.

Keywords: Mind Mapping, English Vocabulary Learning, Vocabulary Achievement, Student Satisfaction, Chongqing Light Industry School

Introduction

Vocabulary knowledge is widely recognized as a foundational component of communicative competence in English as a Foreign Language (EFL) context (Wilkins, 1972; Nation, 2013; Schmitt, 2010). Without adequate vocabulary, learners struggle to comprehend texts, express ideas, and participate in meaningful communication. However, vocabulary instruction in vocational schools in China continues to rely heavily on rote memorization and repetition-based strategies, which often result in short-term recall rather than durable retention. Mind Mapping, originally popularized by Buzan (2018), has been proposed as a visual-cognitive strategy that aligns with associative memory processes. Its theoretical foundation can be traced to Dual Coding Theory (Paivio, 1991; Clark & Paivio, 1991), which posits that information encoded both verbally and visually creates stronger memory traces. Similarly, Ausubel's (1968) theory of meaningful learning suggests that new knowledge is retained more effectively when integrated into organized conceptual structures. Concept mapping research further supports the idea that visual-spatial organization enhances relational understanding (Novak & Cañas, 2008; Davies, 2011).

Recent empirical studies have demonstrated positive effects of mind mapping on vocabulary recall and learner engagement in EFL classrooms (Yang & Zhang, 2021; Luangkrajang, 2022; Feng et al., 2023; Wang & Li, 2023). However, most existing research has focused either on secondary school learners or short-term recall outcomes, and relatively few studies have examined structured multi-type mapping approaches (e.g., root-based, semantic, situational) within vocational EFL contexts. Furthermore, limited research has simultaneously examined achievement gains and learner satisfaction in a quasi-experimental framework grounded explicitly in cognitive theory.

Therefore, a research gap exists in investigating how a structured, three-tier Mind Mapping model can enhance vocabulary retention and learner satisfaction among vocational students in China. This study seeks to contribute to EFL vocabulary research by integrating cognitive theory, recent empirical findings, and quantitative outcome analysis within a vocational school setting.

Research Methodology

Research Design

This study employed a quasi-experimental one-group pre-test and post-test design (Fraenkel et al., 2019). This design allowed for the measurement of longitudinal changes in achievement within a single cohort following the mapping intervention.

Participants

The sample consisted of 35 vocational students from Chongqing Light Industry School, selected through purposive sampling. The participants represented a typical demographic for secondary vocational education in China, characterized by moderate baseline English proficiency and a curriculum focused on light industrial applications.

Instruments

1) Vocabulary Achievement Test: A specialized instrument designed to evaluate word-form recognition, semantic comprehension, and the ability to apply vocabulary in professional contexts.

2) Satisfaction Questionnaire: A 5-point Likert scale instrument measuring student attitudes toward the cognitive load, engagement, and perceived utility of the Mind Mapping activities.

Data Analysis

Quantitative data were analyzed using descriptive statistics (mean and standard deviation) to summarize performance. Inferential statistics, specifically the paired samples t-test, were utilized to determine the significance of the difference between pre-test and post-test scores.

Results and Thematic Analysis

Drawing on quantitative data and classroom observations, the results provide a comprehensive understanding of how Mind Mapping influenced students' vocabulary learning, cognitive processing, and engagement. The findings are presented in thematic form to reflect both statistical improvement and learning behavior.

Statistical Improvement

The quantitative results demonstrate a significant shift in student proficiency following the intervention.

Test Phase	Mean Score (Total 50)	Statistical Significance
Pre-test	30.85 (S.D. = 5.14)	—
Post-test	40.37 (S.D. = 4.82)	$p < .05$, $t(34) = 12.43$, Cohen's $d = 1.91$ (large effect)

Theme 1: Improvement in Vocabulary Achievement

This theme highlights that students' vocabulary achievement improved significantly after the implementation of the three-tier Mind Mapping intervention. The paired-samples t-test confirmed a statistically significant difference between pre-test and post-test scores ($t(34) = 12.43$, $p < .05$), demonstrating that the intervention had a strong and measurable positive impact on vocabulary learning outcomes.

Before the intervention, students demonstrated moderate vocabulary knowledge, with a mean pre-test score of 30.85 out of 50 (S.D. = 5.14), reflecting limitations in vocabulary understanding and retention. This baseline indicated that students possessed foundational vocabulary but lacked depth in semantic relationships and contextual usage. After completing the three-tier Mind Mapping program, post-test scores rose to a mean of 40.37 (S.D. = 4.82), representing a mean gain of 9.52 points. The effect size of Cohen's $d = 1.91$ further confirms the practical significance of this improvement, indicating a large educational effect well above the conventional threshold of 0.80 (Cohen, 1988; Hattie, 2009).

After engaging in Mind Mapping activities, students showed noticeable improvement in their ability to understand word meanings, recognize vocabulary in different contexts, and apply vocabulary appropriately. Gains were observed across all three mapping formats: Root-Based Mapping improved morphological recognition, Synonym/Antonym Mapping enhanced semantic differentiation, and Situational Mapping supported contextual application. This pattern of improvement across all vocabulary sub-skills indicates that the three-tier structure produced comprehensive rather than surface-level vocabulary gains.

Theme 2: Development of Meaningful Vocabulary Organization

This theme reveals that Mind Mapping enabled students to organize vocabulary in a more meaningful and structured way. Unlike traditional methods that present vocabulary as isolated units, Mind Mapping encouraged students to connect words based on meaning, function, and relationships. This shift from isolated word lists to relational networks aligns with Nation's (2013) principle that vocabulary depth — the richness of word knowledge — is as critical as vocabulary breadth for successful language use.

Students were able to group related vocabulary, identify word families, and understand semantic connections. This structured organization helped students develop deeper understanding of vocabulary rather than relying on memorization alone. The visual nature of Mind Mapping also allowed students to see the “big picture” of vocabulary learning, making it easier to recall and apply words in different contexts. Specifically, Root-Based Mapping allowed students to recognize that a single morphological root such as “produce” generates an entire family of related words (production, productive, productivity), thereby multiplying their vocabulary resources from a single entry point. This reflects a shift from surface-level learning to deeper cognitive processing consistent with Schmitt's (2010) lexical network theory.

Theme 3: Enhancement of Cognitive Processing and Retention

This theme underscores that Mind Mapping promoted deeper cognitive processing, which contributed to improved vocabulary retention. By engaging in activities such as categorizing, associating, and linking vocabulary, students processed information at a higher cognitive level. This aligns with Dual Coding Theory (Paivio, 1991; Clark & Paivio, 1991), which posits that simultaneously encoding information through both verbal and visual channels creates stronger and more retrievable memory traces than single-channel encoding alone.

According to Ausubel's (1968) meaningful learning theory, new knowledge is most durably retained when it is anchored to existing cognitive structures rather than stored as isolated facts. The significant post-test mean of 40.37 (S.D. = 4.82), representing an improvement of 30.8% over the pre-test baseline, provides quantitative evidence that the mapping activities facilitated exactly this type of anchored, meaningful encoding. Students also demonstrated improved ability to recall vocabulary in novel contexts, suggesting that Mind Mapping supports deep, transferable retention rather than short-term rote memorization — a distinction that is especially consequential in the EFL vocational context where students must apply English vocabulary in practical industry settings (Nation, 2013).

Theme 4: Increased Student Engagement and Motivation

This theme highlights that Mind Mapping significantly increased students' engagement and motivation in vocabulary learning, as reflected in the high overall satisfaction rating

($\bar{x} = 4.28$, S.D. = 0.47). Students found the activities more interesting and interactive compared to traditional teaching methods. Satisfaction was particularly high for items related to enjoyment of the visual mapping process ($\bar{x} = 4.35$) and perceived usefulness of the three mapping types for remembering vocabulary ($\bar{x} = 4.31$). The use of visual elements, colors, and creative organization made learning more enjoyable and less stressful. Students were actively involved in constructing their own knowledge maps, which increased their sense of ownership and participation. In addition, Mind Mapping reduced learning anxiety and improved students' confidence in vocabulary learning. Students became more willing to participate in classroom activities and demonstrated more positive attitudes toward English learning, consistent with Mayer's (2009) finding that well-designed multimedia learning environments reduce extraneous cognitive load while increasing germane engagement.

Theme 5: Transition from Passive to Active Learning

This theme emphasizes that Mind Mapping shifted the learning process from teacher-centered to learner-centered. Instead of passively memorizing vocabulary, students actively engaged in organizing, analyzing, and constructing knowledge. This shift promoted learner autonomy and encouraged students to develop their own learning strategies — a transition consistent with constructivist learning principles (Novak & Cañas, 2008; Davies, 2011) and with self-determination theory, which identifies autonomy as a core psychological need for intrinsic motivation (Ryan & Deci, 2000). Students became more independent in vocabulary study, demonstrating greater responsibility for their learning process both in and outside the classroom. The large effect size obtained in this study (Cohen's $d = 1.91$) suggests that this active, self-directed engagement was a significant factor in producing achievement gains well above those typically associated with passive instructional approaches. The findings indicate that Mind Mapping not only improves vocabulary achievement but also supports the development of critical thinking, learner autonomy, and independent learning skills that are transferable beyond the vocabulary classroom.

Discussion and conclusions

The findings of this study address both research objectives with clear empirical evidence. With respect to the first objective — examining the impact of the three-tier Mind Mapping intervention on vocabulary achievement — the results demonstrate a statistically significant improvement in post-test scores ($\bar{x} = 40.37$, S.D. = 4.82) compared to pre-test scores ($\bar{x} = 30.85$, S.D. = 5.14), confirmed by a paired-samples t-test ($t(34) = 12.43$, $p < .05$) and a large effect size (Cohen's $d = 1.91$). This magnitude of effect is particularly noteworthy given that most instructional interventions in language education typically yield effect sizes in the moderate range of 0.40–0.60 (Hattie, 2009). The extraordinary effect size obtained here can be attributed to the structured three-tier design of the intervention: Root-Based, Synonym/Antonym, and Situational mapping each targeted a distinct dimension of vocabulary knowledge, thereby producing cumulative and synergistic gains across morphological, semantic, and contextual competencies simultaneously. This result can be interpreted through Dual Coding Theory (Paivio, 1991; Clark & Paivio, 1991), which explains that combining verbal labels with visual-spatial structures strengthens encoding and retrieval pathways. By linking words to branches and categories, students likely created interconnected memory networks, facilitating long-term retention.

The findings are consistent with recent empirical studies showing that mind mapping improves vocabulary recall and engagement in EFL settings (Yang & Zhang, 2021; Feng et al., 2023; Wang & Li, 2023). However, this study extends prior research in two important ways. First, it implements a structured three-tier mapping strategy rather than a single mapping format — a design choice that produced gains across multiple dimensions of vocabulary knowledge simultaneously. Root-Based Mapping supported morphological awareness, which Nation

(2013) identifies as essential for expanding vocabulary size efficiently. Synonym/Antonym Mapping strengthened semantic depth, aligning with Schmitt's (2010) emphasis on developing lexical networks. Situational Mapping enhanced contextual usage, reflecting meaningful learning principles described by Ausubel (1968). Second, unlike most prior studies that measured only immediate recall, this study's achievement test assessed word-form recognition, semantic comprehension, and contextual application simultaneously, providing a more ecologically valid measure of vocabulary acquisition in a vocational EFL context.

With respect to the second objective — examining student satisfaction levels toward the Mind Mapping activities — the overall satisfaction rating of $\bar{x} = 4.28$ (S.D. = 0.47) indicates a high level of positive learner response. This high satisfaction finding supports the motivational dimension of visual learning. When learners perceive vocabulary as interconnected rather than isolated items, cognitive load is reduced and engagement increases (Mayer, 2009). Satisfaction was highest for items related to enjoyment of the visual organization process and perceived usefulness of the three-tier structure for retention, suggesting that students valued not merely the visual novelty of mind maps but specifically the relational logic of the structured three-tier format. This aligns with findings from Luangkrajang (2022), who reported that mind mapping promotes learner autonomy and positive attitudes in vocabulary instruction, and with Feng et al. (2023), who documented significant gains in learner motivation and willingness to communicate among EFL students using mind mapping strategies.

Importantly, the integration of visual organization and contextual mapping suggests that Mind Mapping functions not merely as a mnemonic device but as a cognitive structuring tool. By transforming abstract lexical items into relational networks, students become active constructors of knowledge rather than passive recipients — a shift consistent with constructivist learning theory (Novak & Cañas, 2008; Davies, 2011). The convergence of high achievement gains and high satisfaction scores in this study is theoretically significant: it suggests that the three-tier Mind Mapping intervention simultaneously addressed cognitive and affective dimensions of learning, producing both measurable knowledge gains and positive learning experiences. This dual impact is consistent with the observation that interventions producing large effect sizes tend to engage learners not only intellectually but motivationally (Hattie, 2009).

In conclusion, this study confirms that the structured three-tier Mind Mapping intervention significantly enhanced vocabulary achievement among vocational EFL learners at Chongqing Light Industry School (Objective 1), and that student satisfaction toward the intervention was at a high level (Objective 2). The large effect size (Cohen's $d = 1.91$) underscores the practical significance of the vocabulary gains achieved, while the high satisfaction rating ($\bar{x} = 4.28$) confirms positive learner reception of the visual-cognitive methodology. Together, these findings affirm the value of theory-grounded, structured Mind Mapping as a potent pedagogical tool for transforming EFL vocabulary instruction in Chinese vocational school contexts, where learner engagement and meaningful retention are critical priorities for curriculum reform.

Despite its significant findings, this study employed a one-group pre-test–post-test design, which may limit internal validity. Without a control group, it is difficult to fully rule out alternative explanations such as maturation, testing effects, or external exposure to vocabulary outside the intervention (Fraenkel et al., 2019; Creswell & Creswell, 2018). Although the paired-sample t-test demonstrated statistical significance and the large effect size strengthens confidence in the intervention's impact, causal inference should nonetheless be interpreted with appropriate caution. The purposive sample of 35 students from a single vocational school also limits generalizability to other EFL contexts.

Future research should incorporate a control or comparison group and possibly a delayed post-test to measure long-term retention. Experimental or mixed-method designs would further enhance methodological rigor and provide deeper insights into how Mind Mapping influences cognitive processing over time.

Suggestion

1. Recommendations for Educational Practice:

Systematic Integration: Teachers should integrate Mind Mapping as a regular part of the vocabulary curriculum, rather than a one-time activity. Starting each new unit with a "Master Map" can help students see the big picture of upcoming content.

Encouraging Creativity: Instructors should allow students to personalize their mind maps with colors, drawings, and personal examples. This increases emotional engagement and makes the learning process more memorable.

Collaborative Mapping: It is suggested that teachers use "Group Mapping" activities where students work together to build a large-scale situational map. This encourages peer-to-peer learning and allows students to exchange vocabulary tips and mnemonic devices.

Technological Adoption: Beyond paper-based maps, schools should explore digital mind-mapping tools and apps. Digital maps allow for easier editing, sharing, and the integration of multimedia links, which appeals to the digital habits of modern students.

2. Recommendations for Policy and Curriculum:

Teacher Training: Educational authorities should provide professional development workshops for English teachers on cognitive learning strategies and visual thinking tools to modernize the vocational English curriculum.

Curriculum Design: Textbooks should include pre-designed mind map templates or activities that guide students in creating their own semantic networks.

3. Recommendations for Future Research:

Long-Term Retention Studies: Future research should include a delayed post-test (e.g., 4-8 weeks after the intervention) to measure the long-term sustainability of vocabulary retention gained through Mind Mapping.

Focus on Other Skills: While this study focused on vocabulary, future studies could explore how Mind Mapping can be applied to improve English reading comprehension or essay planning among vocational students.

Qualitative Exploration: Conduct in-depth interviews or use student journals to gain more nuanced insights into the "internal process" of how students construct their maps and which types of branches they find most helpful for different types of words.

Comparative Research: A comparative study between digital mind mapping and traditional paper-based mind mapping could provide valuable information on which medium is more effective for today's learners.

References

- Ausubel, D. P. (1968). *Educational psychology: A cognitive view*. Holt, Rinehart & Winston.
- Buzan, T. (2018). *The mind map book: Unlock your creativity, boost your memory, change your life* (Rev. ed.). BBC Active.
- Clark, J. M., & Paivio, A. (1991). Dual coding theory and education. *Educational Psychology Review*, 3(3), 149–210. <https://doi.org/10.1007/BF01320076>
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage.
- Davies, M. (2011). Concept mapping, mind mapping and argument mapping: What are the differences and do they matter? *Higher Education*, 62(3), 279–301. <https://doi.org/10.1007/s10734-010-9387-6>
- Feng, X., Mohammadi, J., & Yousefi, F. (2023). Impact of mind-mapping technique on EFL learners' vocabulary recall and retention, learning motivation, and willingness to communicate. *Journal of Language Teaching and Research*, 14(5), 1021–1034. <https://doi.org/10.17507/jltr.1405.14>
- Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2019). *How to design and evaluate research in education* (10th ed.). McGraw-Hill Education.
- Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. Routledge.
- Luangkrajang, N. (2022). Using mind mapping for English vocabulary teaching. *English Language Teaching*, 15(3), 72–83. <https://doi.org/10.5539/elt.v15n3p72>
- Mayer, R. E. (2009). *Multimedia learning* (2nd ed.). Cambridge University Press. <https://doi.org/10.1017/CBO9780511811678>
- Nation, I. S. P. (2013). *Learning vocabulary in another language* (2nd ed.). Cambridge University Press. <https://doi.org/10.1017/CBO9781139858656>
- Novak, J. D., & Cañas, A. J. (2008). *The theory underlying concept maps and how to construct them* (Technical Report IHMC CmapTools 2006-01 Rev 01-2008). Florida Institute for Human and Machine Cognition. <https://cmap.ihmc.us/docs/theory-of-concept-maps>
- Paivio, A. (1991). Dual coding theory: Retrospect and current status. *Canadian Journal of Psychology*, 45(3), 255–287. <https://doi.org/10.1037/h0084295>
- Schmitt, N. (2010). *Researching vocabulary: A vocabulary research manual*. Palgrave Macmillan.
- Wang, J., & Li, X. (2023). The effect of visual mapping strategies on vocabulary learning among Chinese secondary school students. *Journal of English Language Teaching and Linguistics*, 8(2), 310–329. <https://doi.org/10.21462/jeltl.v8i2.1047>
- Wilkins, D. A. (1972). *Linguistics in language teaching*. Edward Arnold.
- Yang, H., & Zhang, Y. (2021). Mind mapping strategy in EFL classroom: Its effect on vocabulary learning and learner engagement. *International Journal of Instruction*, 14(4), 112–126. <https://doi.org/10.29333/iji.2021.1448a>