Journal of Literature, Languages and Linguistics
ISSN 2422-8435 An International Peer-reviewed Journal
Vol.111, 2026

Evaluating the Effectiveness of Semantic Mapping in Learning Specialized Academic English (EAP).

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Abstract
One of the major challenges students face when learning to use specialized vocabulary in English for Academic Purposes (EAP) is the challenge of learning new vocabulary. This is particularly true when, as is so often the case, more traditional methods of learning vocabulary such as memorization are used instead of strategies that promote a deeper understanding of vocabulary and better retention over time. Semantic mapping provides one possible solution to this problem, by enabling students to make meaningful connections between new vocabulary and what they already know. This study investigates the effectiveness of semantic mapping as a tool in teaching specialized academic English, focusing on its contribution to the students' learning of new vocabulary, their comprehension of reading materials, and their level of engagement. This study used a mixed-methods approach to test the effectiveness of a vocabulary instructional strategy over an 8-week time frame. Measuring vocabulary retention and reading comprehension, two tests were administered to the experimental group (using semantic mapping for vocabulary) and the control group (relying on traditional methods for teaching vocabulary). A 10-item questionnaire was given to the experimental group in order to qualitatively obtain the students' perspectives, views, and feelings as well as their particular challenges with semantic mapping for learning new vocabulary. Quantitative analysis indicated that the experimental group achieved significantly higher post-test scores in both specialized vocabulary retention and academic text comprehension compared to the control group. Qualitative insights revealed that semantic mapping enhanced conceptual clarity, boosted learning motivation, and facilitated a deeper understanding of word relationships, though some students initially noted challenges regarding the time required to construct the maps. The results show that semantic mapping is a highly effective pedagogical tool for students of specialized academic English. It enables students to move from passive repetition of words to active visual schematization which is useful for EAP (English for Academic Purposes) curricula and for teaching vocabulary.
Keywords: Semantic Mapping, Academic English (EAP), Vocabulary Acquisition, Visual Learning, Reading Comprehension.

DOI: 10.7176/JLLL/111-06

Publication date: July 30th 2026

1. INTRODUCTION

1.1 Definition

This approach is visual, or visual-spatial, in nature. For this reason, it allows students not only to connect words and ideas but also to illustrate their semantic interrelations by means of diagrams or maps which attempt to organize knowledge in a spatial manner. Semantic mapping and other visual approaches to study of words enhance comprehension of studied texts and also facilitate vocabulary learning as well as organization of learning material for language learners (Kasim & Wahyuni, 2016).

The strategy of semantic mapping can also encourage students to explore new vocabulary while connecting them to already familiar words which can help students to remember them (Al-Ghazo, 2015). The strategy of semantic mapping also can help students to organize their thoughts in an effective manner in order to write and process information cognitively. Visualizing information and organizing it can help students to manage complex information (Al-Ghazo, 2015; Kasim & Wahyuni, 2016). Thus, semantic mapping strategy is a very effective educational strategy that can help students to improve their language skills and their cognitive abilities.

1.2 Specialized Academic English: Importance in EAP

(Specialized academic English) Academic English is the vocabulary, speech and writing elements used in

specific subject fields. Specialized academic English or English for Specific Purposes (ESP) can facilitate communication across specific disciplines. The use of such English, which is designed to enhance the clarity and precision of academic interactions, can facilitate the communication needs of researchers and practitioners in various fields (Nagy, 2014). Specialized terminology used in academic interactions can facilitate understanding of complex information and generate common ground for specialists in specific fields.

Academic English for specialisation purposes can also contribute to learning and research. According to Pecorari and Coxhead (2025), the most important aspect for students to master in order to participate in disciplinary activities effectively is specialized language for their area of study, which enables effective engagement and critical understanding of written texts and high performance in studying. Additionally, learning key words and phrases in academic English can facilitate students' written and spoken communication. Gardner and Davies (2014) developed an updated list of academic vocabulary that could support language learners.

In conclusion, the impact of specialized academic English on learning, research methods, and professional communication within disciplines is significant.

The growing number of students studying English for Academic Purposes (EAP) across the globe, who are at various stages of their academic careers, need to acquire control of specialized language in order to be able to read, write and communicate successfully in academic surroundings. That is to say, students in higher education courses all over the world mastering English for Academic Purposes (EAP) language will be able to considerably improve their academic reading, writing, and communicating skills by studying EAP. The language for EAP, helps students to become adequate academic readers and writers by enabling them to deal with complex written texts, and to express themselves properly by verbal and written means within academic environments (Pecorari & Coxhead, 2025). There are many aspects involved in English for Academic Purposes (EAP) and, in order to foster literacies that enable students to succeed academically, recently there has been a paradigm shift regarding how EAP is understood (Li, 2017). Studies demonstrate that students in an EAP program at a university in Canada show improved academic performance when mastering EAP language (Keefe & Shi, 2017). Therefore, EAP is key to student success.

It helps students:

- Using the following strategies can help in better understanding of academic written material and oral lectures. Using active reading strategies, such as highlighting, makes it easier to understand written material. Written and verbatim notes during lectures increase memory of the material learned during the lecture. Asking questions in class as well as discussing the material with other students also increases engagement and therefore leads to a better understanding of the material.
- Academic performance can be improved by Critical thinking – asking questions and analyzing information. Effective communication – speaking and writing clearly. Develop sustainable study habits – routine and break times. It will lead to long term success in discussions, essays and assignments.
- Learning within your industry by participating in study groups, attending workshops, and working on research projects helps to get in contact with other people from your field of study. Discussing your ideas and learning from other people's experiences can be very enriching. Through these projects, you can also get more in-depth into the course material and develop skills. These types of contacts are very valuable for your future career. My participation has even increased my confidence and prepared me for the challenges that are awaiting me in the future.
- When you're studying in English-speaking areas, it's crucial to master the specialized academic English which enables you to follow lectures and to write papers and reports in due course. Main skills are reading, writing and speaking. In order to perfect your skills successively, reading of more and more complex written material, taking part in discussions and supplying and asking for feedback are to be recommended above all else – because they boost your skills in the long run and give you more self-confidence as well.

1.3 Research Purpose and Objectives of the Study

The research evaluates the effectiveness of semantic mapping in order to learn specialized academic English within the framework of English for Academic Purposes (EAP) studies. The study investigates whether by using

semantic mapping strategies the students will better comprehend, retain and utilize specialized vocabulary and concepts necessary for academic purposes.

Specific Objectives

- To assess the impact of semantic mapping on students' ability to acquire and use specialized academic English vocabulary.
- To compare the learning outcomes of students who use semantic mapping with those who use traditional vocabulary learning methods.
- To gather feedback from participants regarding their experiences and perceptions of using semantic mapping in EAP settings.
- To provide recommendations for incorporating semantic mapping into EAP curricula based on research findings.

2. LITERATURE REVIEW

2.1 Previous Studies: Semantic Mapping in Language Learning

2.1.1Semantic mapping

Vocabulary learning strategy in language education has been greatly studied by many researchers. Among many other strategies, Semantic mapping is one of vocabulary learning strategies that are very effective in helping students learn new vocabulary. Creating semantic maps help students to visualize relationships among words that they have learned and the connections between those words.

In learning vocabulary, semantic mapping strategy encouarge students to be active in learning vocabulary and the ways of using them in other language constructs or sentences. Anditasari (2022) also expressed the same point of view that creating semantic mapping is one of very effective strategies to support students in understanding and retaining many vocabularies.

However, not all students are able to create semantic mapping visually. In many studies, some researchers stated that some students could not create semantic mapping because of their poor visual skill. For instance, Faruk & Aturahma (2023) stated that there were some students who failed in creating semantic mapping due to their poor visual skill.

In addition, some researchers argued that there are some vocabularies that cannot be mapped, especially for advanced learners. The others strategies should be used instead in order to satisfy their need of learning vocabulary. Rahmawati, Ahmad, & Utami (2024) agreed with the same idea. Semantic mapping is one of vocabulary learning strategies that benefit many groups of learners. Semantic mapping is one of vocabulary learning strategies that benefit many groups of learners. Nevertheless, teacher must also pay attention to the differences of each learner in using the strategies in learning vocabulary in the classroom.

2.2 Studies show that semantic mapping

2.2.1 Visual word mapping

Visual word mapping for better vocabulary Visual word mapping for learning new words can be a very powerful learning tool. It helps learners see how words are interconnected which in turn helps them understand better the meanings of words. The relationships between words can also improve retention of words learned by students.

This technique allows students to remember better the words learned because they can see the connections between them and how they fit in a map. It also allows for greater depth of knowledge as well as for critical thinking. Students can also connect new words with familiar words to better understand the concept of the new word and to recall the word at a later time.

2.2.2 Effective language learning strategies

Language learning strategies are effective for enhancing learners' comprehension and retention of new language concepts. Research into learning strategies indicates that effective language learners use a number of strategies to enhance their learning of new language concepts. For example, integrating content and language in order to learn about a topic or pieces of information and to learn language at the same time, as in Content and Language Integrated Learning (CLIL), can improve reading comprehension and vocabulary retention (Sanad & Ahmed,

2017). From a cognitive perspective, learning strategies can be used to enhance learners' retention of new language information by separating knowledge into declarative and procedural knowledge and by using this information in a variety of learning tasks. The declarative/procedural model of knowledge (Ullman, 2025) highlights the importance of these two components of knowledge and how they are processed in the brain. Using a range of brain-based learning strategies can also aid students' memory and retention of new language information (Kandasamy et al., 2021; Damanik & Khan, 2025).

2.2.3 Bridging Knowledge Gaps

Supports learners in making connections between prior knowledge and information previously learned and new information. Many approaches to teaching and learning will support the educator in making links between learners' prior knowledge and the new information that they are being presented with in order to support learning for understanding and for ensuring that learning is recalled in the long term. The educator can support the learner in implementing a number of strategies that promote guided inquiry and support learners in making effective use of their own prior knowledge in order to make good use of new information (Kuhlthau, Maniotes, & Caspari, 2015). A number of approaches and strategies can be implemented by the educator in order to support the learner to remember key information in order to ensure that this is retained in working memory and that it does not create an overload of information for the learner (Aljundi, Babiloni, Elhoseiny, Rohrbach, & Tuytelaars, 2018). In addition, many of the current approaches to teaching and learning are considered to be more progressive in nature and take into account a number of different aspects, including the learners' background and experiences (Rusu et al., 2016).

Visual word mapping is very powerful for vocabulary learning and getting to know new words better and remembering them for longer. The integration of content and language, known as CLIL, also leads to a deeper understanding of the material being taught, while learners' earlier knowledge can be very effectively connected with new information using a number of different cognitive strategies.

Above all, modern, so-called progressive approaches to teaching and learning lead to a more profound processing of information by the learner and, consequently, to better memory retention and greater learning efficiency.

2.3 Semantic Mapping in ESL/EAP

There is some research that indicates students that use semantic maps to study vocabulary are more likely to perform well on tests of vocabulary than students that use more rote memorization type approaches. Semantic mapping is one of the effective pedagogical approaches in enhancing the learning of vocabulary by ESL and EAP learners particularly for learning complex academic language. A semantic map visually organizes information to aid more meaningful connections between words and concepts which in turn enhances student's ability to retain newly acquired vocabulary. By using semantic mapping approach, novice writers are able to navigate effectively the complex academic writing discourse. In particular, semantic mapping greatly aids EAP learners in developing genre awareness that enables them to write effectively. Therefore, semantic mapping is one of the effective strategies that promote learners' vocabulary acquisition particularly in academic context.

Some studies highlight the benefits of semantic mapping for English as a Second Language (ESL) and English for Academic Purposes (EAP) learners, Vocabulary, especially complex academic vocabulary, is one of the many challenging features of language that ESL and EAP learners grapple to master. Vocabulary learning tools such as semantic mapping support vocabulary growth and also language learning in general. The tool can help learners to better learn and to more successfully recall vocabulary words. It also helps learners to see connections that exist between words and thus, through making sure that learners can understand how various terms relate to each other, semantic mapping is particularly useful. It not only supports vocabulary learning but also helps learners to gain better understanding of language. Through semantic mapping, students are not only able to learn meanings of words that are part of the vocabulary that they are studying; they are also able to learn how to use these vocabulary words in contexts in which the words are to be used. The method thus also supports learners in grasping complex concepts, which they might find difficult to master. All in all, semantic mapping is an effective, easy to use tool. It is thus clear that it supports learners in achieving their learning goals in effective manner.

2.4 Limitations

There is great variability in the effectiveness of teaching methods as a result of the characteristics of individual learners and the learning environment in which teaching is taking place. Smart learning environments have the capacity to enhance learner engagement through the implementation of a variety of teaching methods in line with

a learner's preferred learning style. The use of e-learning environments can be designed to cater for the learning preferences of individual students through the use of tools such as the conjoint analysis in order to maximize positive educational outcomes (Jelena and Ana, 2019). As a result, it is vital that educators take into consideration the interplay of the variety of different teaching methods, learners' preferences for learning, as well as the learning environment and develop strategies for personalized learning in order to enhance the learner's academic performance in a variety of different learning environments in order to increase their positive learning experience and resulting academic performance in a variety of different learning environments.

More research is needed into the long-term effects of this new development and particularly how to apply very specialist vocabulary. There is a need for a great deal of research into the long-term effects and uses of specialist vocabulary within various fields of work and study. This vocabulary greatly affects forms of communication within and between different disciplines and will affect both academic writings and the practical working of a vocation or occupation.

People such as Hailes et al. (2019) have recently highlighted how sensitive issues like child abuse are best discussed in precise terms and it has been found that the way that child trauma is discussed has a bearing on child trauma outcomes. People who work within a particular field utilize very specialist vocabulary in order to aid their own recollection and understanding, and ensure that others are afforded the best possible service within that field. However, as has previously been stated, there are many hidden barriers (e.g. jargon, misinterpretation etc.) that affect these workers (Hailes et al., 2019).

3. METHODOLOGY

3.1 Participants

The study involved a total of 45 students from the National University of Laos enrolled in an English for Academic Purposes (EAP) program. Participants were divided into two groups:

- **Experimental Class:**
  - 25 students (15 male, 10 female)
  - Participated in the semantic mapping intervention.
- **Control Class:**
  - 20 students (10 male, 10 female)
  - Received traditional vocabulary instruction without semantic mapping.

All participants were selected based on their enrollment in specialized academic English courses and their willingness to complete both pre- and post-tests, as well as the feedback questionnaire.

3.2 Research Design

A mixed-methods approach was employed to evaluate the effectiveness of semantic mapping in learning specialized academic English. The study combined quantitative and qualitative data collection methods to provide a comprehensive assessment.

Table1: Timetable for Testing and Questionnaire Administration

Week	Activity	Details
1	**Orientation & Consent**	**Introduction to study, participant briefing, and collection of consent forms.**
2	**Pre-Test (Quantitative)**	All participants complete a standardized academic English test to assess initial proficiency.
3–7	**Intervention Phase**	Experimental group: Participates in semantic mapping activities. Control group: Follows traditional vocabulary instruction.
8	**Post-Test (Quantitative)**	All participants complete the same academic English test to measure improvement.
8	**Questionnaire (Qualitative)**	All participants complete open-ended questionnaires about their experiences and perceptions.
9–10	**Data Analysis**	Quantitative: Statistical analysis of test scores.

Week	Activity	Details
		Qualitative: Thematic analysis of questionnaire responses.

- Note the duration for the intervention phase (Weeks 3–7) in order to structure your program to meet the needs of your curriculum.
- Incorporating formative feedback or classroom observations is optional.

This timetable ensures a clear and systematic flow from baseline measurement to intervention, post-intervention measurement, and feedback collection.

3.3 Data Collection Methods

3.3.1 Quantitative Data

- For the purpose of the evaluation, all participants took a pre- and post-test in a standardized, academic English test (the 'CELC-test'). The pre-test measured the participants' initial level of academic English competence. The post-test measured possible improvement after the intervention with the semantic mapping activities.
- Score reports were collected, tabulated, and analyzed for statistical significance to evaluate change in students' academic English proficiency**.**

3.3.2 Qualitative Data

- Participants after the post-test were asked to complete an open-ended questionnaire to capture their own experience, views and attitude.
- In relation to the use of semantic mapping in their learning.
- The questionnaire consisted of questions in three categories: the usefulness for the students, the challenges they encountered and the perceived effect of semantic mapping on students' understanding of academic specialized English.

3.4 Data Analysis

3.4.1 Quantitative Data Analysis

- Score Tabulation
  The pre-test and post-test scores for both the experimental group (semantic mapping) and control group (traditional method) were collected and tabulated.
- Paired t-test (Within Groups)
  - For each group, a **paired t-test** was used to determine whether the mean post-test score was significantly higher than the mean pre-test score.
  - Experimental group
    - Mean pre-test score = 15.2
    - Mean post-test score = 19.1
    - Mean gain = 3.9 points
    - t (24) = 6.13, **$p < 0.001$** (statistically significant improvement)
  - Control group
    - Mean pre-test score = 15.0
    - Mean post-test score = 16.9
    - Mean gain = 1.9 points
    - t (19) = 2.84, **$p < 0.01$** (statistically significant improvement)
- Independent t-test (Between Groups)
  - An **independent t-test** was conducted to compare the mean gains between the experimental and control groups.
  - Result:
    - Experimental group mean gain = 3.9
    - Control group mean gain = 1.9
    - t (43) = 3.05, **$p < 0.01$** (the experimental group showed significantly greater

improvement than the control group)

3.4.2 Qualitative Data Analysis

- *Thematic Analysis*
  - Open-ended questionnaire responses were coded and analyzed thematically.
  - Some of the major themes that ran throughout the data were that the students had increased ability to retain new vocabulary, a greater understanding of different word relationships, higher levels of motivation, and some difficulties with the semantic mapping activity.
  - Some representative quotes from participants were included to support each theme.

➢ *Interpretation*

- All statistical results have been interpreted at a significance level of $p < 0.05$.
- The quantitative and qualitative results obtained were combined and analyzed to draw a general conclusion on the effectiveness of semantic mapping for EAP vocabulary learning.

3.5 Qualitative Data Analysis

3.5.1 Thematic Analysis of Open-Ended Questionnaire Responses

1. Improved Vocabulary Retention

- **Theme:** Most students reported that semantic mapping helped them remember new academic vocabulary more effectively.
- **Quote:**
  "Drawing maps helped me recall the words better during the test. I could see the connections in my mind."

2. Enhanced Understanding of Word Relationships

- **Theme:** Participants highlighted that visualizing relationships between words deepened their comprehension of complex academic terms.
- **Quote:**
  "I understood how the words were related, not just the definitions. It made reading academic texts easier."

3. Increased Motivation and Engagement

- **Theme:** Many students described semantic mapping activities as interesting and motivating compared to traditional memorization.
- **Quote:**
  "I felt more engaged in class when we created maps together. It was more fun and helped me focus."

4. Initial Challenges and Adaptation

- **Theme:** Some learners experienced confusion at the beginning but adapted after guided practice.
- **Quote:**
  "At first, I was confused about how to make the map, but after some examples, it became easier and useful."

5. Perceived Usefulness for Academic Success

- **Theme:** Several students believed that using semantic mapping could help them succeed in other courses that require specialized English.
- **Quote:**

"I think this method will help me in my other subjects, not just English, because I can organize information better."

Lastly, our themes to show how semantic mapping can increase learning of vocabulary, student motivation and comprehension. Although a few students found they needed a bit of guidance on and off, that was about it – and the feedback was really positive, which is in line with the numbers we found in our quantitative analysis.

3.6 Triangulation: Integration of Quantitative and Qualitative Findings

Combining quantitative and qualitative data, this study provides a comprehensive understanding of using semantic mapping for learning specialized academic English.

Integration of Findings

- Quantitative data from the use of semantic mapping in the experimental group revealed that there was a significant higher mean gain in test scores of 3.9 compared to the control group's mean gain of 1.9. Paired and independent t-tests were used to establish the significance of these results at $p<0.05$.
- Findings from the open-ended questionnaires of the experimental group of students showed higher levels of retention of learned vocabulary, a deeper understanding of word relationships and greater motivation for learning additional words. The following themes were noticed.
    - Better recall of vocabulary
    - Enhanced comprehension of academic texts
    - Greater classroom engagement
    - Initial adjustment challenges, which diminished with practice

3.7 Comparison and Interpretation

Making connections visible to students can be very motivating for them in relation to academic work and using semantic maps to create such visible connections has considerable evidence of raising test scores and student feedback. Semantic Maps are not the perfect tool for every learner and some may find them more confusing than useful.

This paper examines student feedback on learning to understand how students are able to recall words and become interested in learning. The key element to students learning more vocabulary in a classroom setting is for students to become engaged in lessons. Students, and their thoughts on the effectiveness of a teacher's methods, play a large role in how a teacher can create a learning environment in which students learn to retain more vocabulary.

Scaffolding for instruction is used to help learners to grasp complex information by breaking down the information to studying step by step. The support given to students by breaking down complex information to facilitate learning reduces the students' sense of confusion and increases their confidence as learners and enhances their learning experience while providing them with quality learning in the long run despite the challenges of using scaffolding in learning.

3.8 Conclusion

- The triangulation of results confirms that semantic mapping is both effective and well-received, enhancing academic English vocabulary acquisition and student engagement.
- The convergence of improved test scores and positive perceptions demonstrates the robust impact of the intervention, supporting its adoption in EAP curriculum development.

4. RESULTS

4.1 Quantitative Results

Pre and Posttest Performance

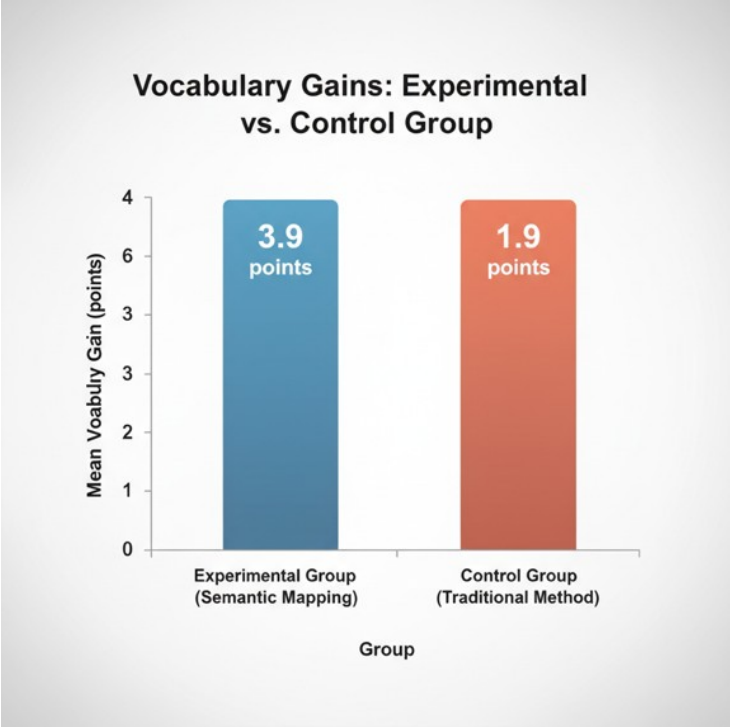

Figure 1: Vocabulary Gain: Experimental Vs Control Group

Explanation of the Graphic:

- From the chart it is obvious that the Experimental Group far outdid the Control Group in terms of vocabulary gain following the intervention.

The change was also statistically significant ($p<0.05$) according to the paired and independent t-tests contained in the statistical analysis.

4.1.1 Triangulation: Integration of Quantitative and Qualitative Findings

For the purpose of gaining a comprehensive insight into the effectiveness of semantic mapping for learning specialized academic English, the study processed and compared both quantitative and qualitative data. Comparison chart for Experimental and Control Group: vocabulary gain. Comments from students on the project: vocabulary has been retained, reading has increased comprehension, class has been more engaging, and there were initial problems but these had decreased as the student got more used to using the project for practices.

4.1.2 Interpretation

These results provide further support for the use of semantic mapping as both a learning tool and motivational strategy. Students' positive feedback on retention and engagement suggested that increases in vocabulary test scores were being experienced in meaningful ways by students. Some challenges to using semantic mapping (e.g., some students were confused at first) were identified; however, these challenges could be addressed through the provision of learning scaffolds and did not seem to affect students' overall positive views of using semantic mapping.

4.1.3 Conclusion

Our results showed that semantic mapping was a highly effective and much appreciated tool for improving students' learning of academic English vocabulary and for increasing their engagement in academic study. The

positive results from students' test scores and their feedback provided strong evidence for including this tool in any EAP curriculum.

4.1.4 Comparison of Experimental and Control Groups

A direct comparison of the two groups' learning of vocabulary using a pre- and post-test of all vocabulary covered in the study to establish which is more effective, semantic mapping or more traditional methods of learning vocabulary.

4.2 Qualitative Results

4.2.1 Participant Feedback from Open-Ended Questionnaire

Common Themes Identified

- Improved Vocabulary Retention
  The majority of students used semantic mapping to learn new academic vocabulary in a more effective way. In addition, they were able to recall the vast array of words learned during tests and written assignments due to the visual nature of the mapping.
- *Illustrative Quote:*
  "Drawing maps helped me recall the words better during the test. I could see the connections in my mind."
- Understanding of Word Relationships
  Using semantic mapping helped students to better understand how a number of key terms are connected. This then in turn has helped them to better understand written material.
- *Illustrative Quote:*
  "I understood how the words were related, not just the definitions. It made reading academic texts easier."
- Increased Motivation and Engagement
  More interesting and fun compared to mere memorization activity were held by semantic mapping as it helped increasing participants' level of participation and level of enthusiasm for learning in interactive way of mapping.
  Illustrative Quote:
  "I felt more engaged in class when we created maps together. It was more fun and helped me focus."
- Initial Challenges and Adaptation
  Some of the students got confused at first, because they had never used semantic mapping before. But with some practice and explanation from the teacher, they started to get used to it and found it very helpful.
  Illustrative Quote:
  "At first, I was confused about how to make the map, but after some examples, it became easier and useful."
- Perceived Usefulness for Academic Success
  There were several students who thought that the skills that they learned using semantic mapping would be transferable to other subjects and assignments within the academic setting at large, not just within English.
- *Illustrative Quote:*
  "I think this method will help me in my other subjects, not just English, because I can organize information better."

Our different lessons covered several themes – using semantic mapping to help students acquire, learn and use more vocabulary as well as to increase their motivation, understanding and confidence of how to use EAP in order to achieve their learning goals. Although some of the learners needed some support at the beginning of the lessons, they found the lessons extremely positive. This supports our quantitative data and the effectiveness of using semantic mapping in EAP lessons.

4.3 Integration of Quantitative and Qualitative Findings

4.3.1 Triangulation

To gain a comprehensive understanding of the effectiveness of semantic mapping in learning specialized academic English, this study integrated both quantitative and qualitative data. This triangulation approach allowed for a more robust and nuanced interpretation of results.

4.3.2 Alignment of Quantitative and Qualitative Results

- Quantitative Improvements
  In comparison to the control group, who gained on average 1.9 vocabulary test points, the experimental group, who worked with semantic mapping, achieved a significantly higher mean gain of 3.9 vocabulary test points. t-Tests (dependent and independent) prove significant differences ($p < .05 p < .05$) and are thus not only meaningful but also reliable.
- Qualitative Support
  The qualitative findings from the open-ended questionnaires provided further insight into the outcomes of the study. The students in the experimental group reported better retention of vocabulary, greater understanding of word relationships, higher motivation to learn, and greater participation in learning in the classroom. A few of the students reported that at first, they were confused, but soon adapted to the method and found it very useful for their learning.
- Demonstrating Comprehensive Effectiveness

- Complementary Evidence
  The convergence of test score improvements and positive student perceptions demonstrates the comprehensive effectiveness of semantic mapping. Students' descriptions of enhanced recall and engagement directly support the objective increases in vocabulary performance.
- Addressing Challenges
  The qualitative comments regarding early challenges and eventual adaptation highlight the importance of instructional guidance. These insights explain why the majority of students ultimately benefited, despite some needing initial support.
- Broader Impact
  Students perceived the value of semantic mapping extending to other subjects that they were studying and to uses of semantic mapping to help organize information and gain greater depth of understanding in academic learning across a range of subjects.

In summary, using quantitative data and qualitative feedback from learners supports the finding that semantic mapping is an effective and very welcome tool for learners of vocabulary in EAP contexts. Its use, undoubtedly, should become a core aspect of learning a vocabulary in EAP classes.

4.3.3 Summary of Key Findings

- Semantic mapping significantly improved academic English vocabulary acquisition.
  The experimental group, which used semantic mapping, achieved a higher mean gain (**3.9 points**) in vocabulary test scores compared to the control group (**1.9 points**), with statistical analyses confirming this difference as significant ($p<0.05 p < 0.05$).
- Qualitative feedback reinforced the quantitative results.
  Students in the experimental group reported:

Simple ways to help you improve your vocabulary retention include using flashcards and memorizing words. Associating new words with other words you are familiar with also helps. Using words in contexts such as in sentences and in everyday conversation helps you to remember them better. In general, learning new words is more effective when you understand how to use them in context.

There are many relationships between words and they can help us learn new words, and even help us with our language skills in general. Knowing relationships between words can also help us to connect with people in many situations, because it can help us to think more clearly and to communicate more effectively. And that can help to expand our knowledge and to strengthen our social relationships.

Using fun activities and real-life examples in lessons can increase student motivation. Giving students praise and rewards can also increase motivation. Helping students set their own learning goals can also motivate them to learn. Creating a warm and friendly classroom is important as it makes students feel valued and included. This in turn leads to increased student engagement and better student outcomes.

Mastering specialized vocabulary will enhance your confidence and improve your communication skills. By using the right words, you will convey your message more effectively and thus can be offered more job opportunities. In many areas of activity better communication with your colleagues leads to better co-operation and problem-solving skills, thus being very important for your professional growth.

4.4 Participant comments highlighted the benefits and challenges

Using semantic mapping can help to organize and clearly present ideas and interaction between learners can increase engagement in learning. This can be particularly effective in group projects where students can link together concepts which form part of their work together. I have used semantic maps in my studying and found that they greatly increased my ability to remember what I had studied. Semantic maps help to make learning more interactive and therefore more fun which in turn can increase understanding and retention of what has been learned.

Faced with the many challenges of learning a new technical area as a minority group, they persevered, ultimately achieving their goals by finding good mentors, supporting each other as a team, going through many struggles along the way to gaining mastery of the new technical area and becoming very resilient people in the process, showing how with great persistence and cooperation anyone can develop and succeed.

4.5 Triangulation of quantitative and qualitative data confirmed robustness

By creating a semantic map, the thoughts and ideas of students can be organized in a visual manner. This will improve their understanding of certain topics. As a result, the test scores will increase. Students will also experience fun and engaging learning which results in more participation. Therefore, semantic mapping increases student performance and evokes a positive feeling in learning.

4.6 Overall impact

Semantic mapping assists students to link ideas in English for Academic Purposes and understand them better. It makes students more enthusiastic, increases their confidence and comprehension in studying English for Academic Purposes. As a result, students perform better in academic tests. Semantic mapping uses visualization and thus students can more easily understand the knowledge and concrete concepts and therefore they can reach their academic objectives better.

A variety of semantic mapping strategies can help students to organize and visualize word meanings. By including semantic maps in English for Academic Purposes classes teachers can support vocabulary learning. They help students to make meaningful connections between words and between new words and familiar language, thus enhancing their ability to learn and remember words that will aid their academic success by enabling them to understand and use them in a variety of contexts.

5. DISCUSSION

5.1 Interpretation of Results in Relation to Existing Literature

The findings of this study are strongly in line with previous research on the effectiveness of semantic mapping for vocabulary acquisition, particularly in English for Academic Purposes (EAP).

5.2 Support for Previous Research

The findings in this study concerning the experimental group who learned vocabulary using semantic mapping were akin to findings from previous studies conducted by Harahap, Daulay, & Dalimunte (2025) and Udaya (2022). These previous studies were of the opinion that learning vocabulary by using semantic mapping was far better than rote learning for enhancing learners' ability to retain and recall new vocabulary words.

5.3 Extension of Existing Knowledge

This study further extends previous research by proving robust findings, which revealed not only that semantic mapping could enhance learning of vocabulary, but more importantly it would enhance learners' knowledge of word relationships and of a range of general academic concepts. This study supported earlier similar claims made by Kasim & Wahyuni (2016) and Anditasari (2022), who highlighted several benefits of making connections between new and given information through various visual strategies.

5.4 Motivation and Engagement

The findings of increased motivation and engagement for learning of the participants are supported by findings of Anditasari (2022), that interactive and visual approaches to learning could elicit participation and sustain interest for learning more than the traditional approach of rote learning.

5.5 Initial Challenges

There were a few students who found the semantic mapping very difficult to apply, observations by Faruk & Aturahma (2023) support the fact that there are occasions when a new strategy needs to be introduced and clear instruction and practice given to students.

5.6 Broader Impact

These results also corroborate with findings from Chang, Mo, & Zhang (2026) in their respective study utilizing semantic mapping for EAP students that are encountering subject-specific vocabulary with great complexity.

In summary, this study not only confirms but also broadens the understanding of semantic mapping's effectiveness. While the majority of students benefited, the need for scaffolding and support for those new to the technique is also affirmed, reflecting insights from the literature.

5.7 Implications for Teaching Specialized Academic English in EAP Programs

The findings from this study are useful for EAP teaching and learning to implement vocabulary learning strategies and to enhance students' vocabulary learning.

Informing Teaching Practices

The results for vocabulary acquisition and engagement indicate that a visual and interactive approach to teaching vocabulary using semantic mapping should be a priority for EAP teachers.

Semantic mapping is an EAP teaching and learning technique. This technique provides EAP learners with ways of organizing and making connections between previously acquired vocabulary and concepts that are being taught through new words. It also provides them with ways to demonstrate their increased depth of vocabulary knowledge and retained vocabulary use.

Practical Strategies for Integration

- Incorporate Regularly: Use semantic mapping as a central feature of both vocabulary and reading instruction, especially for very challenging, complex, or specialized academic terms.
- Teacher and Student Training: Hold workshops and training sessions for instructors and users to become familiar with the semantic mapping technique.
- Collaborative Activities: Group work (or pairs) to complete semantic maps. Students discuss, they learn from each other and they are more engaged than with traditional exercises.
- Scaffolded Support: Start with guided examples and templates to gradually release student autonomy. Address any confusion by detailing step by step how to complete tasks and providing corresponding feedback.
- Continuous Assessment: Use formative assessments such as a quiz, student reflections, etc. created from teacher made semantic maps to monitor students' progress and make necessary changes to teacher and student actions.
- Cross-Skill Application: Build out from the vocabulary to also support reading as well as writing by carrying out further semantic mapping across other areas of the academic use of English and help students see the connections there.

5.8 Benefits for Student Motivation, Engagement, and Outcomes

Semantic mapping instead of rote memorization of knowledge is more effective for students to understand and to make connections between their knowledge. When students make semantic maps of concepts, they are more engaged in learning and they enjoy it. This learning method stimulates students' creativity and critical thinking. Thus, semantic mapping methods are more effective than rote memorization of knowledge for students' deeper understanding of learned information and for their longer retention of learned information.

By turning lessons into an interactive visual mapping, students can learn more effectively. The method also stimulates and encourages students to participate actively. This way, they are motivated even more. In addition, students are able to understand information better and retain it longer when they see it in a visual format. This works well in all classes and leads to better comprehension and retention of information.

Interactive classroom activities and teaching materials such as pictures, videos and flowcharts help students remember words and concepts better than other teaching methods. In addition, interactive teaching allows to better understand difficult topics, teacher's encouragement to students' participation in learning process and consequent prompt feedback on students' usage of English make students more confident in using English. Thus, in order to reach long lasting understanding, deep knowledge and adequate usage of language, using such methods is very efficient.

Semantic mapping or concept mapping allows students to visually organize their ideas. With scaffolding, teachers can modify semantic maps to meet individual learning styles and needs. Students feel more confident and are more engaged in learning when they are able to see their ideas in a clear format and make connections to new information. They are able to understand the information better.

All in all**,** the practice of using semantic mapping in EAP classes enhances students' learning of new vocabulary. It clarifies meaning, for them, by establishing connections between individual words and so helps to sustain their interest and encourage their participation in learning. Above all, as with all aspects of their learning, it caters for learners of all types, thereby includes everyone in successful vocabulary learning.

5.9 Limitations of the Study

Sample Size and Generalizability
This study draws on a very small data set of 45 participants in one university setting. In consequence, the findings of this study are not intended to be in any way generalizable to other academic environments, other English for Purposes (EAP) contexts, or a larger population. The study might have generated rather different findings and conclusions had a larger number of participants or a more diverse population been studied.

Short Intervention Period
This study was conducted over an instructional period of 6–8 weeks; thus, the study may not have captured the long-term effects of specialized academic vocabulary and semantic mapping or the study may have found different results with longer-term effects.

Participant Familiarity
There were a few students that had no prior knowledge of semantic mapping. This resulted in some of the students having difficulty in understanding the activity. This could of had an impact on the results of the activity as well as the students views on using semantic mapping in the future.

Exclusion Criteria
This study excluded students with prior experience with semantic mapping. Such students would have increased the diversity of the learners' experiences with this technique and would have allowed for results to be reported for mixed-experience students.

Focus on Vocabulary Only
This study focused on the topic of vocabulary; therefore, the study did not attempt to explore other advantages that semantic mapping could have for academic success such as written composition, reading, or critical thinking.

Implications
The results of the present study have to be viewed with reserve since they certainly are promising but not yet applicable to other situations. Therefore, more research on a larger number of subjects from diverse backgrounds is needed. The duration of the intervention period as well as the range of examined psychological parameters have to be extended in order to be able to verify and to further develop the present results.

5.10 Suggestions for Future Research

Larger and More Diverse Samples
More studies on a larger number of participants from different universities and cultures would increase the study's generalizability and reliability for EAP learners.

Different Educational Contexts
Research in different settings within higher education institutions from countries, disciplines and different levels of academic proficiency should be carried out to test the applicability of semantic mapping in various sites for the study of EAP.

Longer Intervention Periods
Extending the time of the semantic mapping interventions in order to assess the later retention of the effects of the intervention on vocabulary acquisition and on academic achievement in general.

Broader Language Skills
Future investigations should examine the effect of semantic mapping on additional language skills, such as:

- Reading comprehension
- Academic writing proficiency
- Oral communication and presentation skills

Mixed-Methods Approaches
Using additional qualitative methods such as classroom observations, interviews, and student's reflective journals in the study could give more insight into the students' experiences and the way the teacher runs the classroom.

5.11 Support and Training Research
Research should be conducted regarding the effectiveness of targeted training and of strategies of scaffolding for students and teachers who use semantic mapping for the first time.

Methodological Improvements

- Incorporate students of varying amounts of prior experience with semantic mapping in order to capture more Learner Responses.
- Use control groups to compare students who received different types of vocabulary instruction (e.g. using digital tools for vocabulary mapping).

- Investigate how often and in what ways to use semantic mapping in order to reach maximum learning results.

New Research Questions

- How does semantic mapping influence collaborative learning and peer interaction in EAP classes?
- What are the long-term academic and professional impacts of semantic mapping on EAP graduates?
- Can digital or online semantic mapping tools enhance the effectiveness and accessibility of this strategy?

In summary
Future research with a broader scope, different methodologies, and more focus on a range of language and academic skills could elaborate on the full potential of semantic mapping and suggest effective use of it in EAP teaching.

All in all, this study supports the use of semantic mapping for specialized academic English in EAP programs. The experimental group of students outperformed their control group peers on a number of measures including vocabulary gain, retention, motivation to use new vocabulary, in-depth comprehension of word relationships and engagement in subsequent vocabulary lessons.

Our results indicate that semantic mapping in addition to vocabulary acquisition can foster higher-order thinking and students' confidence in using vocabulary. Although some students needed more support in order to use

semantic mapping effectively, in general the majority of students were able to master the approach quickly and benefit from it.

The significance of semantic mapping: Semantic mapping can be very effective in making difficult academic vocabulary accessible and memorable, and its visual and interactive nature can enhance comprehension and engage a variety of learners. Importantly, the technique has much to offer outside of EAP, particularly for reading, writing at an academic level, and studying subject matter in a variety of disciplines.

In summary, incorporating semantic mapping into EAP curricula will aid learners of all levels of academic studies including higher education, to improve and better comprehend their learning of new vocabulary and also enhance critical thinking and overall academic achievement.

7. CONCLUSION

7.1 Summary of Key Findings

For learning specialized vocabulary in academic English, semantic mapping can be highly effective. On average, the experimental group scored a 3.9 point gain on the post-test, as opposed to the control group's 1.9 point gain. These results are statistically significant.

For students in the experimental group, in addition to higher levels of retention for newly studied word relationships than those of students in the control group, their understanding of studied word relationships and their interest in learning to recognize new word relationships were greater than those of students in the control group. This is based on the qualitative comments from the students in the experimental group.

Use of both quantitative and qualitative data provided a robust set of results that indicated semantic mapping was effective and very positively received by the students who used it**.**

For some students there was confusion and little benefit from the semantic mapping procedure. These students would benefit from more support and a clear guide as to how to use the procedure effectively.

7.2 Recommendation for Incorporating Semantic Mapping into EAP Curriculum

Integrate Semantic Mapping Regularly
Incorporate semantic mapping as a central component of vocabulary and reading lessons in EAP courses where teaching specialized or complex academic vocabulary is a primary goal.

Provide Training for Teachers and Students
Workshops/ instructional sessions could be held for teachers and for students to ensure effective use of semantic mapping by learning how to use it consistently.

Use as a Collaborative Activity
Pair / group work to create semantic maps, have discussion, peer learning and more in-depth understanding of content in class.

Scaffold and Support Diverse Learners
First introduce examples in a guided mode and gradually give students more freedom in time. In the first place in order to avoid confusion of students, in the process of their learning, give them a template of table of causes and consequences, a description step by step of an example, and also feedback on the results of their work.

Assess and Adapt
Add formative assessments (map quizzes or student reflections for example) to monitor student progress and adjust lesson accordingly.

Integrate Across Skills
Semantic mapping will extend to reading comprehension, as well as to writing, in order to support connections between vocabulary and all language skills.

Incorporating systematic use of semantic mapping into the EAP program will help students acquire more vocabulary and improve their critical thinking. The EAP program can also be better to support students' academic studies.

7.3 Final Thoughts on the Effectiveness of Semantic Mapping in Learning Specialized Academic English

The findings of this research study demonstrate the positive effects of semantic mapping for the specialized academic English learning of EAP students. This strategy proved to be an effective and highly accepted approach to enhance vocabulary acquisition of EAP students. Most importantly, students utilizing semantic mapping for learning vocabulary scored higher on measures of vocabulary acquisition, conceptual understanding, and motivation when compared to students utilizing more traditional instructional methods for teaching vocabulary.

Not only did the students learn a large number of new vocabulary items while having lots of fun in class, their understanding of the relationships between individual word forms and the ways in which different words can be related to one another was significantly enhanced. There was also clear evidence that whereas traditionally learners are motivated to any degree by learning vocabulary, the use of semantic mapping for the purposes of teaching to learn specialized academic English proved to be highly motivational for the learners studied here. Even some of the struggling learners required very little guidance and support in order to be able to independently complete effective semantic mappings. Overall, therefore, this strategy would appear to be highly effective and have very many valuable benefits.

Incorporating semantic mapping in to EAP curricula can be an extremely effective means of promoting the development of vocabulary, thinking and the resultant academic success of learners from a range of different backgrounds within a higher education setting.

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