ORIGINAL RESEARCH

SURVEYING STUDENTS' LEARNING PREFERENCES: MEMORIZING VS UNDERSTANDING CHEMISTRY ENGLISH TERMS

Keysha Rahma[1], Nazwa Syava[1], Wahyunengsih[2]
[1]Chemistry Study Program, Faculty of Science and Technology, UIN Syarif Hidayatullah Jakarta
[2]English Education Program, Faculty of Tarbiyah and Teacher Training, UIN Syarif Hidayatullah Jakarta

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Corresponding Author:
Wahyunengsih
Email: wahyu.nengsih@uinjkt.ac.id

Abstract

English words appear everywhere in chemistry classes. Even so, knowing the words on paper does not mean that students feel comfortable using them. Quite a few students say they can memorize terms for an exam, but the meaning slips away when they need to explain or apply the terms in actual writing. This situation led the researcher to examine how chemistry students study these terms, whether they mostly memorize definitions or try to understand their meanings and how they are used.

Fifty chemistry students took part in an online questionnaire with a five-point Likert response scale. This study employed a quantitative descriptive survey design, and the answers were summarized descriptively to identify which learning pattern stood out most. The results show that memorization remains prevalent, especially during exam periods. The highest mean score was 3.76 for the statement, "I often memorize chemistry terms without understanding their use." Understanding concepts, however, seemed more helpful for long-term retention, with a mean score of 3.63. The strongest finding highlights the role of repeated exposure and contextual use of chemistry terms, which showed the highest mean score of 3.91.

Based on these results, memorization helps in the short term, but its effect fades if the terms are not used again. When students understand a term and later encounter it repeatedly in class activities, the vocabulary tends to remain in their memory and feels easier to use naturally. These findings may contribute to the development of learning strategies that encourage continuous vocabulary practice, allowing terms to be applied not only in exams, but also in honest academic communication.

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1. Introduction

General Overview

English in chemistry has a high level of linguistic complexity due to the large number of technical and specific scientific terms. Terms such as oxidation, precipitation, or stoichiometry are not only difficult to pronounce but also have different conceptual meanings when applied in different contexts. Furthermore, most chemical terms are derived from Latin or Greek roots, adding to the difficulty for students unfamiliar with their scientific etymology. This complexity often hinders students from understanding English-language chemistry texts and literature. Thus, the linguistic complexity of chemical terminology is a significant challenge in learning scientific English.

Many students tend to rely on rote memorization to learn English chemical terms without truly understanding their conceptual meaning. This occurs because most learning is still oriented towards achieving exam scores, so students focus more on memorizing definitions than on associating terms with actual chemical processes or phenomena. For example, students might memorize the term "endothermic reaction" without truly understanding that it describes the process of absorbing heat energy from the environment. As a result, students' ability to use the term in a scientific context is limited. Therefore, a learning approach that solely emphasizes memorization is not practical enough to achieve a deep understanding of English for chemistry.

Good English language skills play a crucial role in scientific communication, particularly in the field of chemistry. Most journals, textbooks, and scientific research reports are written in English, so students need to master it to understand and participate in global scientific developments. Furthermore, English proficiency is key for students and researchers to present research results, write scientific articles, and interact with the international academic community. Lack of English proficiency can limit students' access to the latest scientific resources and hinder their contributions to science. Therefore, English proficiency is not only crucial as a means of communication but also as a primary means of building academic and professional competence in the scientific world.

Research Gap

Previous research rarely explains how chemistry students learn English terms or compares memorization and comprehension approaches. Most research focuses only on general scientific English learning without examining the specific needs of chemistry[4]. Furthermore, there is still little research that empirically examines the relationship between memorization strategies and comprehension in scientific vocabulary acquisition. Therefore, studies that specifically highlight how Chemistry students learn English terms are still urgently needed.

In response to this gap, this study focuses specifically on chemistry students and examines how they approach English terminology in their daily academic activities. Unlike previous ESP studies that mainly discuss vocabulary learning in general terms, this research looks at students' actual learning preferences between memorizing and understanding chemistry-related English terms, using empirical data from a chemistry program context. By linking these preferences to patterns of repeated exposure and classroom use, the study provides a more concrete picture of how chemistry students retain and apply technical vocabulary. In this way, the study offers a field-specific contribution to ESP research by highlighting learning tendencies that are often overlooked in chemistry-focused English instruction.

Previous Studies

Scientific terms are not just words; they are closely connected to the concepts and practices of a discipline. Because of this, students need to understand how these terms are used in context rather than only memorizing definitions[4], [10].

In practice, relying primarily on memorization can make it difficult for students' to apply scientific vocabulary. Several studies report that although students are able to recall technical terms for examinations, they frequently struggle to use them accurately in assignments or explanations because they do not fully understand the underlying concepts[1], [9].

The importance of practicing vocabulary in context is particularly evident in chemistry education. Previous research shows that limited chemistry-specific ESP materials make it difficult for students to write laboratory reports or participate actively in discussions, while repeated use of terms in meaningful academic tasks helps students develop clearer understanding and greater confidence[17].

Empirical Reasons

In many chemistry classes, students are already familiar with English chemistry terms, but they do not always feel confident using them. Some students can remember terms quite well when preparing for exams, yet they often pause or hesitate when they have to use the same terms in assignments or class discussions[1].

This problem is also mentioned in a study by Rahman and Putri. They found that students usually know the basic meaning of chemistry terms, but difficulties appear when the terms are used in reading materials or explanations[9]. In these situations, students often struggle to choose the correct terms or explain ideas clearly, even though they have memorized the definitions before.

Different conditions were reported by Uspayanti and Indriyani. In their study, students were more comfortable using chemistry terms when the terms appeared repeatedly in learning activities, such as reading scientific texts, group discussions, or laboratory work[17]. When students became familiar with how the terms were used, they were able to apply them more naturally in their academic tasks.

These situations show that memorization alone does not always help students use chemistry terms effectively. Instead, repeated use and understanding of terms in learning activities seem to help students use English chemistry vocabulary more confidently.

Basic Theories

In ESP learning, vocabulary is closely related to how language is used in a specific field. Technical terms are not learned as separate items but are understood through their use in academic activities related to the discipline. For this reason, several recent studies argue that students need to encounter terminology in meaningful learning situations, rather than merely learn it as a list of definitions [4], [10], [12].

In chemistry, English terms are directly connected to concepts and processes. In chemistry-related ESP courses, English terms are not introduced only once. They reappear at different points in the learning process, helping students become more comfortable using them. When this happens, students usually feel more familiar with the terms and are less hesitant to use them in their academic work [1], [11], [17].

Based on these views, this study argues that understanding and contextual use are essential for learning English chemistry terminology. Learning strategies that focus on meaning and use are considered more suitable for supporting academic communication than strategies that rely mainly on memorization.

Based on the previously discussed theory, researchers saw an opportunity to examine a rarely explored area. Many studies discuss ESP in general, but the chemistry context is often overlooked. This is particularly true when it comes to how students learn terms: do they tend to memorize them or understand their usage? Several recent

publications from 2020 to 2024 support the need for this study, as research comparing the two approaches is still scarce. By directly observing students' learning preferences, this study is expected to illustrate how these learning styles influence their memorization of terms and their use in lectures. The results can inform the Development of English-learning strategies better suited to the needs of chemistry.

Research Purposes

This study has two main purposes: to identify students' learning preferences between memorization and understanding in learning English chemistry terms, and to examine how these preferences influence the use and perceived benefits of chemistry-related English vocabulary in academic contexts.

Research Questions

1. What are the students' learning preferences regarding memorization versus Understanding of Chemistry-related English terms?
2. How do these preferences affect students' comprehension and long-term retention of chemistry vocabulary?

2. Research Method

2.1 Research Design

This study used a quantitative descriptive approach. The goal was to examine how students typically learn English chemistry terms. Data was collected once through a self-completed questionnaire. There was no specific treatment or intervention, so the study attempted to describe the existing situation.

2.2 Population and Sample

The study was conducted on Chemistry students. A total of 50 students completed the questionnaire voluntarily. This number was deemed sufficient to provide an initial overview of the learning patterns emerging from the respondents' answers. Convenience sampling was used for sampling. Respondents were selected from students who could be contacted and were willing to participate in the study. This method was chosen because it was easier to implement within the limited time for data collection.

2.3 Research Instrument

The research instrument was a three-part questionnaire. Each section contained ten statements related to students' memorization and understanding of English chemistry terms. The questionnaire was developed by a lecturer and used in the study.

Before distribution, the questionnaire received approval from the English lecturer in the study program. This approval was granted because the questions were deemed to align with the course material and learning objectives. Afterward, the questionnaire was used without further changes.

Each statement was answered on a five-point Likert scale, ranging from strongly disagree to agree strongly.

2.4 Data Collection Procedure

Data collection was conducted online. Researchers prepared a questionnaire, requested permission to use the instrument, and then distributed the link to students. Completion was voluntary. Once all responses were collected, the data were reorganized and prepared for analysis.

2.5 Data Analysis

The data were analyzed descriptively. Responses on the Likert scale were converted to numerical scores, and the average was then calculated. Higher scores indicate stronger agreement, while lower scores indicate more vigorous disagreement. A score around three is considered neutral. This average was used to identify emerging learning tendencies.

2.6 Ethical Considerations

The research adhered to ethical principles. Students participated voluntarily after understanding the research objectives. Personal identities were not disclosed in the results. Data was securely stored and used solely for academic purposes.

3. Result

Rather than relying on a single approach, undergraduate chemistry students use a combination of strategies when learning English chemistry terms. The results show that memorization remains part of students' learning practices, particularly when they are required to recall terminology within a short period of time. However, students do not rely solely on memorization, as their responses also reflect an awareness of the limitations of learning terms without context. For this reason, the results are presented in three tables that describe students' strategies for memorizing chemistry terms, strategies for contextual understanding of chemistry terms, and the effect of learning preferences on comprehension and long-term retention.

Table 1. Strategies for Memorizing Chemistry Terms

Category	Learning Strategy Items	Mean
Highest	"I often memorize chemistry terms without understanding their use."	3.76
Lowest	"I would rather memorize a list of chemistry terms than understand the context."	3.28

As shown in Table 1, students reported a relatively high tendency to memorize chemistry terms without fully understanding their use (M = 3.76). This pattern reflects students' tendency to rely on memorization when quick learning is required. At the same time, Items related to memorizing vocabulary lists without context received lower scores (M = 3.28). Learning chemistry terms in this way was less favored by students. Memorization was still used, but it was not treated as the primary approach for technical terms. These findings suggest that memorization functions mainly as a short-term strategy rather than a preferred long-term learning approach.

Table 2. Strategies for Contextual Understanding of Chemical Terms

Category	Learning Strategy Items	Mean
Highest	"Understanding concepts helps me remember terms longer."	3.63
Lowest	"I need a long explanation to understand chemical terms."	3.49

Responses related to understanding-based strategies show a more positive pattern. As shown in Table 2, students generally agreed that understanding chemical concepts helps them remember English chemistry terms for longer (M = 3.63). At the same time, they did not strongly agree that long explanations were necessary to understand chemical terminology (M = 3.49). Explanations that were directly tied to chemical concepts and learning activities received more positive responses than lengthy theoretical explanations. This indicates that students value clarity and relevance over extensive explanation when learning technical terms.

Table 3. The Effect of Learning Preferences on Comprehension and Long-Term Retention

Category	Learning Strategy Items	Mean
Highest	"I remember terms better if they are understood and used repeatedly."	3.91
Lowest	"Learning preferences influence understanding of chemical terms."	3.29

Responses related to understanding and repeated use of chemistry terms showed the strongest agreement among students (M = 3.91). Students became more familiar with chemistry terms when they encountered them in learning situations that explained their meanings and uses. At the same time, items related to awareness of learning preferences received lower scores (M = 3.29), indicating that students did not consistently attend to how they approached their own learning, even when the approach was helpful.

Taken together, students' responses show that memorization is still used in learning English chemistry terms. At the same time, approaches that involve understanding and using terms in context appear to be more helpful for maintaining comprehension and recall. The comparison across the three tables highlights a clear pattern in which contextual understanding and repeated exposure receive stronger support than memorization alone.

4. Discussion

Students still rely on memorization when learning English-language chemistry terms, especially in situations that require quick recall. This way of learning often appears in assessment-related situations, where the focus is on remembering terms rather than on how they are used. Memorization alone is usually not enough when chemistry terms are needed for academic tasks.

Students responded more positively when chemistry terms were learned through understanding rather than memorization. Terms introduced alongside chemical concepts were easier to remember and use during learning activities. In these cases, vocabulary did not stand alone but became part of the chemistry content being studied. This kind of experience has also been noted in studies related to English for Specific Purposes, where familiarity with the subject matter plays a role in students' use of scientific terminology.

The strong agreement related to repeated use and understanding highlights the importance of exposure across different learning activities. Students feel more at ease with chemistry terms when the same terms come up in lectures, Reading materials, and laboratory activities. Encountering the terms in different parts of the course helps them use the vocabulary more naturally in writing and class discussions. Similar classroom experiences have also been noted in work on English for Specific Purposes.

From a pedagogical perspective, these findings suggest that chemistry instruction and ESP courses should provide students with repeated opportunities to encounter and use terminology in meaningful academic contexts. Rather than introducing terms as isolated vocabulary items, instructors may integrate key chemistry terms into lectures, laboratory tasks, reading assignments, and written reports, allowing students to apply the terms across different learning situations. Such practices can help students move beyond short-term memorization and develop more confident and functional use of chemistry-related English.

An interesting point in this study is that students do not always explicitly recognize how their learning preferences influence their understanding. Even so, their responses suggest that they benefit more from learning approaches that emphasize understanding rather than memorization. Teaching chemistry terminology, therefore, needs to go beyond simply introducing terms. Students are not always aware of which learning approaches help them work with chemistry terms more effectively.

Memorization is still used to learn chemistry vocabulary, though it often falls short when the terms are needed for academic tasks. Approaches that place greater emphasis on understanding, context, and regular use help students use English chemistry terms more confidently in educational tasks.

5. Conclusion

The findings of this study show that memorization remains a key part of how undergraduate chemistry students learn English-language chemistry terms. Memorization is commonly used when students need to recall chemistry terms quickly. In the longer term, this approach is less helpful for maintaining understanding of the terms.

Students tended to respond more positively to learning approaches that involve understanding chemical concepts. Chemistry terms were easier for students to remember when they were linked to meaning and used during learning activities. Seeing the same terms appear in different contexts helped students stay familiar with the vocabulary and reduced forgetting. In these situations, chemistry terms were learned as part of understanding the subject, rather than as isolated words to memorize.

At the same time, students were not always aware of how their own learning preferences influenced their comprehension. Although they benefit from understanding-based learning, they do not consistently reflect on the strategies they use. This suggests that students could benefit from learning environments that foster greater awareness of effective vocabulary-learning strategies. Memorization remains part of how students learn English chemistry terms, particularly for short-term needs. For continued understanding and use over time, students benefit more from learning that involves meaning, context, and regular exposure to the terms within academic activities. For future research, further studies could examine how specific instructional activities in chemistry or ESP courses influence students' long-term development of technical vocabulary and their ability to use terms accurately in academic communication.

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