Proceedings of International Conference on Research in Education (ICRE) 2025, pp. 218-225
ISSN: 3124-4467
27-28 November 2025 - Yogyakarta, Indonesia
https://e-conf.usd.ac.id/index.php/icre
Fakultas Keguruan dan Ilmu Pendidikan, Universitas Sanata Dharma, Yogyakarta

CHEMISTRY EDUCATION STUDENTS' DIFFICULTIES IN UNDERSTANDING ENGLISH LITERATURE

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Received: 17 November 2025; Accepted: 25 November 2025

Abstract
Chemistry education students often face challenges in comprehending English-language literature, although most chemistry literature is published in English. These difficulties lead to reluctance in reading, as the material is considered complex and time-consuming, potentially hindering optimal development of scientific knowledge. This literature review analyzes seven journal articles to identify the difficulties, contributing factors, and impacts experienced by chemistry education students in understanding English-language literature. The results indicate that students struggle with grasping main ideas, implied information, and vocabulary. The implementation of basic English courses has been shown to improve students' abilities, as evidenced by enhanced vocabulary, reading, and writing skills, and positive responses to effective, easy-to-understand, and useful teaching methods. Therefore, while challenges remain, learning basic English plays a crucial role in enhancing chemistry education students' ability to comprehend scientific literature.

Keywords: basic English, chemistry education, English-language literature, reading comprehension, vocabulary

Introduction

In the era of globalization of science and technology, English literacy skills have become one of the essential competencies for university students, particularly in scientific fields such as chemistry. This is because most scientific literature sources, including journals, research articles, and chemistry textbooks, are written in English as the primary language of international scientific communication. Proficiency in English not only helps students understand complex chemical theories and concepts but also opens access to the latest developments in research and scientific innovation worldwide. However, in reality, not all chemistry students possess strong abilities in comprehending English-language literature. Many of them find it difficult to interpret technical terms, complex sentence structures, and the scientific context used in foreign language texts. These difficulties often lead to reluctance and disinterest in reading further, as they are perceived as time-consuming and demanding significant effort to understand the content (Mardiani et al., 2021).

The phenomenon of low interest in reading English texts has actually appeared since elementary school. Based on a study by Sari et al. (2024), it was found that 61% of students had a good interest in reading English texts, 31% were in the fair category, 4% poor, and 4% very good. This means that 4% of students had no interest in English reading because they considered it boring and difficult to understand. This condition indicates that interest in reading English-language literature remains a real challenge even from an early age, which can influence students' reading habits at the university level (Jumaroh & Aisyah, 2021). As a result, students tend to avoid English-language literature sources and prefer Indonesian references, which are relatively limited in number. By avoiding English sources, students risk losing opportunities to optimally broaden their scientific horizons. This situation can lead to weak scientific analytical skills and outdated information, which hinders the development of academic competence in chemistry (Fajri & Akmaluddin, 2018). Therefore, it is important to foster awareness and motivation among chemistry students to become more open to reading scientific literature in English. In addition, effective learning strategies and mentoring are required to help students improve their ability to read and comprehend scientific texts in English. Thus, students can become more active and confident in exploring various global scientific sources, which in turn supports the improvement of chemistry education quality at the university level (Tambunsaribu, 2022). This review is expected to provide suggestions for improving English proficiency among students in the chemical education study program, thereby supporting academic success.

Method

The method used in this study was a literature review, which is a systematic approach to identifying, analyzing, and synthesizing various scientific literature sources relevant to the research topic. This process involved several main stages. First, selecting and collecting journals, research articles, and textbooks discussing students' English literacy skills, particularly in chemistry. The literature search was conducted using the Google search engine. The keywords were chemistry education, English-language literature, reading comprehension, basic English, and vocabulary. Second, evaluating the quality and relevance of each source was done based on specific criteria such as data accuracy, publication year, and contribution to understanding the issue. Third, content analysis was conducted to identify main themes, students' difficulties, causal factors, and strategies that have been implemented to improve literacy skills; and fourth, synthesizing the analysis results to provide a comprehensive overview of the conditions, challenges, and solutions related to chemistry students' comprehension of English-language literature. Through this method, the study could present a systematic and accurate summary of the investigated phenomenon and support the development of effective learning strategies.

Findings and Discussion

The Importance of English Literacy in Chemistry Education

In the context of chemistry education, English literacy is a fundamental skill for students, as most scientific literature, including journals, research articles, and textbooks, is written in English as the primary language of international scientific communication. Proficiency in English not only facilitates students' understanding of complex chemical theories and concepts but also provides access to recent research, global scientific innovations, and the development of competencies aligned with international standards (Azamat et al., 2024). Students who can effectively read English-language literature have greater opportunities to stay updated with the latest chemistry research, compare methodologies across studies, and integrate scientific findings from different countries into their learning and research practices.

Nevertheless, in reality, many students face significant difficulties in reading English-language literature. Research shows that around 65% of chemistry education students struggle to understand technical terms and complex sentences in scientific literature, while 25% report only partial comprehension, and 10% state that they are unable to interpret English literature independently. These difficulties arise not only from limited vocabulary but also from challenges in interpreting implicit meanings, understanding conceptual relationships, and linking theories with experimental data presented in academic texts. Moreover, formal sentence structures and academic writing conventions often pose additional barriers, as students are not yet familiar with scientific grammar and international writing standards (Setyaningsih et al., 2024).

The phenomenon of low interest in reading English-language literature has also been observed since early education. Although 61% of elementary students have good English reading interest, there are still 4% who are uninterested because English texts are considered boring and difficult to understand. This condition shows that low reading habits in English-language literature have formed from an early age and may continue into higher education. Consequently, university students tend to avoid international literature sources and rely more on Indonesian references, which are relatively limited and often lack the most recent developments in chemistry research. This choice directly affects students' ability to conduct scientific analysis, evaluate data, and understand global research contexts, thereby limiting their learning quality, innovation, and academic contribution (Sari et al., 2024).

Psychological Factors and Facility Limitations in English Literacy

In addition to reading habits and language limitations, psychological factors also affect students' ability to read English-language literature. Students often experience anxiety, low self-confidence, and frustration when encountering complex scientific texts. These feelings lead to procrastination or avoidance of reading, indirectly slowing their scientific literacy development. Furthermore, limited supporting facilities such as access to paid international journals, a lack of academic guidance in reading English texts, and insufficient integration of English literature in the curriculum are also major obstacles. These factors collectively create conditions in which students' comprehension of English- language scientific

literature remains suboptimal, even though such literature constitutes the main source of modern chemical knowledge.

The difficulty in reading English-language literature directly affects students' learning patterns. They tend to avoid international literature and rely more on Indonesian references, which are limited in number and sometimes do not include the latest developments in chemistry. As a result, their analytical and evaluative abilities become restricted, and their learning motivation decreases because they feel incapable of keeping up with global academic literature (Setyaningsih et al., 2024). This condition clarifies that low English literacy is not merely a linguistic issue but also impacts learning quality, conceptual understanding, and students' critical thinking skills in chemistry.

Learning Strategies to Overcome English Literacy Challenges

To address these difficulties, various strategies have been implemented and shown positive outcomes in enhancing scientific literacy skills. One widely used approach is the development of English-language chemistry textbooks that not only present chemical material but also include technical vocabulary, grammar, and examples of scientific terminology used in context with the course material. Explained that such textbooks do not merely provide conceptual knowledge but are systematically designed to strengthen students' understanding of technical terms, scientific sentence structures, and interpretation of information in English-language literature. Students using these textbooks reportedly gain greater confidence, as they can comprehend scientific texts more effectively and recognize common writing structures and linguistic patterns used in international chemistry journals. Thus, these textbooks serve as a bridge between students' basic English proficiency and complex scientific literature, enabling them to learn to read literature more effectively and independently without relying on translation or external assistance (Oktapianti, 2022).

Moreover, the implementation of active learning models, particularly Project-Based Learning (PjBL), has proven effective in overcoming English literacy challenges. It is stated that PjBL allows students to directly engage in research or experimental projects that require them to collect and understand scientific literature (Subagia & Sudiatmika, 2024). This process encourages students to repeatedly read scientific texts, identify relevant information, and connect theory with laboratory practice. In the long term, PjBL not only enhances conceptual understanding of chemistry but also trains students to think critically, assess information quality, and improve scientific communication skills. This approach emphasizes active and collaborative learning, enabling students to learn not only individually but also from their peers through discussions, presentations, and joint project evaluations. This significantly helps students build scientific literacy skills and reduce anxiety when facing complex English-language literature.

Strengthening Digital Literacy and Its Impact on Academic Competence

Another key approach to improving students' abilities is the reinforcement of digital literacy. In today's digital era, students' abilities are no longer limited to conventional reading or linear comprehension but require skills to access, navigate, and process scientific literature online. Digital literacy allows students to access academic sources from international databases, online journals, institutional

repositories, and the latest publications that may not be available in print. Emphasized that students with strong digital literacy are better able to navigate English-language scientific sources efficiently, search for relevant information quickly, and utilize chemical software and data analysis tools to accurately visualize research results. This enables students not only to read literature but also to analyze data, compare findings from various studies, and draw valid conclusions based on scientific evidence (Nada, 2020).

Furthermore, digital literacy assists students in academic information management. They can systematically store references using reference management software, categorize journals and articles based on topics, relevance, or research methodology, thereby facilitating the literature review process for academic assignments or research projects. This capability also supports data integration from various international journals into their research projects, allowing students to combine theory and practice comprehensively. Strong digital literacy not only supports reading ability but also enhances critical thinking, analysis, synthesis, and evaluation skills—core foundations in academic and research competence development. Additionally, digital literacy opens opportunities for students to follow the latest trends in chemistry, including utilizing preprint articles, open experimental data, and online collaborations with other researchers nationally and internationally. Students proficient in digital literacy can more easily compare research methodologies, assess source credibility, and understand different scientific contexts in English-language literature. Therefore, digital literacy not only supports content comprehension but also equips students with analytical thinking, logical argumentation, and data-driven decision-making skills in their research. Overall, strengthening digital literacy is one of the key strategies that support chemistry education students in reading and understanding English-language scientific literature effectively. This ability not only enhances individual academic competence but also encourages students to actively participate in research, write scientific papers, and present research findings in academic forums. With strong digital literacy, students can bridge the gap between complex English-language literature and their academic abilities, ultimately improving chemistry education quality, expanding scientific insight, and preparing students to compete globally in science and research.

Integration of a Holistic Approach in Developing English Literacy for Students

Overall, the combination of developing English-language chemistry textbooks, implementing Project-Based Learning (PjBL), and strengthening digital literacy forms a holistic and integrated approach to improving students' ability to read English-language scientific literature. This approach not only focuses on mechanical language improvement but simultaneously develops students' learning independence, critical thinking, scientific analysis, and broader academic competencies, including the ability to write research reports, compose scientific articles, and participate in scientific discussions. Through the development of English textbooks tailored to the chemistry curriculum context, students gain not only theoretical knowledge but also technical vocabulary, examples of scientific terminology used in research contexts, and practice in interpreting literature. Such textbooks help students recognize scientific writing patterns, understand academic

text structures, and facilitate interpreting complex information, enabling them to read literature more confidently and effectively.

The Role of Project-Based Learning and Digital Literacy in Enhancing Students' Academic Independence

In addition, the application of Project-Based Learning encourages students to actively engage in learning, both individually and collaboratively (Farida, 2021). Through PjBL, students participate in research projects that require direct comprehension of scientific literature, thereby becoming accustomed to searching, selecting, and evaluating information from various international sources. This activity promotes analytical thinking, scientific argumentation, and problem-solving skills, as students connect theory with laboratory practice and solve real-world problems encountered during projects. Active engagement in PjBL also enhances collaboration, communication, and teamwork— essential competencies in academic and international scientific research. By becoming accustomed to reading scientific literature to complete projects, students gradually improve their English literacy skills, thus significantly reducing barriers that previously hindered their understanding of academic texts (Permana & Sulastri, 2024). Strengthening digital literacy also plays an essential role in improving students' access to English-language scientific literature. The ability to navigate scientific databases, download articles, assess source credibility, and utilize chemical software for data analysis and visualization allows students to gain a more comprehensive understanding of global research. Good digital literacy also facilitates information management, enabling students to store references systematically and integrate data from various sources into research projects or scientific reports. Thus, digital literacy not only supports reading skills but also reinforces critical thinking, analysis, and synthesis of scientific information—essential foundations for developing students' overall academic competence.

By combining learning resource development, active learning models, and digital literacy enhancement, chemistry education students are expected to significantly overcome difficulties in reading English-language literature. These strategies not only improve students' reading and comprehension abilities but also encourage them to become more independent and proactive learners. This enables students to access a broader range of international literature through online journals, research articles, and credible scientific databases, allowing them to obtain more up-to-date and relevant information in chemistry. Moreover, students with good English literacy can critically evaluate scientific information, compare research findings from various sources, and assess the quality and validity of methodologies and data—skills essential for developing academic competence at the university level.

Furthermore, improving English literacy impacts not only reading ability but also creates opportunities for students to actively participate in scientific research. Students who understand international literature well tend to be more confident in designing experiments, writing research reports, and preparing scientific articles for publication. This also promotes collaboration with other researchers, both nationally and internationally, allowing students to expand academic networks and gain diverse perspectives on current chemical issues. In addition, good English literacy enables students to participate in conferences, seminars, and international

workshops, directly enhancing scientific insight, presentation skills, and academic communication abilities.

Learning resource development strategies such as English-language textbooks adapted to students' proficiency levels, project-based learning modules, and the use of digital technology to access literature provide a holistic and contextual learning experience. The application of these approaches enables students not only to understand literary content but also to integrate such information into research projects, class discussions, and laboratory activities, creating an interactive and applicable learning process. Thus, students not only gain theoretical knowledge but also practical skills applicable in research and broader chemical science development.

Conclusion

Overall, improving English proficiency among students in the chemical education study program is essential for supporting their academic success. Strengthened English literacy enables students to access a wider range of scientific references, understand global research developments, and complete academic tasks more effectively. By enhancing their ability to comprehend and utilize English-language literature, students are better equipped to develop strong analytical skills and produce higher-quality scientific work. Ultimately, efforts to improve English proficiency are expected to help students become more competent, confident, and globally competitive chemistry educators and researchers.

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