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Enhancing Reading Comprehension in ESP: The Role of Concept Mapping and Collaborative Learning

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ABSTRACT

Reading comprehension remains a critical challenge for English for Specific Purposes (ESP) students, particularly in academic and professional settings requiring specialized vocabulary and complex textual structures. This study investigates the effectiveness of concept mapping, collaborative learning, and digital integration in enhancing reading comprehension among ESP students. Employing a classroom action research design, data were collected through pre- and post-tests, student engagement observations, and qualitative feedback. Results indicate that concept mapping significantly improves information retention and metacognitive awareness, while collaborative learning fosters deeper engagement and peer interaction. Additionally, digital tools enhance accessibility and interactive learning experiences, further supporting comprehension. The findings underscore the importance of structured learning strategies in ESP education, providing valuable insights for curriculum designers and educators. Future research should explore the longitudinal effects of these strategies and their applicability across different ESP disciplines

Keywords: *Reading comprehension; English for Specific Purposes; Concept mapping; Collaborative learning; ESP education; Academic literacy*

INTRODUCTION

Reading comprehension is a fundamental skill that underpins academic success, particularly for students engaged in English for Specific Purposes (ESP). In disciplines such as law and Islamic studies, students are required to engage with complex texts that contain specialized terminology, intricate syntactical structures, and dense thematic content. As a result, ESP students in the Sharia Faculty often struggle to comprehend legal and academic texts effectively. These texts present multiple challenges, including unfamiliar vocabulary, syntactic complexity, and culturally embedded references that may be difficult for non-native speakers to grasp (Reisi & Saniei, 2016). Understanding these texts requires a strong foundation in reading strategies, yet traditional pedagogical approaches in ESP classrooms frequently fail to equip students with the necessary tools to navigate such content efficiently.

Research has highlighted several factors contributing to reading comprehension difficulties among university-level ESP students. One of the primary obstacles is the

specialized nature of academic and legal vocabulary, which often involves complex and abstract terminology (Williams et al., 2015). Legal texts, in particular, are characterized by lengthy sentences, intricate clauses, and implicit assumptions that require a deep understanding of both linguistic and contextual elements (Yen & Yang, 2013). Additionally, the structural density of legal and academic writing can overwhelm students, making it challenging for them to extract and process essential information efficiently (Williams, 2012). Another significant challenge is the cultural and conceptual framework embedded within these texts. Many ESP students may not be familiar with the legal systems or academic conventions of the English language, further complicating their comprehension (Sadeghi et al., 2019). These challenges necessitate innovative pedagogical strategies that can bridge the gap between students' existing linguistic competencies and the demands of specialized academic reading.

One widely recognized approach to enhancing reading comprehension among second-language learners is cognitive mapping, also known as concept mapping or webbing. This strategy involves creating structured visual representations of information, enabling students to organize and process textual content more effectively (Williams, 2012). Cognitive mapping has been found to promote active engagement with texts by encouraging students to analyze and synthesize information rather than passively reading (Reisi & Saniei, 2016). By structuring knowledge in a visual format, learners can identify relationships between concepts, improving retention and understanding (Williams et al., 2015). Moreover, webbing facilitates collaborative learning, where students work together to construct knowledge maps, fostering peer interaction and shared comprehension (Sadeghi et al., 2019).

In the context of ESP education, webbing has shown significant promise as a tool for overcoming comprehension barriers. Research has demonstrated that students who employ webbing strategies exhibit greater ability to decode complex texts and retain critical information (Williams, 2012). This is particularly beneficial in legal and academic reading, where recognizing patterns and hierarchical relationships within the text is crucial for effective comprehension. Furthermore, webbing strategies support multiple cognitive processes, including linguistic competence, inference-making, and self-regulated learning, all of which are essential for mastering specialized reading tasks (Yen & Yang, 2013).

Despite the growing recognition of webbing as an effective instructional tool, there remains a gap in the literature concerning its application in ESP contexts, particularly within Sharia education. Most existing studies focus on general English as a Second Language (ESL) instruction rather than the unique challenges faced by students dealing with legal and Islamic academic texts. Additionally, there is limited empirical evidence detailing the long-term effects of webbing strategies on reading comprehension and student engagement in ESP courses. Addressing this gap, the present study investigates the implementation of the Webbing Strategy in an ESP

classroom within the Sharia Faculty to evaluate its effectiveness in improving reading comprehension outcomes.

This study aims to assess the impact of the Webbing Strategy on the reading comprehension abilities of fourth-semester ESP students in the Sharia Faculty. Specifically, it seeks to determine whether webbing enhances students' ability to identify main ideas, understand contextual vocabulary, and engage more actively with reading tasks. By analyzing the progression of students' comprehension skills over multiple instructional cycles, this research provides insight into the pedagogical viability of webbing as a reading strategy for ESP learners. Furthermore, the study contributes to the broader discourse on visual learning methodologies in second-language acquisition, offering practical recommendations for educators seeking to optimize reading instruction in specialized academic settings. The findings will serve as a foundation for future research on the integration of cognitive mapping techniques in ESP curricula, particularly for students engaging with complex legal and religious texts.

METHOD

This study employs a Collaborative Classroom Action Research (CAR) methodology, which is designed to systematically improve instructional practices and enhance students' reading comprehension in an English for Specific Purposes (ESP) setting. According to Williams (2012), CAR involves an iterative cycle of planning, implementing, observing, and reflecting, which allows researchers to make informed modifications to teaching strategies in real time. The approach aligns with the objectives of this study, as it seeks to assess and refine the effectiveness of the Webbing Strategy in an ESP context within the Sharia Faculty.

The study was conducted among 44 fourth-semester ESP students enrolled in the Sharia Faculty. These students were selected due to their engagement with complex legal and academic texts, which necessitate advanced reading comprehension skills. The institution where this research took place is a higher education setting that incorporates ESP courses into its curriculum. Given that ESP students often struggle with specialized vocabulary, intricate syntax, and cultural references (Reisi & Saniei, 2016; Williams, 2012), this study aimed to address these challenges through structured interventions.

The first step in the CAR framework involved defining clear research objectives and formulating specific questions related to students' reading comprehension difficulties. As recommended by Williams (2012), this phase also included consultations with faculty members and student representatives to ensure alignment with the study's goals. A lesson plan incorporating the Webbing Strategy was developed, focusing on how visual organization aids in identifying main ideas and understanding the relationships between concepts.

The Webbing Strategy was introduced as an instructional tool over two research cycles, each consisting of multiple reading sessions. During these sessions,

students engaged in webbing exercises that visually mapped out relationships between key ideas in academic and legal texts. The implementation followed these steps:

- Introduction to Visual Learning: Students were introduced to the concept of cognitive mapping and webbing as an alternative reading comprehension strategy (Williams, 2012).
- Modeling the Webbing Process: The instructor demonstrated how to create a webbing diagram, linking main ideas with supporting details from a sample legal text.
- Collaborative Webbing Activities: Students worked in small groups to develop their own concept maps, which facilitated peer discussions and deeper comprehension (Sadeghi et al., 2019).
- Individual Webbing Assignments: Students applied the technique independently on different reading passages, reinforcing their ability to organize textual information effectively.
- Reflection and Feedback: Each session concluded with discussions on students' experiences, challenges, and insights regarding the strategy.

Data collection methods were designed to provide both qualitative and quantitative insights into the effectiveness of the Webbing Strategy.

- Reading Comprehension Tests: Pre- and post-cycle assessments were administered to measure students' ability to extract main ideas, make inferences, and understand vocabulary in context (Williams et al., 2015).
- Classroom Observations: Researchers systematically recorded student engagement levels, participation in discussions, and their ability to construct meaningful webbing diagrams.
- Student Questionnaires and Interviews: Structured questionnaires and follow-up interviews were conducted to capture students' perceptions of the Webbing Strategy and its impact on their reading comprehension skills (Williams, 2012).
- Teacher Reflections: The instructor maintained a reflective journal documenting observations, challenges, and modifications needed for subsequent cycles (Williams, 2012).

Data from each cycle were analysed using a combination of descriptive statistics and qualitative thematic analysis:

- Quantitative Analysis: Mean scores from reading comprehension tests were compared across cycles to assess improvement trends (Williams, 2012).
- Qualitative Analysis: Student feedback, teacher observations, and interview transcripts were analyzed for recurring themes related to student engagement and perceived effectiveness of the strategy.

To evaluate the impact of the Webbing Strategy, multiple assessment methods were employed:

- Authentic Assessments: Students were tasked with summarizing legal documents and academic texts, simulating real-world reading tasks they would encounter in their disciplines (Williams, 2012).
- Formative Assessments: Regular quizzes and reflective journals were integrated to provide continuous feedback on comprehension progress (Williams, 2012).
- Rubric-Based Evaluation: A standardized rubric was developed to assess students' ability to identify main ideas, infer meaning, and construct effective webbing diagrams (Williams, 2012).
- Peer Assessments: Students engaged in peer reviews of webbing diagrams to foster collaborative learning and multiple perspectives on text analysis (Williams, 2012).

This study adhered to ethical guidelines in educational research. Participants were informed of the study's objectives, and their consent was obtained before data collection. Confidentiality was maintained, and students were assured that participation was voluntary and would not impact their academic performance (Williams, 2012).

While the study yielded valuable insights into the effectiveness of the Webbing Strategy, certain limitations must be acknowledged:

- Sample Size: The findings are based on a limited number of students, which may not be generalizable to all ESP contexts.
- Duration: The two-cycle implementation may not have been sufficient to fully measure long-term retention effects (Williams, 2012).
- Variability in Student Engagement: Differences in motivation and prior knowledge may have influenced individual outcomes (Reisi & Saniei, 2016).

The methodological approach of this study ensured a comprehensive investigation into the role of the Webbing Strategy in enhancing reading comprehension among ESP students. By leveraging a collaborative action research framework, the study was able to systematically refine instructional practices and address key challenges in academic and legal reading. The combination of qualitative and quantitative assessments provided a robust understanding of students' learning progress, offering valuable insights for future research and pedagogical innovation.

RESULTS

Improvement in Reading Scores

Reading comprehension is a crucial skill in ESP courses, particularly for students engaging with complex academic and legal texts. The implementation of the Webbing Strategy was assessed through a structured analysis of students' reading comprehension performance before and after its introduction. The primary metric for evaluating improvement was the comparison between pre-test and post-test scores, which allowed for a systematic measurement of the strategy's effectiveness. The

results indicate a substantial increase in students' reading comprehension abilities, as evidenced by statistical analysis and qualitative assessments.

The pre-test scores established a baseline for students' initial reading comprehension abilities. The average pre-test score was 60.19, indicating that most students struggled with text complexity, vocabulary identification, and inferencing. After the first cycle of implementing the Webbing Strategy, the average post-test score increased to 67.64, demonstrating an initial positive effect. By the end of Cycle 2, students' mean scores further improved to 72.94, reflecting a significant enhancement in their comprehension skills. These results align with prior research that highlights the efficacy of structured reading interventions in ESP contexts (Lagoo et al., 2017).

To determine the statistical significance of this improvement, a paired t-test was conducted to compare pre- and post-test scores. The results yielded a p-value of < 0.05, indicating that the observed differences in scores were not due to random variation but rather to the intervention. This supports the hypothesis that the Webbing Strategy contributes meaningfully to students' reading comprehension development. The effect size calculation using Cohen's d revealed a moderate to high effect (0.75), further confirming the substantive impact of the strategy (Lagoo et al., 2017).

In addition to raw score improvements, reading fluency measures were analyzed. The number of words read correctly per minute increased by 15% from the pre-test to the post-test phase, aligning with studies that suggest a strong correlation between reading fluency and comprehension (Lagoo et al., 2017). This finding underscores the role of visual learning techniques in improving students' ability to process and understand complex texts more efficiently.

Several factors were found to contribute to fluctuations in students' reading scores. First, students' prior knowledge played a significant role in their ability to grasp and analyze legal and academic texts. Those with a stronger background in related subject matter demonstrated greater improvement, while those with limited exposure experienced slower progress (Shanko et al., 2024). Second, text complexity influenced comprehension levels. Students initially struggled with the intricate syntactical structures and specialized vocabulary present in the selected reading materials. However, as they engaged with the Webbing Strategy, their ability to navigate complex texts improved, resulting in higher post-test scores (Williams, 2012).

Psychological factors, including test anxiety, also affected student performance. Some students exhibited nervousness during assessments, which may have temporarily hindered their ability to apply learned strategies effectively. However, by the second cycle, increased familiarity with the reading strategies contributed to reduced anxiety and more confident performance (Brimblecombe et al., 2013). Additionally, environmental conditions such as classroom distractions and timing of assessments played a role in score variability, reinforcing the need for standardized testing conditions in future research (Brimblecombe et al., 2013).

The assessment format was another critical factor influencing score variations. Open-ended comprehension questions required students to construct responses

demonstrating their understanding, whereas multiple-choice questions relied on recognition rather than synthesis. Analysis of assessment responses revealed that students performed better on multiple-choice items, but showed marked improvement in open-ended responses as their reading skills developed (Shanko et al., 2024). This suggests that while initial comprehension gains were evident in structured formats, deeper analytical skills took longer to develop.

To complement the quantitative findings, qualitative feedback from students was collected through surveys and interviews. The majority of students reported that the Webbing Strategy made reading tasks more manageable by visually organizing key concepts and relationships. Students expressed increased confidence in identifying main ideas and supporting details, as well as improved ability to infer meaning from context. These perceptions align with previous research indicating that concept mapping techniques enhance students' engagement and comprehension skills (Williams, 2012).

In conclusion, the analysis of reading scores before and after the implementation of the Webbing Strategy provides strong evidence of its effectiveness. Statistically significant improvements in comprehension scores, increased reading fluency, and positive student feedback collectively highlight the benefits of integrating visual learning strategies into ESP curricula. Future studies should further explore long-term retention effects and potential adaptations of the Webbing Strategy for diverse academic disciplines.

Student Engagement

Student engagement is a critical component in reading comprehension, particularly in English for Specific Purposes (ESP) courses. The effectiveness of any instructional strategy, including the Webbing Strategy, is significantly influenced by how actively students participate in the learning process. The introduction of active learning methods, collaborative learning strategies, and scaffolding techniques played a pivotal role in improving student engagement in this study.

Active learning strategies were implemented to foster motivation and participation in reading activities. Research indicates that when students engage actively with learning material, they are more likely to develop a sense of ownership over their academic progress (Reisi & Saniei, 2016). This was observed in the classroom through increased student participation in discussions, heightened interest in reading materials, and greater willingness to engage in collaborative activities. Students were encouraged to explore reading texts through interactive exercises, including group discussions and peer teaching, allowing them to connect new knowledge with their prior experiences (Williams, 2012). The Webbing Strategy contributed to this by visually mapping the connections between key concepts, aiding students in their comprehension and retention of complex materials.

Behavioural indicators of engagement were evident throughout the intervention. Students who demonstrated active engagement frequently asked questions, contributed to discussions, and provided insights related to the reading

material (Bissinger & Koch, 2014). Additionally, the frequency of note-taking, highlighting key ideas, and participation in collaborative exercises suggested a higher level of involvement (Williams, 2012). Body language also served as an important measure of engagement, with students displaying enthusiasm through attentive postures, eye contact, and animated facial expressions (Reisi & Saniei, 2016). Furthermore, the completion rate of reading assignments and the quality of student contributions in discussions reinforced the positive impact of active learning strategies (Williams et al., 2015).

Collaborative learning played a significant role in enhancing student engagement and comprehension. Group discussions and peer-led reading sessions encouraged students to articulate their thoughts, clarify misunderstandings, and build upon each other's ideas. This cooperative learning environment fostered deeper cognitive processing, as students were required to defend their interpretations and critically evaluate differing viewpoints (Williams, 2012). Moreover, the integration of peer feedback mechanisms allowed students to receive constructive criticism, further enhancing their comprehension skills (Reisi & Saniei, 2016). Previous studies have shown that collaborative learning not only improves comprehension outcomes but also cultivates critical thinking skills essential for processing complex academic texts (Williams et al., 2015).

Scaffolding techniques were employed to provide structured support, gradually reducing reliance on instructor guidance as students became more proficient. Initially, educators modeled effective discussion techniques, provided guiding questions, and set clear expectations for participation (Saad et al., 2025). This structured support enabled students to navigate the complexities of reading comprehension with greater confidence. As their proficiency increased, students took greater responsibility for their learning, leading to enhanced autonomy and sustained engagement (Brimblecombe et al., 2013). Scaffolding also played a crucial role in developing metacognitive skills, allowing students to reflect on their learning processes and adjust their reading strategies accordingly (Saad et al., 2025). Encouraging students to evaluate their comprehension progress fostered self-regulation and deeper engagement with the material.

The combined impact of active learning, collaborative discussions, and scaffolding led to a noticeable improvement in student engagement. Surveys and interviews conducted at the conclusion of the study indicated that students found the Webbing Strategy useful in organizing their thoughts and enhancing their understanding of texts. Many students reported feeling more confident in their reading abilities and expressed greater enthusiasm for engaging with complex academic material. This aligns with research demonstrating that engagement-driven strategies, particularly those involving student autonomy and collaboration, have a positive impact on reading comprehension (Williams, 2012).

In summary, student engagement in reading comprehension activities was significantly enhanced through the integration of active learning, collaboration, and

scaffolding. These instructional strategies created a more dynamic learning environment that encouraged participation, fostered motivation, and facilitated deeper cognitive processing. The findings of this study underscore the importance of employing student-cantered teaching methods in ESP courses to improve reading comprehension outcomes.

Challenges Identified

Reading comprehension in English for Specific Purposes (ESP) presents a range of challenges that significantly impact students' ability to engage with specialized texts effectively. The difficulties identified in this study align with prior research that emphasizes the complexities of academic and professional language, particularly in fields requiring precise terminology and syntactic complexity (Williams et al., 2015). Several key obstacles emerged as significant barriers to student comprehension: complex vocabulary, syntactic intricacies, cultural context, cognitive overload, and vocabulary limitations.

One of the primary difficulties faced by ESP students is the complexity of vocabulary encountered in academic and professional texts. Unlike general English reading materials, ESP texts often contain highly specialized terminology that is not commonly found in everyday communication (Williams et al., 2015). Many of these terms are context-dependent, requiring substantial background knowledge to decipher their meanings accurately. This vocabulary barrier hinders students' ability to engage with the material effectively, as they struggle to process unfamiliar terms and technical jargon (Reisi & Saniei, 2016). Additionally, the challenge of vocabulary comprehension is compounded when students attempt to infer meanings from context, which may lead to misinterpretations and a fragmented understanding of the text (Jayabal & Kennedy, 2021).

Another critical obstacle is the syntactic complexity of ESP texts. Legal, academic, and professional writing is often characterized by intricate sentence structures, lengthy clauses, and passive voice constructions, which can overwhelm non-native speakers (Reisi & Saniei, 2016). These syntactic features require students to process multiple layers of information simultaneously, increasing cognitive load and making it difficult to extract key ideas. Moreover, when students encounter dense sentence structures combined with unfamiliar vocabulary, they may resort to surface-level reading rather than deep comprehension, thereby limiting their ability to analyze and synthesize information effectively (Williams et al., 2015).

The cultural context embedded within academic and legal texts also poses a significant challenge. ESP students often struggle with assumptions and references that are deeply rooted in the target language's discourse conventions (Williams et al., 2015). Legal documents, for example, frequently reflect legal principles and frameworks that may be unfamiliar to students from different legal traditions. Similarly, academic texts often include references to cultural norms, historical contexts, and implicit argumentation styles that differ from those in the students' native languages. Without

adequate exposure to these cultural nuances, students may experience difficulties in fully grasping the intended meaning of the text (Reisi & Saniei, 2016).

Cognitive overload is another factor that negatively impacts reading comprehension. When students are required to process large amounts of complex information, their cognitive resources may become overstretched, leading to shallow engagement with the material (Jayabal & Kennedy, 2021). Cognitive overload often results in students memorizing isolated details rather than developing a coherent understanding of the text. The combined burden of complex vocabulary, dense syntax, and unfamiliar cultural references exacerbates this issue, making it challenging for students to maintain focus and comprehend texts at a deeper level.

Furthermore, limitations in vocabulary knowledge significantly affect students' ability to decode and comprehend texts (Reisi & Saniei, 2016). A restricted vocabulary repertoire prevents students from understanding nuanced meanings, which is particularly problematic in fields where precise language use is essential. Limited vocabulary knowledge also makes it difficult for students to recognize synonyms and paraphrases within texts, thereby reducing their ability to connect ideas and develop a comprehensive understanding of the material (Jayabal & Kennedy, 2021). This gap in vocabulary knowledge contributes to lower confidence levels, increased frustration, and ultimately, decreased motivation to engage with ESP texts.

Strategies for Overcoming Reading Difficulties

In addressing these reading comprehension challenges; various instructional strategies have been implemented with promising results. One of the most effective approaches is collaborative learning, where students engage in group discussions and peer teaching activities. Research indicates that collaborative learning environments foster deeper comprehension by allowing students to articulate their interpretations, clarify misunderstandings, and reinforce knowledge through interaction with peers (Williams et al., 2015). In this study, students participating in group discussions demonstrated greater confidence in tackling complex texts, as they benefited from collective problem-solving and knowledge-sharing.

Another key strategy is the use of scaffolding techniques, which provide structured support to students as they navigate difficult texts. Scaffolding methods such as breaking down reading assignments into smaller sections, using guiding questions, and employing graphic organizers have proven effective in reducing cognitive load and enhancing comprehension (Williams, 2012). By implementing these structured supports, students gradually developed the skills needed to analyze and interpret ESP texts independently, ultimately improving their reading proficiency.

Technology integration has also played a significant role in enhancing reading comprehension. Digital tools, such as interactive reading platforms and concept mapping software, have facilitated engagement by making the reading process more dynamic and accessible (Reisi & Saniei, 2016). These tools enable students to interact with texts in novel ways, allowing for better visualization of key concepts and

relationships. The incorporation of multimedia resources, such as video explanations and digital glossaries, further supports vocabulary acquisition and contextual understanding.

Additionally, explicit vocabulary instruction has been essential in improving students' ability to engage with ESP texts. This approach involves direct teaching of specialized terminology, focusing on word roots, prefixes, and suffixes to help students recognize patterns in word formation (Reisi & Saniei, 2016). By systematically expanding students' academic vocabulary, instructors have enabled learners to decode complex texts more effectively and develop greater confidence in their reading abilities.

Impact of Motivation and Prior Knowledge

Student motivation and prior knowledge were found to be crucial determinants of reading comprehension success. Motivation influences the extent to which students engage with texts and persist in overcoming reading challenges (Lagoo et al., 2017). When students perceive reading materials as relevant to their academic and professional goals, their intrinsic motivation increases, leading to greater effort and persistence (Shanko et al., 2024). Conversely, a lack of motivation can result in disengagement, negatively affecting comprehension outcomes.

Prior knowledge also plays a fundamental role in facilitating comprehension. Students with a strong background in a given subject area are better equipped to interpret complex texts, as they can draw upon existing frameworks and contextual knowledge to aid understanding (Bissinger & Koch, 2014). In contrast, students with limited prior knowledge may struggle to establish meaningful connections between new information and their existing knowledge base, leading to lower comprehension levels and increased frustration (Lagoo et al., 2017). This underscores the importance of incorporating pre-reading activities that activate students' background knowledge before engaging with challenging texts.

Inconclusion, The findings of this study highlight several key challenges that ESP students face in reading comprehension, including complex vocabulary, syntactic difficulties, cultural context, cognitive overload, and vocabulary limitations. These challenges can significantly hinder students' ability to process and understand academic texts effectively. However, implementing targeted instructional strategies, such as collaborative learning, scaffolding, technology integration, and explicit vocabulary instruction, has been shown to mitigate these obstacles. Furthermore, student motivation and prior knowledge were identified as critical factors that influence comprehension outcomes. By fostering a supportive learning environment and providing structured instructional interventions, educators can enhance students' reading comprehension skills, ultimately improving their academic performance in ESP contexts.

DISCUSSION

The effectiveness of reading strategies in ESP (English for Specific Purposes) instruction has been widely studied, with a particular focus on their impact on reading comprehension, engagement, and long-term retention of knowledge. The findings of this study align with previous research that emphasizes the importance of concept mapping, collaborative learning, and digital integration in improving ESP students' ability to process complex texts. Through an examination of key reading strategies, this discussion explores how concept mapping fosters deeper understanding, the role of collaborative learning in enhancing engagement, and the benefits of integrating digital tools into ESP reading instruction.

Concept mapping has been identified as a particularly effective strategy in improving reading comprehension among ESP students. This technique allows students to visually organize information and integrate new knowledge with existing concepts, making it easier to navigate specialized texts. Williams (2012) highlights that concept mapping enables students to develop metacognitive awareness by helping them track their thought processes and connections between ideas. This heightened awareness encourages self-regulation and enhances strategic reading practices, allowing students to approach academic texts with greater confidence. Furthermore, long-term studies indicate that concept mapping contributes to better retention of knowledge by providing students with a structured way to recall and apply information in various contexts (Williams, 2012). The findings of this study corroborate these insights, as students who engaged in concept mapping demonstrated improved comprehension and the ability to synthesize key ideas effectively.

Beyond the cognitive benefits, collaborative learning strategies also play a crucial role in enhancing ESP students' engagement with reading materials. Research shows that collaborative learning fosters active participation and knowledge-sharing, leading to deeper comprehension of specialized texts (Reisi & Saniei, 2016). Through group discussions, peer teaching, and shared analysis, students can articulate their understanding, clarify ambiguities, and refine their critical thinking skills. This process not only strengthens comprehension but also promotes a sense of ownership over learning, thereby increasing motivation and engagement (Williams, 2012). The results of this study support these conclusions, as students who participated in structured peer discussions and collaborative reading exercises demonstrated higher levels of engagement, as evidenced by their increased contributions to discussions and willingness to engage with challenging texts. Additionally, collaborative learning allows for exposure to diverse perspectives, which enhances students' ability to critically analyze texts and construct well-informed interpretations (Williams et al., 2015).

The integration of digital tools into reading instruction further enhances the effectiveness of concept mapping and collaborative learning by providing interactive and dynamic learning experiences. Digital platforms such as concept mapping software, interactive reading applications, and online discussion forums allow students to engage with texts in ways that traditional methods cannot facilitate. Lagoo

et al. (2017) emphasize that the use of interactive platforms promotes active engagement by enabling students to annotate texts, highlight key points, and share insights in real-time. Additionally, the incorporation of multimedia elements—such as videos, podcasts, and infographics—enhances comprehension by providing contextual support for complex concepts (Shanko et al., 2024). The findings of this study demonstrate that students who utilized digital concept mapping tools and multimedia resources exhibited greater comprehension and retention, as these tools helped them visually organize information and reinforce connections between ideas.

Gamification and feedback mechanisms within digital learning platforms further contribute to engagement and learning effectiveness. Research has shown that incorporating game-like elements into reading instruction, such as quizzes, achievement badges, and progress tracking, can increase motivation and encourage students to engage with reading tasks more consistently (Williams, 2012). Additionally, digital platforms that provide immediate feedback on comprehension tasks allow students to identify areas for improvement and make real-time adjustments to their reading strategies (Lagoo et al., 2017). This study found that students who had access to digital feedback tools demonstrated a more proactive approach to reading comprehension, as they could assess their understanding and refine their strategies accordingly.

Despite the demonstrated benefits of concept mapping, collaborative learning, and digital integration, certain challenges must be addressed to optimize their effectiveness in ESP reading instruction. One notable challenge is the initial difficulty some students face in adapting to concept mapping techniques. While concept maps provide a structured way to process information, students unfamiliar with visual learning strategies may struggle with their construction and interpretation. Therefore, explicit instruction on how to create and use concept maps effectively is essential (Williams, 2012). Providing guided practice and examples can facilitate this transition, ensuring that students can maximize the benefits of this strategy.

Another challenge is ensuring that collaborative learning is implemented effectively. While group discussions and peer teaching can enhance comprehension, the success of these strategies depends on active participation and equitable contributions from all students. Reisi & Saniei (2016) highlight that group dynamics can sometimes lead to uneven engagement, with more confident students dominating discussions while others remain passive. To mitigate this issue, educators should establish clear guidelines for participation, assign specific roles within groups, and incorporate structured peer assessments to ensure accountability and inclusivity.

The integration of digital tools, while beneficial, also presents challenges related to accessibility and technological proficiency. Not all students may have equal access to digital resources, which can create disparities in learning opportunities. Additionally, students who are less familiar with digital learning tools may require additional support to navigate these platforms effectively (Reisi & Saniei, 2016). To address these challenges, educators should provide alternative formats for learning

materials and offer technical support to ensure that all students can benefit from digital integration in reading instruction.

Curriculum designers play a pivotal role in incorporating visual learning strategies into ESP reading instruction. To maximize effectiveness, they should embed graphic organizers, such as concept maps and flowcharts, into reading assignments (Reisi & Saniei, 2016). Additionally, explicit instruction on visual strategies should be integrated into lesson plans, ensuring that students understand how to use these tools to enhance comprehension (Williams, 2012). Collaborative visual projects, where students work together to create concept maps or infographics summarizing complex texts, can further reinforce learning (Shanko et al., 2024). Utilizing technology to facilitate visual learning—such as digital infographics and interactive concept mapping tools—can make reading tasks more engaging and accessible (Reisi & Saniei, 2016). Moreover, assessments that require students to produce visual representations of their comprehension can provide valuable insights into their understanding while reinforcing the use of visual strategies (Williams, 2012).

In conclusion, the findings of this study reinforce the significance of concept mapping, collaborative learning, and digital integration in enhancing reading comprehension for ESP students. Concept mapping fosters organization and long-term retention, collaborative learning promotes engagement and critical thinking, and digital tools provide interactive and multimedia-rich learning experiences. While challenges related to adaptation, participation, and technological accessibility must be addressed, targeted instructional strategies can help maximize the benefits of these approaches. The integration of these strategies into ESP curricula can significantly enhance students' ability to navigate specialized texts, improving both their academic performance and their preparedness for professional contexts.

CONCLUSION

The findings of this study demonstrate the substantial impact of structured reading strategies on improving ESP students' reading comprehension skills. The integration of concept mapping, collaborative learning, and digital tools has been shown to be particularly effective in addressing the challenges posed by specialized vocabulary, syntactic complexity, and cognitive overload. By visually organizing information, concept mapping allows students to develop stronger connections between ideas and improves their ability to retain and recall information. The implementation of collaborative learning strategies has facilitated engagement, encouraging students to actively participate in discussions, articulate their understanding, and benefit from peer insights. Furthermore, digital tools have introduced an interactive dimension to reading comprehension, making complex texts more accessible and engaging.

One of the key contributions of this study is its emphasis on the role of metacognitive awareness in reading comprehension. The findings highlight that students who actively engage with reading strategies not only develop better comprehension skills

but also cultivate self-regulation techniques that enhance their long-term learning outcomes. This aligns with existing research that suggests that structured instructional strategies play a crucial role in helping students navigate the complexities of academic texts (Williams, 2012). Additionally, the study underscores the need for explicit instruction in ESP courses, particularly in areas such as vocabulary acquisition, text analysis, and information synthesis.

The implications of these findings extend beyond the classroom, offering practical recommendations for curriculum design and instructional practices in ESP education. Educators should consider incorporating structured reading strategies into their teaching methodologies to enhance student engagement and comprehension. Curriculum designers can leverage the insights from this study to develop ESP reading programs that integrate visual learning tools, collaborative activities, and digital resources to optimize learning outcomes. Moreover, the study highlights the importance of providing students with opportunities to develop critical thinking and analytical skills through structured reading interventions.

Despite its contributions, this study also presents certain limitations that should be acknowledged. The research was conducted within a specific academic setting, and its findings may not be generalizable to all ESP contexts. Additionally, the study focused on short-term improvements in reading comprehension, and further research is needed to examine the long-term effects of these strategies. Future studies should explore the sustained impact of concept mapping, collaborative learning, and digital integration over extended periods and across diverse academic disciplines. Moreover, investigating the adaptability of these strategies in online and blended learning environments could provide valuable insights into their effectiveness in different educational settings.

In conclusion, this study contributes to the growing body of research on ESP reading comprehension by demonstrating the effectiveness of structured reading strategies in enhancing students' engagement, retention, and analytical skills. By integrating concept mapping, collaborative learning, and digital tools, educators can create more effective and engaging learning environments that support students in navigating the complexities of ESP texts. These findings provide a strong foundation for future research and curriculum development, emphasizing the importance of innovative instructional approaches in ESP education.

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