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Enhancing ESP Reading Comprehension through Context Clues and Digital Strategies

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Abstract:
This study investigates how economics students use context clues and digital strategies to enhance vocabulary acquisition and reading comprehension in English for Specific Purposes (ESP). The research aims to identify students' inference patterns, compare success rates across different types of clues, and analyse the relationship between contextual inference skills and overall comprehension. Using a quantitative descriptive design, data were collected from 85 randomly selected undergraduate economics students who completed ESP reading and vocabulary tasks through both printed and digital formats. Results indicate that students achieved the highest success with definition clues (72.4%) and contrast clues (68.9%), while example clues were the most challenging (47.2%). Pearson correlation analysis revealed a strong positive relationship between the utilisation of context clues and reading comprehension ($r = 0.78$, $p < 0.01$). Regression analysis further confirmed that definition and contrast clues were the strongest predictors of comprehension performance. Findings suggest that combining explicit instruction in context clue recognition with digital scaffolding—such as pop-up glossaries and annotation tools—can significantly improve ESP reading outcomes. These strategies help learners engage actively with specialised economic texts, enhance inferencing accuracy, and foster independent vocabulary learning. The study concludes that integrating digital literacy with traditional reading strategies is essential for developing effective ESP pedagogy in the digital era, supporting both linguistic and professional competencies of economics students.

Keywords: Context clues; Digital strategies; ESP; Reading comprehension; Vocabulary Acquisition

Introduction

In today's global economy, English proficiency is essential for economics students and professionals, as understanding specialized texts directly affects academic and career success (Basturkmen, 2022). primary challenge in economics-related English for Specific Purposes (ESP) involves domain-specific vocabulary that permeates academic and professional discourse. When encountering unfamiliar terminology, proficient readers implement various strategies to deduce meaning, with contextual analysis representing a fundamental approach(Lawrence et al., 2022).

Textual cues are language-based signals found within written material that help readers figure out the meanings of unknown words, allowing them to maintain their reading momentum without needing to look up definitions elsewhere (Zhang et al., 2024a). While the importance of contextual clues for building vocabulary and understanding texts is widely acknowledged, there has been insufficient research investigating how economics students actually use these linguistic hints when reading specialized academic texts in a second language(Bolton, 2022).

Digital technologies have transformed ESP reading comprehension. They provide new opportunities for improving vocabulary and text understanding.Digital platforms provide immediate access to multilingual dictionaries, translation tools, and interactive glossaries that complement traditional context clue strategies (Martinez & Rodriguez, 2023).However, the synergistic relationship between conventional contextual inference techniques and digital support systems in economics ESP remains underexplored, particularly regarding how students navigate between analog reasoning processes and technological assistance when deciphering complex economic terminology.

This study explores how economics students use context clues to infer unfamiliar vocabulary in English texts. By examining clue types and inference patterns, the research contributes to developing more effective ESP teaching methods.The findings provide insights relevant to curriculum development, instructional design, and assessment practices in tertiary economics education contexts where English functions as the instructional medium or required professional competency.

Recent studies have increasingly emphasized the role of context clues in enhancing ESP reading comprehension, particularly for economics students.(Zhang et al., 2024) showed through EEG experiments that learners process different context clues via distinct neural pathways. This confirms the importance of explicit instruction in definitional and contrast clues. This neurocognitive perspective advances earlier descriptive accounts by showing how context clues activate varied cognitive processes in second language reading.Research on ESP-specific contexts also highlights the difficulty of applying general vocabulary strategies to domain-specific texts. (Nguyen & Nguyen, 2022) found that economics students in Vietnam struggled with multi-word technical terms, which often lack direct first-language equivalents. Their corpus-based analysis revealed that contextual guessing strategies were effective only when supported by explicit training in clue recognition. This suggests that context clue instruction must be discipline-sensitive to address the unique challenges of economic terminology.At the same time, digital strategies are becoming an essential complement to traditional inference techniques.(Martinez & Rodriguez, 2023) demonstrated that digital scaffolding—such as online glossaries and annotation functions—significantly improved vocabulary acquisition in ESP learners when compared with conventional reading methods. Their findings align with the present study's focus on integrating digital features into assessment instruments, underscoring that digital support should not replace but reinforce context-based inferencing.

Further evidence from longitudinal research confirms the synergy between digital tools and inferencing skills. (Thompson & Williams, 2022) found that ESP learners who engaged in blended learning environments combining digital highlighting and context clue practice achieved higher retention of academic vocabulary across semesters. This indicates that digital strategies provide not only immediate comprehension support but also long-term vocabulary development.Finally, systematic reviews have underlined the necessity of connecting digital strategies with pedagogical frameworks. (Chen & Liu, 2025) concluded that digital interventions work best when combined with explicit vocabulary instruction and context clue training.This reinforces the view that digital strategies are not stand-alone solutions but integral to a comprehensive ESP curriculum that fosters both linguistic and technological literacy.

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Literature Review

ESP and Economic Vocabulary Acquisition

English for Specific Purposes (ESP) represents a specialized language teaching approach focused on addressing learners' specific needs within particular disciplines or professions (Hutchinson & Waters, 1987) In economics education, ESP encompasses linguistic skills and knowledge necessary for effective engagement with the discipline's discourse community (Swales, 1990).Recent studies confirm its growing relevance in economics education, emphasizing vocabulary challenges and digital strategies (Basturkmen, 2022; Hoang & Mai, 2024; Chen & Liu, 2025).Economic texts present distinctive challenges due to their dense conceptual content and specialized terminology (Basturkmen, 2022).

Recent studies confirm that vocabulary strategies significantly affect ESP learners' performance. Strategic learners who apply contextual guessing or dictionary use achieve better comprehension than those relying on memorization (Al-Zahrani, 2022; Hoang & Mai, 2024). Research also highlights persistent challenges with multi-word economic terms that lack direct first-language equivalents, requiring more advanced strategies that integrate contextual and conceptual understanding (Bolton, 2022; Nguyen & Nguyen, 2022). The integration of digital technology has further reshaped vocabulary acquisition in ESP contexts. Digital platforms such as online glossaries and annotation tools enhance comprehension and facilitate the use of diverse strategies, enabling students to combine contextual inference with real-time dictionary support (Martinez & Rodriguez, 2023; Hoang & Mai, 2024). From a cognitive perspective, Zhang et al. (2024) found that technology-assisted clue recognition activates distinct neural pathways, while Chen and Liu (2025) emphasized that digital tools are most effective when combined with explicit instruction. These findings suggest that digital resources are no longer supplementary but central to modern ESP pedagogy, particularly in economics education.

Context Clues in Reading Comprehension

Context clues represent textual information that assists readers in determining unfamiliar word meanings (Lawrence et al., 2022). These clues vary in explicitness and can be categorized into several types. Contemporary research identifies five primary context clue categories: definition, synonym, antonym/contrast, example, and general context clues (Zhang et al., 2024). Recent neurological studies using EEG technology demonstrate that internal-generated contextual clues activate distinct neural pathways, suggesting that different clue types engage varying cognitive processing mechanisms (Zhang et al., 2024).

Definitional clues offer direct explanations of terms within text, typically marked by expressions like "means," "is," or punctuation such as commas, hyphens, or brackets. Synonym clues present known words as substitutes for unfamiliar vocabulary, whereas antonym or contrast clues use opposing ideas to help clarify meaning through comparison (Baumann et al., 2003). Example clues demonstrate concept meanings using concrete instances or practical applications, and broad contextual clues necessitate readers to synthesize information from multiple sentences or paragraphs to develop understanding.

Meta-analytic research examining vocabulary-reading comprehension relationships in diverse linguistic contexts reveals that contextual vocabulary learning significantly correlates with reading achievement, particularly for logographic language speakers learning English as a foreign language (Wu et al., 2020).Recent empirical studies suggest that explicit instruction in identifying and utilizing context clues significantly enhances reading comprehension, particularly for technical or specialized texts(Martinez & Rodriguez, 2023; Zhang et al., 2024). However, research indicates that context clues are not equally

beneficial, with definition and synonym clues typically providing more direct support than general context clues requiring extensive inferential processing (Lawrence et al., 2022).

Inferencing Strategies in L2 Reading

Inferencing represents a critical cognitive process in reading comprehension, particularly when readers encounter unfamiliar vocabulary. In second language (L2) contexts, inferencing strategies become especially important due to readers' limited lexical resources(Kaivanpanah & Alavi, 2008). Recent systematic reviews emphasize that vocabulary instruction effectiveness depends on theoretical frameworks connecting research findings with pedagogical practices, particularly for English learners in academic contexts (Chen & Liu, 2025).

Lexical inferencing involves utilizing available contextual information and linguistic cues to determine unknown word meanings (Haastrup, 1991). Successful inferencing depends on various factors, including readers' background knowledge, metacognitive awareness, and textual characteristics (Nassaji, 2004). Recent research demonstrates that successful L2 readers employ multiple inferencing strategies simultaneously, drawing on both linguistic and extralinguistic knowledge to construct meaning (Thompson & Williams, 2022; Zhang et al., 2024).

Contemporary studies reveal significant correlations between vocabulary knowledge and reading comprehension across different educational contexts, with effect sizes ranging from moderate to strong depending on learner characteristics and instructional approaches(Wu et al., 2020). In ESP contexts, domain knowledge plays a significant role in successful inferencing. Research demonstrates that economics students with stronger conceptual understanding of economic principles demonstrate superior ability to infer unfamiliar economic term meanings in English texts, suggesting interaction between content knowledge and linguistic inferencing ability (Charles, 2014; Rodriguez & Kim, 2023).

Methods

Research Design

This study employed a quantitative descriptive research design to investigate how economics students use context clues to infer unfamiliar vocabulary meanings in English economics texts. Quantitative descriptive research focuses on systematically describing, analyzing, and interpreting observed phenomena without manipulating variables(Gall et al., 2007). This approach was appropriate for the current study as it aimed to identify patterns in students' inferencing strategies and quantify their effectiveness across different context clue types.

Population and Sample

The research population consisted of 107 undergraduate economics students enrolled in the Economics Department at a public university in Indonesia. All participants were in their second or third year of study and had completed at least one semester of English for Economics course. Students' English proficiency levels ranged from lower-intermediate to upper-intermediate based on departmental placement assessments.

Random sampling techniques were employed to select participants from the population. Using Slovin's formula with a 5% margin of error, the required sample size was calculated as follows:

$$n = N / (1 + Ne^2) \quad (1)$$

Substituting the values into equation (1):

$n = 107 / (1 + 107(0.05)^2)$ $n = 107 / (1 + 0.2675)$ $n = 107 / 1.2675$ $n = 84.4$

Based on this calculation using equation (1), 85 students were randomly selected to participate in the study. Random selection was performed using computer-generated random number tables to ensure unbiased sampling.

Research Instruments

Two primary instruments were developed for this study. The first was the Context Clue Reading Assessment (CCRA), which consisted of 25 economics-related reading passages containing target vocabulary items accompanied by various types of context clues. Each passage included one to two target words, resulting in a total of 40 target words across the assessment. The distribution of context clues was systematic, comprising 10 definition clues, 8 synonym clues, 8 antonym or contrast clues, 8 example clues, and 6 general context clues. For each target word, participants were required to identify the type of context clue present, infer the meaning of the word in English, and provide an equivalent term in their first language (L1).

The second instrument was the Economics Reading Comprehension Test (ERCT), a 45-minute test consisting of five economics-related passages of approximately 300–400 words each, followed by comprehension questions designed to assess literal understanding, inferential comprehension, and critical analysis. Both instruments underwent a validation process to ensure their quality. Content validity was confirmed through expert review by two ESP instructors and one economics professor, while a pilot test was conducted with 20 students who were not part of the final sample. Reliability analysis using Cronbach's alpha showed coefficients of 0.83 for the CCRA and 0.87 for the ERCT, indicating high internal consistency.

In addition to the printed version, the instruments were also delivered digitally through a learning management system (LMS) that integrated features such as pop-up glossaries, online dictionaries, highlighting tools, and annotation functions. These digital supports were embedded to observe how students combined traditional context clue strategies with digital scaffolding in ESP reading tasks

Data Collection Procedures

Data collection occurred during regular class sessions with department administration permission and participants' informed consent. Instruments were administered in two separate sessions to prevent fatigue effects. The CCRA was administered first, followed by the ERCT in a subsequent session. Clear instructions were provided in both English and participants' L1 to ensure complete task understanding.

During CCRA administration, participants were instructed not to use dictionaries or other reference materials. They were given 60 minutes to complete the assessment. For the ERCT, participants were allowed 45 minutes to read passages and answer comprehension questions.

Data Analysis

Collected data were analyzed using both descriptive and inferential statistical methods. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were calculated to summarize participants' performance on both instruments. For the CCRA, success rates were calculated for each context clue type to identify patterns in inferencing effectiveness.

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The inferential statistical analyses conducted in this study encompassed several key procedures. A one-way ANOVA was employed to compare performance across different context clue types, while Pearson correlation analysis was utilized to examine the relationships between context clue identification, meaning inference, and reading comprehension scores.

Additionally, multiple regression analysis was performed to determine which context clue types served as significant predictors of overall reading comprehension performance. All statistical analyses were performed using SPSS version 26.0 with significance level set at $p < 0.05$.

Results

Overall Performance on Context Clue Utilization

Table 1 presents the overall performance of students in identifying and utilizing different types of context clues to infer the meaning of unfamiliar economic vocabulary.

Table 1. Performance on Context Clue Identification and Utilization

Context Clue Type	Identification Success (%)	Meaning Inference Success (%)	Combined Success (%)
Definition	78.6	72.4	75.5
Synonym	65.3	61.7	63.5
Antonym/Contrast	71.2	68.9	70.1
Example	52.8	47.2	50.0
General Context	44.1	38.6	41.4
Overall	62.4	57.8	60.1

Students achieved the highest success with definition clues (75.5%), while general context clues were the most difficult (41.4%). Overall, students were better at identifying clues (62.4%) than inferring word meanings (57.8%). Statistical tests confirmed significant differences across clue types, with definition clues outperforming others and general context clues showing the weakest results.

Relationship between Context Clue Utilization and Reading Comprehension

Pearson correlation analysis revealed significant positive correlations between students' context clue utilization abilities and their performance on the Economics Reading Comprehension Test, as shown in Table 2.

Table 2. Correlations between Context Clue Utilization and Reading Comprehension

Context Clue Type	Correlation with ERCT Score	Significance Level
Definition	0.65	$p < 0.01$
Synonym	0.58	$p < 0.01$

Antonym/Contrast	0.61	$p < 0.01$
Example	0.49	$p < 0.01$
General Context	0.43	$p < 0.01$
Overall	0.78	$p < 0.01$

The overall correlation between context clue utilization and reading comprehension was strong ($r = 0.78$, $p < 0.01$), indicating that students demonstrating greater proficiency in using context clues to infer word meanings also performed better on general economics reading comprehension tasks.

Multiple regression analysis was conducted to determine the relative contribution of each context clue type to reading comprehension performance. The regression model was significant ($F(5, 79) = 32.14$, $p < 0.001$) and accounted for 67% of the variance in reading comprehension scores ($R^2 = 0.67$). Definition clues ($\beta = 0.32$, $p < 0.01$) and antonym/contrast clues ($\beta = 0.28$, $p < 0.01$) emerged as the strongest predictors of reading comprehension performance.

Common Patterns in Inferencing Strategies

Analysis of students' responses to the CCRA revealed several patterns in their approach to inferring word meanings from context. Table 3 summarizes the frequency of various inferencing strategies observed across the sample.

Table 3. Frequency of Inferencing Strategies

Inferencing Strategy	**Frequency (%)**	**Success Rate (%)**
Reliance on immediate lexical environment	42.6	68.3
Integration of information across sentences	27.8	61.5
Connection to background knowledge	14.3	74.2
Morphological analysis	9.2	52.7
Translation-based inference	6.1	38.9

The most frequently employed strategy was reliance on the immediate lexical environment surrounding the target word (42.6%), which yielded a relatively high success rate (68.3%). Integration of information across sentences was the second most common strategy (27.8%), with a success rate of 61.5%. While connection to background knowledge was less frequently observed (14.3%), it was associated with the highest success rate (74.2%), suggesting that students who activated their economics domain knowledge were more successful in inferring word meanings.

Translation-based inference, where students attempted to translate surrounding context before inferring the target word's meaning, was the least common strategy (6.1%) and yielded the lowest success rate (38.9%). This finding suggests that direct engagement with English text was more effective than mediation through L1 translation.

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Discussion

Interpretation of Findings and Comparison with Previous Studies

The findings of this study provide several insights into how economics students utilize context clues to infer the meanings of unfamiliar vocabulary in ESP reading comprehension. The hierarchical pattern of performance across different context clue types—with definition clues yielding the highest success rates and general context clues the lowest—aligns with previous research findings that more explicit context clues better facilitate lexical inference (Lawrence et al., 2022).

The significant advantage observed for definition clues may be attributed to their structural explicitness. Definition clues typically provide direct semantic information through clear linguistic markers (e.g., "refers to," "is defined as"), making them more accessible than clues requiring deeper inferential processing. This finding suggests that economics textbooks and materials should incorporate explicit definitional structures when introducing new terminology to facilitate vocabulary acquisition.

The strong correlation between context clue utilization and reading comprehension performance ($r = 0.78$) supports assertions that vocabulary knowledge and inferencing ability are fundamental components of reading comprehension (Lawrence et al., 2022). The particularly strong predictive value of definition and antonym/contrast clues suggests that explicit instruction in recognizing and utilizing these clue types could yield significant benefits for economics ESP students.

The observed patterns in inferencing strategies reveal that most students relied primarily on local contextual information rather than integrating information across broader textual units. While this approach was moderately successful, the higher success rates associated with background knowledge activation suggest that encouraging students to connect new vocabulary with existing economics concepts could enhance inferencing effectiveness. This finding aligns with observations that domain knowledge significantly influences ESP vocabulary acquisition (Charles, 2014).The relatively low performance on example clues (50.0%) is somewhat surprising given that examples typically provide concrete illustrations of abstract concepts. This finding may indicate that students struggle to extract generalizable meaning from specific instances, particularly in economics texts where examples often involve complex scenarios. More explicit instruction in recognizing the relationship between examples and the concepts they illustrate could address this challenge.The low success rate of translation-based inference strategies (38.9%) suggests that encouraging direct engagement with English texts, rather than constant mental translation, may benefit economics ESP students. This finding supports communicative language teaching approaches that emphasize target language immersion rather than L1 mediation.

Pedagogical Implications

The integration of digital strategies in ESP reading comprehension highlights the role of digital scaffolding as a complement to traditional context clue usage. Recent findings indicate that adaptive digital tools, such as pop-up glossaries, annotation functions, and highlighting, can provide scaffolding that enhances lexical inference by making textual clues more salient to learners (Oakley, 2024). In the present study, the embedding of digital features within the instruments allowed participants to combine conventional inference with technology-supported strategies, reflecting authentic academic reading environments in higher education.

Moreover, digital strategies encourage the use of metacognitive reading practices that support vocabulary acquisition. Empirical evidence shows that students who employ digital-based metacognitive strategies,

such as self-monitoring through online reading platforms, demonstrate stronger performance in lexical inference compared to those relying solely on traditional text (Nilforoushan, 2023). This suggests that digital supports are not only technical aids but also integral to cognitive processing, particularly in the complex domain of economics ESP reading.Nonetheless, it must be acknowledged that digital support does not guarantee improved comprehension if misused. (Salmerón et al., 2022*)* reported that unstructured digital engagement correlated negatively with reading outcomes, while purposeful use of digital tools for research and comprehension tasks correlated positively. This nuance aligns with the current findings, emphasizing that the effectiveness of digital strategies depends on how intentionally they are integrated into reading activities.

From a pedagogical perspective, research emphasizes that digital tools should reinforce explicit instruction and repeated practice rather than replace them. Digital scaffolding that highlights definitional or contrast markers directly supports the most effective context clue types identified in this study. Such alignment ensures that digital strategies strengthen existing reading skills rather than create new layers of distraction or dependency (Oakley, 2024).In summary, the integration of digital strategies in ESP vocabulary inference expands the scope of instruction and assessment beyond traditional reading comprehension. Digital scaffolding provides learners with real-time interaction, supports motivation, and allows tracking of reading behaviors, thereby bridging the gap between linguistic processing and technological adaptation. These results confirm that digital strategies are not peripheral to ESP instruction but are essential for cultivating comprehensive and adaptive reading skills among economics students.

Conclusion

This study investigated how economics students use context clues to infer unfamiliar vocabulary meanings in English economics texts. Findings reveal that students demonstrate varying proficiency across different context clue types, with definition clues yielding the highest success rates and general context clues proving most challenging. A strong positive correlation between context clue utilization and reading comprehension performance underscores the importance of contextual inferencing skills in ESP reading.

The observed patterns indicate that while students predominantly rely on local contextual information, the integration of background knowledge yields the highest success rates, suggesting that effective vocabulary inference in economics ESP requires both linguistic processing skills and domain-specific conceptual knowledge. These results support interactive models of reading comprehension that emphasize bidirectional flow between bottom-up textual processing and top-down knowledge application.

Several pedagogical implications emerge from this study. Economics ESP curricula should incorporate explicit instruction in context clues, particularly definition and contrast types. The finding that background knowledge activation yielded high inference success rates suggests that integrated content and language instruction would benefit students more than separated approaches. Additionally, ESP reading materials should provide graduated exposure to different context clue types, and students should develop metacognitive awareness of their inferencing processes.

Study limitations include its cross-sectional design, focus on written texts only, and correlational rather than causal findings. Future research should investigate developmental changes through longitudinal studies, examine multimodal contexts, conduct experimental research on pedagogical interventions, and compare patterns across different ESP domains to determine generalizability.In practical terms, the findings recommend that higher education policymakers integrate digital scaffolding tools—such as LMS-based glossaries, annotation features, and interactive dictionaries—into ESP curricula for economics students. For classroom application, instructors can design digital reading modules where learners actively practice

context clue strategies using embedded pop-up definitions and highlighting tools, thereby bridging traditional inference training with modern digital literacy. These initiatives not only align with national policies on digital education but also provide concrete pathways to improve vocabulary acquisition and comprehension in economics-focused ESP learning

This study contributes originally to the ESP field by demonstrating that the integration of digital scaffolding with traditional context clue strategies is not merely supplementary, but an essential component of vocabulary instruction for economics students. It bridges conventional theories of lexical inference with digital learning practices, offering a new perspective for developing ESP pedagogy in the digital era.

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