

Original Paper

Reconceptualizing ESP Vocabulary Learning: A Systemic Failure Model in Vietnamese Higher Education

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Abstract

ESP vocabulary is a core component of academic and professional competence, yet it remains insufficiently developed among non-English major students. Existing research, including prior studies, has largely focused on identifying and categorizing learning difficulties, offering limited explanatory insight. This study addresses a critical gap by reconceptualizing ESP vocabulary learning as a systemic process and proposing a mechanism-based model of learning failure. Using a secondary analysis and reinterpretation of a mixed-method dataset involving 200 university students, the study maps empirical findings onto key learning stages, including input, cognitive processing, retention, output, and feedback. The results reveal that learning failure is not isolated but occurs as a cascade of breakdowns across these stages. Building on this, the study develops a Systemic ESP Vocabulary Learning Failure Model and a corresponding pedagogical framework. Theoretically, the study advances vocabulary learning by introducing a system-based perspective. Practically, it provides a coherent instructional model to guide integrated ESP vocabulary teaching in higher education contexts.

Keywords

ESP vocabulary learning, systemic learning failure, cognitive load, lexical processing, input-output theory, higher education, pedagogical model, EFL context

1. Introduction

1.1 Problem Reframing

In contemporary higher education, English for Specific Purposes (ESP) vocabulary has become a critical component of students' academic and professional competence. Mastery of specialized vocabulary is not only essential for accessing domain-specific knowledge but also for participating effectively in

disciplinary communication. Despite its recognized importance, ESP vocabulary learning remains a persistent challenge for non-English major students, particularly in EFL contexts such as Vietnam.

However, the dominant narrative in existing literature tends to conceptualize these challenges as a set of discrete and isolated difficulties, such as pronunciation problems, limited vocabulary retention, or grammatical confusion. While such categorizations are descriptively useful, they offer limited explanatory power. This study argues that ESP vocabulary learning failure is often misunderstood as a collection of isolated difficulties rather than a systemic breakdown occurring across multiple stages of the learning process. In other words, what appears to be fragmented learning difficulties may in fact reflect a deeper, interconnected failure within the learning system itself.

Reframing the problem in this way enables a shift from surface-level description to mechanism-oriented explanation, thereby opening new avenues for both theoretical development and pedagogical innovation.

1.2 Critique of Existing Research

A substantial body of research has investigated vocabulary learning in second language acquisition, including ESP contexts. These studies have contributed valuable insights into various aspects of vocabulary learning, such as lexical knowledge, learning strategies, and learner-related variables. Nevertheless, a closer examination reveals several limitations in the existing literature.

First, current research tends to be fragmented, focusing on individual factors or categories of difficulty without adequately addressing their interrelationships. Studies often examine pronunciation, memory, or motivation in isolation, leading to a compartmentalized understanding of vocabulary learning. Second, most studies adopt a predominantly descriptive approach, aiming to identify and categorize difficulties rather than to explain how and why these difficulties emerge within the learning process.

More importantly, there is a lack of causal explanation in the literature. Existing studies rarely explore the underlying mechanisms that generate and sustain learning difficulties, nor do they examine how breakdowns in one stage of learning may trigger failures in subsequent stages. In addition, there is limited theoretical integration between cognitive perspectives (e.g., processing, memory, cognitive load) and pedagogical practices (e.g., teaching methods, task design, classroom interaction). As a result, the field lacks a coherent framework that can systematically explain ESP vocabulary learning outcomes.

1.3 Research Gap

Building on the above critique, this study identifies several critical gaps in the current research landscape. First, there is a lack of systematization in understanding ESP vocabulary learning. Although numerous factors have been identified, they have not been integrated into a unified explanatory framework that captures the dynamic and process-oriented nature of learning.

Second, existing studies rarely establish a meaningful connection between cognitive processes and pedagogical practices. While cognitive theories emphasize mechanisms such as information processing, memory encoding, and retrieval, pedagogical studies often focus on instructional techniques without grounding them in cognitive principles. This disconnection limits the effectiveness of both theoretical and practical contributions.

Third, and most importantly, there is an absence of a systemic failure model in ESP vocabulary learning. Current research does not adequately conceptualize learning failure as a multi-stage, interdependent process in which breakdowns accumulate and interact over time. Without such a model, it is difficult to fully understand the complexity of learners' difficulties or to design effective interventions.

1.4 Research Aim

In response to these gaps, the present study aims to reconceptualize ESP vocabulary learning from a systemic perspective. Specifically, it seeks to develop a mechanism-based conceptual framework that explains how and why ESP vocabulary learning failures occur.

Rather than merely identifying surface-level difficulties, this study focuses on uncovering the underlying processes that lead to learning breakdowns across different stages, including input, cognitive processing, retention, and output. By doing so, the study intends to provide a more comprehensive and theoretically grounded understanding of ESP vocabulary learning in higher education.

1.5 Research Questions

To achieve the above aim, the study addresses the following research questions:

- 1) How can ESP vocabulary learning difficulties be reconceptualized as systemic failures rather than isolated problems?
- 2) What underlying mechanisms explain the breakdowns across different stages of the ESP vocabulary learning process?
- 3) How can a systemic pedagogical model be developed to effectively address these learning failures?

2. Theoretical Framework

2.1 Cognitive Load Theory and the Complexity of ESP Vocabulary

From a cognitive perspective, ESP vocabulary learning is highly demanding due to substantial cognitive load. Cognitive Load Theory (Sweller) suggests that effective learning depends on balancing intrinsic, extraneous, and germane load; however, in ESP contexts, these loads often converge and intensify.

Intrinsic load is particularly high because specialized vocabulary consists of abstract, low-frequency, and discipline-specific terms that require both linguistic and conceptual understanding. Learners frequently encounter terminology beyond their subject knowledge, which hinders comprehension and retention (Dudzik & Dzieciół-Pędich, 2022; Hunchenko, 2023; Zamfir, 2022).

At the same time, extraneous load is often increased by traditional teaching methods such as decontextualized word lists and translation-based instruction, which promote superficial processing rather than meaningful understanding. Without adequate scaffolding, learners must expend excessive effort on decoding rather than integration.

In contrast, germane load, responsible for schema construction, is often underdeveloped, as learners have limited opportunities for contextualized use and deeper processing. As a result, vocabulary knowledge remains fragmented and difficult to transfer.

Overall, ESP vocabulary learning should be understood as a cognitively intensive process in which overload can accumulate across stages, contributing to systemic learning failure.

2.2 Lexical Processing Model: From Form to Meaning and Use

Lexical processing models (Nation; Level) conceptualize vocabulary knowledge as an integrated system of form, meaning, and use. Effective learning requires learners to recognize and produce forms, understand meanings in context, and apply words appropriately in syntactic and pragmatic use. These dimensions interact dynamically rather than developing in isolation.

In ESP contexts, this process becomes more complex due to specialized vocabulary characterized by polysemy, context-specific meanings, and restricted usage within disciplinary discourse. Learners must therefore go beyond basic form–meaning mapping to understand how vocabulary functions in specific academic or professional contexts, which is particularly challenging when subject knowledge is limited (Coxhead, 2017; Gatev, 2024).

Additionally, lexical ambiguity and strong context dependency increase processing demands. Learners often struggle not only with recognition but also with integrating vocabulary into coherent discourse, especially in discipline-specific tasks (Haque et al., 2025).

Overall, ESP vocabulary acquisition should be viewed as a dynamic and recursive process in which linguistic and contextual knowledge continuously interact. Breakdowns at any stage can hinder the development of stable and functional lexical competence.

2.3 Input-Output Theory: The Role of Exposure and Activation

Input-Output Theory (Krashen; Swain) highlights the complementary roles of exposure and activation in vocabulary learning. While comprehensible input is necessary for acquisition, it is insufficient for developing communicative competence; learners must also engage in meaningful output, where vocabulary is actively retrieved and used.

In ESP contexts, particularly in EFL environments, there is often an imbalance between input and output. Instruction typically emphasizes exposure to specialized vocabulary through reading and explanation, with limited opportunities for productive use. As a result, learners develop mainly receptive knowledge, leading to inert vocabulary that cannot be effectively used in communication.

This imbalance also limits feedback, as learners who do not produce language cannot identify gaps or receive corrective input. Consequently, vocabulary remains only partially learned and fails to develop into functional competence.

Recent ESP pedagogy addresses this gap by promoting contextualized and task-based learning environments that require active vocabulary use. Through problem-solving and discipline-specific tasks, learners move from passive recognition to active application, thereby enhancing processing, retention, and overall learning effectiveness (Hunchenko, 2023; Basturkmen, 2024).

2.4 System Theory in Education: Learning as an Interconnected Process

While previous theories explain specific aspects of vocabulary learning, they do not fully capture its systemic nature. This study therefore adopts a system theory perspective, viewing learning as a dynamic process in which multiple components and stages interact continuously.

From this perspective, learning is not a sequence of isolated events but a complex system shaped by cognitive, linguistic, and contextual factors. Accordingly, learning failure should be understood not as independent difficulties but as breakdowns across interconnected stages that can propagate throughout the system.

In ESP vocabulary learning, early-stage limitations, such as insufficient exposure to authentic input, can negatively affect later stages, including processing, retention, and output. For example, weak input may lead to shallow processing, resulting in unstable retention and limited activation. This cascading effect suggests that learning difficulties are systemic and cumulative rather than additive.

A system-based perspective also integrates cognitive and pedagogical dimensions, linking learning processes with instructional design. This aligns with current ESP research emphasizing the integration of linguistic, cognitive, and contextual factors, as well as the shift toward discipline-specific, needs-based instruction (Hyland, 2022; Basturkmen, 2024; Shalash, 2024).

Overall, system theory provides a coherent framework for understanding both how ESP vocabulary learning occurs and why it fails, forming the basis for the conceptual model proposed in the next section.

2.5 Proposed Conceptual Model: Systemic ESP Vocabulary Learning Failure Model

Building on the above theoretical foundations, this study proposes a Systemic ESP Vocabulary Learning Failure Model, which conceptualizes vocabulary learning as a multi-stage, interconnected process vulnerable to breakdowns at different points. Rather than treating difficulties as isolated issues, the model frames them as systemic disruptions across interdependent stages.

The model comprises five stages: input (exposure), cognitive processing, lexical retention, output (application), and feedback. Input provides access to authentic, discipline-specific vocabulary and forms the basis for learning. Cognitive processing involves decoding and integrating meaning, but may be hindered by complexity and limited scaffolding. Retention refers to the consolidation of vocabulary in memory, which requires repeated and meaningful engagement. Output represents the productive use of vocabulary in communication, while feedback supports refinement through correction and recycling.

Each stage is associated with a corresponding failure: exposure deficiency limits input; cognitive overload constrains processing; memory instability weakens retention; lack of activation restricts output; and absence of reinforcement undermines feedback. As illustrated in Figure 1, these failures are interconnected and cumulative, shaping ESP vocabulary learning as a systemic process rather than a set of independent difficulties.

Systemic ESP Vocabulary Learning Failure Model

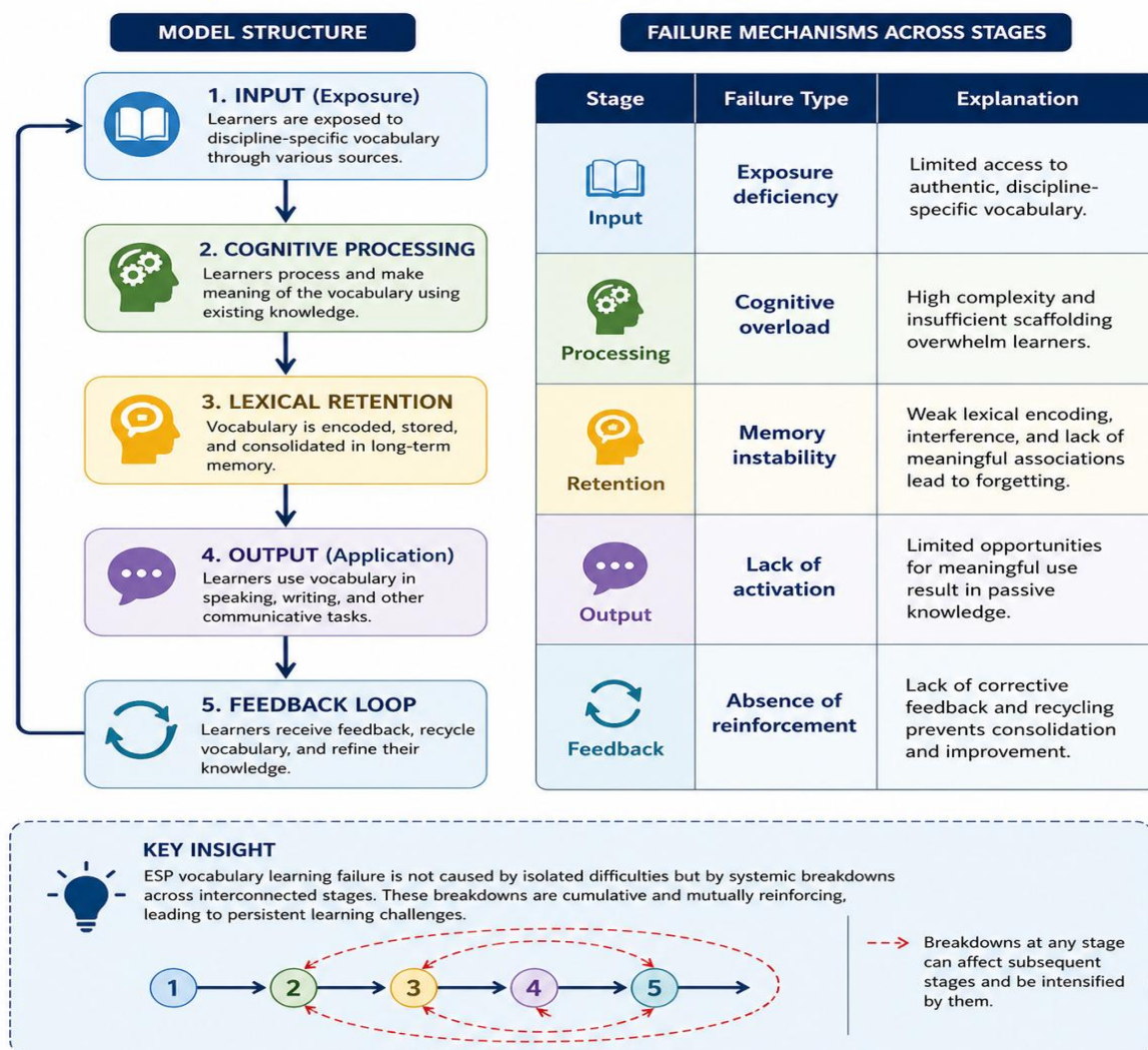


Figure 1. Systemic ESP Vocabulary Learning Failure Model

The model illustrates ESP vocabulary learning as a multi-stage process with corresponding failure mechanisms at each stage, showing that breakdowns are interconnected and cumulative rather than isolated.

A key insight is that learning failure arises from systemic disruptions across stages, not from single difficulties. Breakdowns are mutually reinforcing: inadequate input may lead to shallow processing, resulting in unstable retention and limited output. Over time, this cascade creates persistent learning problems that cannot be effectively addressed through isolated interventions.

By adopting this systemic perspective, the study provides a more coherent explanation of ESP vocabulary learning failure and establishes a foundation for pedagogical approaches that target multiple stages simultaneously, addressing underlying mechanisms rather than surface-level symptoms.

2.6 Pedagogical Implications and Contemporary Approaches

Effective ESP vocabulary instruction should move beyond fragmented techniques and address learning as a systemic process. In line with the proposed model, pedagogy needs to integrate input, processing, retention, output, and feedback, thereby reducing cumulative breakdowns across stages.

Strategic and explicit instruction plays a key role in this integration. Training learners in strategies such as contextual guessing, note-taking, and lexical mapping enhances processing efficiency and reduces cognitive overload, supporting deeper retention (Zahrani & Chaudhary, 2022; Zamfir, 2022).

Contextual lexis learning further strengthens this approach by embedding vocabulary in authentic, discipline-specific contexts. This promotes meaningful understanding, long-term retention, and learner autonomy, directly addressing weaknesses in input and retention stages (Haque et al., 2025; Dudzik & Dzięcioł-Pędich, 2022).

Multimedia and gamified learning environments also contribute by reducing extraneous load and increasing engagement. Interactive tools, such as Wordwall, support repetitive and meaningful practice, thereby improving both processing and retention (Alharbi, 2023; Syarifah & Fediyanto, 2025).

In addition, digital lexicography and AI-based tools enable personalized and data-driven learning. Corpus tools and AI platforms help learners explore authentic usage, collocations, and context, supporting multiple stages of learning, particularly input enrichment and feedback. However, their effectiveness depends on careful pedagogical integration (Mykolaichuk & Babych, 2025; Chaves-Yuste & Márquez-Cruz, 2025).

Overall, ESP vocabulary instruction should be reoriented toward an integrated, system-aware pedagogy that aligns teaching strategies with learning mechanisms, thereby addressing both surface-level difficulties and underlying systemic causes.

2.7 Instructional Priorities in ESP Vocabulary Learning

Building on the preceding discussion, several key priorities can guide effective ESP vocabulary instruction. First, needs and register analysis is essential for aligning vocabulary with disciplinary communication. Rather than adopting a general approach, instruction should target the lexical items and discourse practices most relevant to learners' academic and professional contexts (Coxhead, 2017; Hyland, 2022; Basturkmen, 2024).

Second, active learning tasks are crucial for promoting engagement and deeper processing. Problem-solving, discussion, and collaborative activities encourage learners to apply vocabulary meaningfully, thereby strengthening retention and output while fostering learner autonomy (Hunchenko, 2023; Dudzik & Dzięcioł-Pędich, 2022).

Third, content integration links vocabulary learning with subject knowledge. Embedding vocabulary within disciplinary content enhances understanding and supports effective use in real contexts (Gatev, 2024; Kausar, 2025; Myklash, 2023).

As illustrated in Figure 1, these priorities highlight the need to align linguistic, cognitive, and contextual dimensions in ESP vocabulary pedagogy.

2.8 Challenges and Future Directions

Despite advances in ESP pedagogy, several challenges persist. Learners often demonstrate limited vocabulary breadth and depth, particularly in long-term retention and flexible use. In addition, ambiguity in specialized lexis, such as polysemy and context-dependent meanings, continues to hinder accurate application. Another key issue is the weak link between informal language exposure and discipline-specific registers, which limits the transfer of general language competence to ESP contexts (Rød & Calafato, 2025; Haque et al., 2025).

Future research should adopt a more longitudinal and systemic perspective, examining how vocabulary develops across stages and contexts. Greater attention is also needed on the effective and ethical integration of artificial intelligence to support personalized learning and adaptive feedback. In addition, developing context-sensitive and discipline-specific instructional frameworks remains a priority for addressing the diverse needs of ESP learners (Basturkmen, 2024; Khamdamova et al., 2024).

2.9 Synthesis

ESP vocabulary learning is shifting from decontextualized, form-focused approaches to a more integrated and systemic paradigm. Current perspectives highlight the roles of strategy use, contextualization, technology, and alignment with disciplinary practices. By framing vocabulary learning as a dynamic and interconnected system, this study provides a clearer understanding of the mechanisms underlying both success and failure, while offering a foundation for more effective, targeted pedagogical design in higher education.

3. Methodology

3.1 Research Design

This study adopts an analytical reinterpretation design, which re-examines an existing dataset through a new theoretical lens. Rather than collecting new data, the study repositions previously gathered empirical evidence within the proposed Systemic ESP Vocabulary Learning Failure Model. This approach enables a shift from a descriptive analysis of isolated difficulties to an explanatory analysis of systemic learning breakdowns. By applying a mechanism-based framework, the study aims to uncover how different types of learning failure emerge and interact across stages of the vocabulary learning process.

3.2 Data Source

The analysis is based on a dataset comprising 200 non-English major students at Trade Union University (TUU). Data were originally collected using a mixed-methods approach, including a structured questionnaire and semi-structured interviews. The questionnaire provided quantitative insights into students' perceived challenges in ESP vocabulary learning, while the interviews offered qualitative depth regarding learners' experiences, behaviors, and learning contexts. This combination of data sources allows for a comprehensive reinterpretation aligned with the proposed model.

3.3 Analytical Strategy

The analytical strategy departs significantly from the original study by reorganizing the data according to learning mechanisms rather than predefined categories of difficulty. Specifically, the analysis involves mapping empirical findings onto the five stages of the proposed model: input, cognitive processing, lexical retention, output, and feedback. This mapping process enables the identification of stage-specific breakdowns and their interconnections.

In addition, a re-clustering procedure is employed to group data patterns based on underlying mechanisms rather than surface-level characteristics. Unlike the original categorization, which classified difficulties into separate groups, the present study reorganizes them into systemic patterns of failure that reflect the dynamic and cumulative nature of learning. This approach facilitates a deeper understanding of how difficulties interact and propagate across stages.

3.4 Validity and Rigor

To ensure analytical rigor, the study employs theoretical triangulation by integrating multiple theoretical perspectives, including cognitive load theory, lexical processing models, input–output theory, and system theory. This multi-theoretical approach strengthens the explanatory power of the analysis and reduces the risk of interpretive bias.

In addition, the process of data reinterpretation is conducted systematically, with careful alignment between empirical evidence and the proposed conceptual framework. Rather than altering the original data, the study reanalyzes it through a different analytical lens, thereby maintaining data integrity while enhancing theoretical depth. This approach ensures that the findings are both empirically grounded and theoretically robust.

4. Findings

4.1 Input Failure: Exposure Deficiency

The analysis reveals a significant deficiency at the input stage, where learners have limited exposure to ESP-specific vocabulary and insufficient access to contextualized lexical input. In many cases, vocabulary is introduced through isolated lists or simplified texts that do not reflect authentic disciplinary discourse. As a result, learners are not adequately exposed to how vocabulary is used in real academic or professional contexts. This lack of rich and meaningful input constrains initial comprehension and limits the development of deeper lexical knowledge, thereby weakening the foundation for subsequent stages of learning.

4.2 Processing Failure: Cognitive Overload

At the cognitive processing stage, learners experience considerable difficulty due to the complexity of ESP vocabulary. Technical and abstract terms impose a high cognitive load, particularly when learners lack sufficient background knowledge in the relevant discipline. In addition, many lexical items exhibit multiple meanings depending on context, which further complicates processing. This combination of conceptual difficulty and semantic ambiguity often leads to overload, preventing learners from

effectively decoding, interpreting, and integrating new vocabulary into their existing knowledge structures.

4.3 Retention Failure: Memory Instability

The findings also indicate instability at the retention stage, where learners struggle to consolidate vocabulary into long-term memory. A key issue is the failure to develop a coherent lexical network, as vocabulary is often learned in isolation without meaningful connections to other lexical items or conceptual frameworks. Furthermore, interference effects, particularly those involving similar forms or meanings (e.g., synforms), contribute to confusion and forgetting. Without repeated exposure and meaningful use, lexical items remain weakly encoded and are easily lost over time.

4.4 Output Failure: Lack of Activation

At the output stage, learners demonstrate a clear lack of activation, as they have limited opportunities to use vocabulary in productive and communicative contexts. Classroom practices tend to emphasize recognition rather than application, resulting in passive knowledge that cannot be readily mobilized in speaking or writing. The absence of structured practice and communicative tasks prevents learners from transforming receptive knowledge into functional competence, thereby reinforcing the gap between knowing and using vocabulary.

4.5 Systemic Failure Pattern

Taken together, these findings suggest that ESP vocabulary learning failure is not the result of isolated issues at individual stages but reflects a systemic pattern of breakdowns across the learning process. Failures at each stage are cumulative and interdependent: insufficient input leads to shallow processing, which in turn results in unstable retention and limited output. Over time, these interconnected failures reinforce one another, creating persistent and self-sustaining learning difficulties. This pattern supports the central argument of the study that vocabulary learning in ESP contexts must be understood as a dynamic system, where effective intervention requires addressing multiple stages simultaneously rather than focusing on discrete problems in isolation.

5. Discussion

5.1 From Difficulties to Systemic Failure

The findings of this study challenge the conventional view that ESP vocabulary learning problems can be understood as isolated or independent difficulties. Instead, the evidence supports a systemic interpretation in which failures are interconnected and unfold across multiple stages of the learning process. Difficulties at the input stage, such as limited exposure to authentic vocabulary, constrain the quality of cognitive processing. In turn, shallow or overloaded processing undermines the formation of stable lexical representations, leading to weak retention and limited ability to activate vocabulary in communicative contexts. This chain of interdependent failures suggests that ESP vocabulary learning is best understood as a dynamic system in which breakdowns are cumulative rather than discrete.

Consequently, addressing individual symptoms without considering their systemic relationships is unlikely to produce sustainable improvements in learning outcomes.

5.2 Theoretical Implications

The study contributes to the literature by extending existing theories of vocabulary learning beyond descriptive accounts toward a more integrated and explanatory framework. While prior research has provided valuable insights into specific aspects of lexical acquisition, such as cognitive load, lexical processing, or input–output dynamics, these perspectives have often been applied in isolation. By synthesizing these theoretical strands within a system-based model, the present study offers a more comprehensive understanding of how vocabulary learning operates as a multi-stage process. This approach advances vocabulary learning theory by emphasizing the importance of interconnections among stages and highlighting the mechanisms through which learning failures emerge and propagate. In doing so, it introduces a system-oriented perspective that can inform both future research and pedagogical design.

5.3 Explaining the Vietnamese Context

The systemic pattern of learning failure identified in this study can be further understood in relation to the specific characteristics of the Vietnamese EFL context. Instructional practices are often influenced by a grammar-translation approach, which prioritizes textual input and linguistic analysis while providing limited opportunities for communicative output. As a result, learners tend to develop receptive knowledge without corresponding productive competence. In addition, an exam-driven educational system reinforces surface-level learning strategies, such as memorization and short-term recall, rather than deeper processing and meaningful application. These contextual factors contribute to an imbalance across learning stages, where input is emphasized at the expense of processing depth, retention stability, and output activation. This imbalance aligns with the systemic failure model proposed in this study and helps explain the persistence of vocabulary learning difficulties among ESP learners in Vietnam.

5.4 Contribution in Relation to Existing Studies

Compared with previous research, which has primarily focused on identifying and categorizing vocabulary learning difficulties, this study offers a distinct contribution by explaining the underlying mechanisms that generate these difficulties. Earlier studies have typically adopted descriptive approaches, highlighting issues such as limited vocabulary knowledge, lack of strategies, or low motivation. While these findings are informative, they do not fully account for how such difficulties are interconnected or why they persist over time. In contrast, the present study shifts the focus from identification to explanation by demonstrating how failures emerge across stages and interact within a systemic framework. This mechanism-based perspective not only deepens theoretical understanding but also provides a stronger foundation for designing effective and targeted pedagogical interventions.

6. Pedagogical Model

Building on the systemic analysis of vocabulary learning failure, this study proposes a Systemic ESP Vocabulary Instruction Model that aligns pedagogical intervention with the underlying mechanisms of learning. The model is designed to address breakdowns across all stages of the learning process by integrating input, processing, retention, output, and feedback into a coherent instructional sequence. Rather than treating vocabulary as isolated units to be memorized, this model emphasizes structured, context-rich, and iterative learning that supports both cognitive development and communicative competence.

The first component, input enrichment, focuses on enhancing the quality and relevance of lexical exposure. Instruction should prioritize authentic, discipline-specific materials that reflect real academic and professional discourse. By increasing both the quantity and contextual richness of input, learners are better positioned to form meaningful initial representations of vocabulary.

The second component, guided cognitive processing, involves supporting learners in actively engaging with vocabulary through structured tasks. These may include semantic mapping, contextual inference, and analysis of word usage in disciplinary texts. The goal is to reduce cognitive overload while promoting deeper processing and integration with prior knowledge.

The third component, structured retention, emphasizes the consolidation of vocabulary through systematic reinforcement. Techniques such as spaced repetition, lexical networking, and multimodal encoding should be employed to strengthen memory stability and facilitate long-term retention. At this stage, vocabulary should be revisited across different contexts to build flexible and transferable knowledge.

The fourth component, contextual output, highlights the importance of activating vocabulary through meaningful use. Learners should be provided with opportunities to apply lexical items in speaking and writing tasks that simulate real-world communication. Task-based and problem-solving activities are particularly effective in promoting productive competence and bridging the gap between knowledge and use.

The final component, the feedback loop, ensures continuous refinement and development of vocabulary knowledge. Through corrective feedback, peer interaction, and iterative practice, learners are able to identify gaps, adjust their understanding, and reinforce learning over time. This cyclical process is essential for transforming initial exposure into stable and functional lexical competence.

Taken together, the Systemic ESP Vocabulary Instruction Model provides a comprehensive pedagogical framework that directly corresponds to the stages of the proposed learning model. By targeting each stage in an integrated manner, the model addresses not only surface-level difficulties but also the systemic causes of vocabulary learning failure.

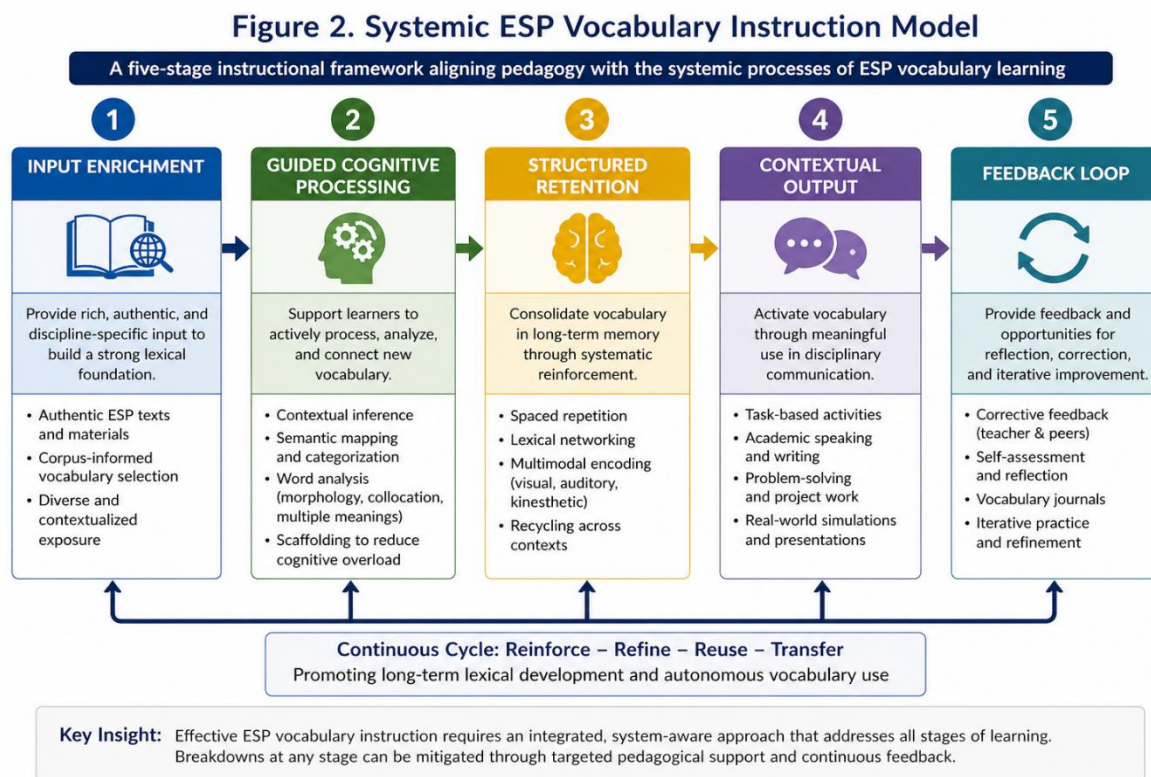


Figure 2. Systemic ESP Vocabulary Instruction Model

The model illustrates a five-stage instructional framework aligning pedagogical intervention with the cognitive and systemic processes of ESP vocabulary learning, including input enrichment, guided processing, structured retention, contextual output, and feedback loop.

7. Implications

7.1 Pedagogical Implications

The findings of this study highlight the need to reorient ESP vocabulary instruction toward a task-based and context-driven approach. Task-based ESP provides learners with opportunities to actively engage with vocabulary through problem-solving, collaboration, and discipline-specific communication tasks. Such an approach facilitates the transition from passive recognition to active use, thereby strengthening the output stage of learning. At the same time, context-driven vocabulary instruction ensures that lexical items are embedded within meaningful academic and professional situations. This contextualization enhances comprehension, supports deeper cognitive processing, and promotes long-term retention. Together, these pedagogical strategies address multiple stages of the learning process and contribute to a more integrated and effective model of vocabulary acquisition.

7.2 Curriculum Implications

At the curriculum level, the study suggests the need to reduce cognitive overload by carefully selecting and sequencing vocabulary content. Rather than introducing large volumes of specialized terms within a

limited timeframe, curriculum design should prioritize depth over breadth, allowing learners sufficient time to process, practice, and consolidate vocabulary. In addition, greater emphasis should be placed on applied learning, where vocabulary is integrated into authentic tasks and disciplinary content. This approach enables learners to develop functional competence and enhances the transferability of lexical knowledge across contexts. Curriculum designers should also ensure a balanced distribution of activities across input, processing, retention, and output stages, thereby aligning instructional design with the systemic nature of vocabulary learning.

7.3 Technological Implications

The integration of technology offers significant potential for enhancing ESP vocabulary learning when aligned with pedagogical objectives. Artificial intelligence tools can support personalized learning by adapting content to learners' proficiency levels and providing immediate feedback. Spaced repetition systems are particularly effective in strengthening lexical retention by promoting systematic review and long-term memory consolidation. In addition, digital corpora and corpus-based tools enable learners to explore authentic language use, including collocations, frequency patterns, and disciplinary variations, thereby enriching both input and processing stages. However, the effective use of technology requires careful pedagogical integration to ensure that digital tools complement, rather than replace, meaningful learning processes.

8. Conclusion

This study reconceptualizes ESP vocabulary learning as a systemic and dynamic process rather than a set of isolated difficulties. The findings show that learning failure occurs as a multi-stage breakdown across interconnected phases, including input, processing, retention, output, and feedback, where disruptions are cumulative and mutually reinforcing.

By proposing a mechanism-based framework, the study moves beyond descriptive accounts to explain how and why these failures emerge. The results highlight the need for an integrated pedagogical approach that aligns instructional practices with cognitive processes, ensuring meaningful input, guided processing, structured retention, active output, and continuous feedback.

Overall, the study provides a coherent theoretical and pedagogical model for understanding and improving ESP vocabulary learning in higher education contexts.

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