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READING COMPREHENSION AND SEMANTIC PROCESSING

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Abstract

This study investigates the impact of vocabulary depth on reading comprehension, the role of semantic relations in facilitating comprehension, and the influence of inferencing abilities on reading ability. Through a qualitative content analysis, this study analyzed the reading passages of the IELTS, TOEFL, and SAT to identify semantic and linguistic features that are determinants of comprehension. Data collection was conducted through an analysis of standardized texts, while at the analytical level, the identification of semantic relations, inferential demands, and text complexity were considered. The main findings are that a shallow vocabulary size impedes students' ability to master specialized and abstract words, while a lack of knowledge of semantic relations impedes the integration of textual materials. Inferential capacity has a central role in linking inferred meaning, but limited conceptual capacity always aggravates challenges related to understanding. These findings corroborate the research questions and show the integration of these semantic components and their central role in reading ability. The results of this research demonstrate that master plans in vocabulary enrichment, semantic mapping, and inferential thinking can result in improved comprehension skills. The implications highlight the contribution of creative pedagogy and well-designed texts toward unbiased development in literacy.

Keywords: *Semantic relations, inferencing abilities, qualitative content analysis, cognitive constraints, creative teaching strategies.*

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1. INTRODUCTION

1.1 Background

Reading comprehension is a key area in language learning and cognitive development because it is a basis upon which knowledge acquisition and enhanced communication skills are developed (Parker et al., 2003). Reading comprehension allows students to read, and understand what the text means, new vocabulary, sentence structure and nuances of meaning (Gilakjani & Sabouri, 2016). The written material teaching aids the students in helping linguistic forms with real life contexts and they improve their fluency and accuracy as well as develop critical thinking (Yuan, 2021). This makes the work of integrating listening, speaking, and writing into a holistic learning experience (Maru et al., 2020). Reading comprehension from a cognitive point of view has become stronger in cognitive functions, for example, attention, memory, and inferencing (Hogan et al., 2014). Writing material, which students read to interpret symbols, seek patterns and extract meaning reinforces students' ability to solve problems (Sideridis et al., 2013). It also encourages critical assessment — the readers have to assess a source of information and verify its validity. Intellectual development as well as personal growth needs such involvement (Labarrete, 2019).

Creativity and imagination are developed by reading comprehension because one can come across different types of ideas (Astuti et al., 2018). Their cognitive scope is expanded and their intellectual and emotional capacities are developed via the pursuit of new experiences. It also creates empathy because readers learn to appreciate other cultures, experiences, and viewpoints (Zhanqiang, 2023). And more importantly, in the modern digital world there is so much information and one can't tell who's good and who's not good. If one were advanced enough in reading skills, one would have the capacity to go through the difficult text and make good decisions based on it, as well as to adjust to the needs of linguistic and cognitive demands (Goldman, 2012). Above all, reading comprehension is much more than the decoding of written text; it is a key way of learning, speeds up intellectual growth, and is the foundation of successful communication. It is this core ability that allows one to overcome challenging areas of language and intelligence, thus advancing not only education but also personal growth (Snow, 2010).

1.2 Problem

One of the drawbacks of learning semantics is that it might hinder learners' ability to comprehend what they read. Second, there is a lack of vocabulary depth. If learners do not know those meanings (polysemy, idiomatic expressions etc.), they cannot decode text effectively and end up with gaps in understanding (Shakil, 2020). The hurdle also includes semantic relations (Ardanouy & Hélène Deacon, 2024). This is especially true for readers who do not realize that getting the word order right is as important as the words themselves, and this includes synonyms, antonyms, and formal/less formal hierarchical relationships (e.g., hypernyms, hyponyms, etc.). This prevents them from being able to integrate ideas and draw meaning from texts (Labarrete, 2019).

Comprehension depends upon inferencing but takes place when the learner is not able to connect sentences or is not able to deduce implicit meanings (Lee, 2013). For example, texts that demand inferential knowledge of culture or context may confuse readers if that information is not present (Musdalifah, 2021). Comprehension is further complex by ambiguity and figurative language. It confuses the readers especially when context clues are subtle or absent. These problems are exacerbated by cognitive processing limitations: slow semantic retrieval or working memory constraints. Because of this, learners might find themselves struggling to make sense analyze and synthesize information as they are unable to effectively remember multiple semantic elements (Sweller et al., 2019). Poorly organized texts, with low coherence or high lexical density, can potentially overload readers, thus making them even more difficult to understand. Solutions that developed in response to these issues include vocabulary enrichment, direct instruction in semantic relationships, and formal practice in inferencing, all to foster deeper understanding and more capable reading comprehension (Gilakjani & Sabouri, 2016). Hence, the following research questions the current study focused on.

1. What effect does vocabulary depth have on reading comprehension?
2. How does facilitation reading comprehension involve semantic relations?
3. What effect do inferencing abilities have on reading proficiency?

1.3 Significance of Study

The reading comprehension and semantic processing implications for this study are very important in language education and cognitive development studies. The application of this study can assist educators in crafting more specific teaching strategies via the investigation of vocabulary depth, semantic relationship, and inferencing ability to boost students' reading competence (Gu, 2017). Within the language learning scope, this investigation proves that semantic knowledge is a pillar as a basis for reaching reading literacy. Thus, educators can assist learners in integrating vocabulary-building activities and exercises that work towards the development of a deeper understanding of word meanings and relationships. Furthermore, this strategy makes reading better, explicitly, and more fluently both in writing and speaking (Musdalifah, 2021).

The research also points out the need for inferencing skills to be taught (Lee, 2013). It fosters learners to use implicit meanings to draw inferences and helps learners to discuss the connections between ideas by connecting ideas in texts. These academic and real-world communication skills are so important (Hogan et al., 2011). The study brings cognitive development insight into how semantic processing enhances cognitive functions like memory, attention and problem-solving (Saini & Sahula, 2020). Engagement with semantically rich texts is a way for learners to develop their analytical and evaluative skills which are key skills for lifelong learning and decision-making. In addition, the study's results can influence curriculum planning to facilitate materials in meeting the learners' semantic and cognitive needs (Kovaleva & Khachatryan, 2021). Consequently, this has implications of a wider theoretical nature for the development of adaptive educational frameworks to address various learner challenges and for the creation of tools to enable individuals to thrive in linguistic and intellectual domains (Ajideh et al., 2012).

2. LITERATURE REVIEW

2.1 Theories of Reading Comprehension

Research on the understanding of reading comprehension and semantic processing is initiated on several influential theoretical frameworks, including the Simple View of Reading (SVR) and the

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Construction-Integration Model (CI Model). The SVR posits that reading comprehension is the product of two primary components: linguistic comprehension and decoding (Mahlow et al., 2020). Decoding is something of the kind that you are doing which is the ability to translate from written symbols into words that are spoken, while linguistic comprehension is something of the kind about the listening of spoken language, vocabulary and syntax too (Tan et al., 2007). This model suggests that accurate reading comprehension only happens when decoding and linguistic comprehension are both adequate. Semantic knowledge serves the purpose of interpreting the text; without semantic knowledge, readers are unable to derive meaning from the text (Kim, 2020). The SVR offers a precise framework for determining reading ability deficiencies, highlighting the necessity of striking a balance between comprehension-focused education and decoding (Vaughn et al., 2019).

Kintsch (1998) suggests that a better way of showing the comprehension of reading is proposed in the Construction-Integration Model (CI Model) which is more dynamic. It describes comprehension as a two-phase process: construction and integration. At the construction stage, readers take the cognitive representation of text by decoding words and retrieving semantical and syntactical meanings. By resolving ambiguities and making connections between new information and existing knowledge, this cognitive representation is improved throughout the integration phase. This model provides a framework for the role of inferencing and semantic networks in the development of coherent understanding, where semantic relations, and context knowledge, support comprehension. For both frameworks, semantic processing plays an important role at this level. As opposed to the SVR, the CI Model takes a particular interest in processes of meaning-making through active combined production of new and existing knowledge. Together, they present an integrative view of the cognitive and linguistic processes involved in reading comprehension, offering both new developments in research and educational practices (Aryadoust, 2017).

2.2 Vocabulary Depth and Reading

Vocabulary depth is the qualitative side of word knowledge, focusing not only on how many words an individual knows, but how words are understood—if an individual knows five words and they're completely devoid of meaning, that's a low vocabulary depth (Şen & Kuleli, 2015). Unlike vocabulary breadth, it does not concern the total of words a person knows. Breadth makes basic communication possible by offering a large range of words, depth adds to comprehension and expression by adding more information to the meaning of each word. Semantic richness is a critical dimension of vocabulary depth, but it encompasses many different meanings for words — being aware of synonyms, antonyms and other hierarchical relationships like hyponyms, and hypernyms. For example, the word light can mean not heavy, related to brightness or easy. Its richness goes so far as to include morphological awareness — which involves grasping the nature of words and knowing roots and prefixes as well as suffixes. As an example, the word unbelievable gives us believe and unbelievable so we have the root believe, the prefix un-, and the suffix able.

Further, an ability to acquire collocational knowledge – an understanding of words that commonly co-occur themselves – is also an essential skill. To illustrate, language users who can master a language know that 'make a decision' is okay, but 'do a decision' isn't. Vocabulary depth is further enriched by contextual flexibility—meaning with enough cues, people can infer words like run in sentences like run a mile and run a company (Şen & Kuleli, 2015). It also has something to do with pragmatic understanding – that is you know the correct use of the words in various social or cultural settings, e.g. when to use awesome informally as opposed to impressive in a more formal setting. In essence, the depth of vocabulary, describes more, than definition, by encompassing the meanings, relationships, and contextual nuances of words. Qualitative knowledge in this case contributes to language proficiency and further reading, comprehension, more could be inferred, and reliable communication.

The role of vocabulary depth in reading comprehension outcomes has been repeatedly pointed out by empirical research. As one example, in seminal research, Qian (2002) studied the relationship between ESL students' vocabulary breadth, depth, and reading comprehension. The research has shown that vocabulary range facilitates an initial understanding of the text, but vocabulary depth, such as word meaning, collocations, and morphological relationships, highly predicts accurate comprehension of complicated texts. Likewise, Proctor et al. (2012) studied bilingual learners and found that more knowledge of vocabulary is related to increased inferencing and integration of ideas and better comprehension. Although learners with an equivalent vocabulary breadth performed as well as peers who could not discriminate nuanced word meanings, the latter scored considerably worse when discriminating contextual usage of those words. This highlights the critical interplay between depth and critical cognitive skills.

Perfetti and Stafura's (2014) other study stressed deep semantic processing to build coherent cognitive representations of reading. The idea that richer vocabulary networks enable readers to connect words and sentences to help deepen their understanding of the text was supported by their work. Together, these studies highlight that vocabulary depth is not additional, but central to high-level comprehension of reading, affecting both language and cognitive elements of understanding.

2.3 Semantic Relations and Comprehension

Semantic relations are the relations (connections) between words, that enable the shaping of word meaning and usage of a word in context, without which language comprehension and communication are impossible (Troyer & McRae, 2022). For example, synonyms are words with similar meanings (happy and joyful). Such relations enable language users to express ideas with a slight change in their variations and make expression more engrossing and understanding too. Learners must be able to identify synonyms to infer the meaning of one word from another. Antonyms instead correspond to oppositional meanings, for example, hot vs cold. By specifying the relations between these lexical forms, these relations teach readers and listeners how contrasts and distinctions should develop in texts, thereby sharpening analytical skills and expanding lexical networks (Flusberg et al., 2024).

Hierarchical relationships are depicted by hyponyms where one word is a subset of another (Maia & Lima, 2021). Rose is a hyponym of the flower. It helps readers by fostering the categorization or inferencing by recognizing hyponyms. But collocations are words that usually occur together such as make a decision or strong coffee. Collocations play as big a role in fluency as any other thing can think of because they represent natural language. These collocations are crucial to the coherence of communication. The semantic relations of these types give a

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framework of understanding among words that allows a learner to understand a linguistic item more deeply, accurately, and efficiently (Al-Khawaldeh et al., 2024).

A semantic network is essential for understanding text because it allows learners to have a way to organize and get into the meaning of words and the relationships between them. Nodes (words or concepts) and links (semantic relationships) compose this network based on the reader who can associate related ideas and derive meaning out of text reflective of the network structure (Al-Khawaldeh et al., 2024). A well-structured semantic network enables readers to retrieve not only the immediate meaning of the word they encounter in the text but also the words that are related to the word in question (Borge-Holthoefer & Arenas, 2010). When you're reading about trees, you are engaging them with terms like branches, leaves, and forests, because that's in the broader context. It helps to see the big picture of what's going on and connect the dots to begin to recognize how the pieces may fit together.

Semantic networks also provide a mechanism to aid comprehension by encouraging efficient memory retrieval. Words or phrases encountered in the familiar semantic framework are processed faster and better; the cognitive load is smaller. It has been suggested that understanding a sentence like "The rose bloomed in the garden" is enriched significantly when the reader's semantic network associates rose with flower and bloomed with growth. What is more important, these networks are fundamental in the formation of links among sentences and paragraphs. These links created by the readers relate newly presented information to what they already know; it improves the building up of a coherent cognitive representation of the text. Most importantly, however, semantic networks bear great importance in reading comprehension and memory of complex or abstract information (Borge-Holthoefer & Arenas, 2010).

2.4 Inferencing Abilities in Reading

Making inferences or predictions based on the text's explicit language is known as inferencing (Sumekto, 2018). Depending on learners' sorts of reading strategies, they are essential for reading comprehension so learners can fill up the gaps in the information, relate the ideas and decode the implicit meanings. They rely heavily on prior knowledge, context, semantics in general, and the ability of readers to construct a coherent sense of the text. Bridging inferences are one common type: they help bridge disparate bits of information situated in a text (Collins et al., 2017). Coherence depends on them; in that they link ideas across sentences or paragraphs but must be drawn from context. Darcy, for instance, neglected his umbrella. The reader claims that he got wet while walking from home since it was pouring. This serves as a bridge for us to understand this gap between two sentences which is therefore logical (Collins et al., 2017).

There is another type called elaborative inferences where they add up information that expands a text's significance. None of these are strictly necessary to comprehend but add depth and detail (Collins et al., 2017). These can easily be tricky things for a reader to pick up in a sentence like 'Zahiya baked a cake for the party.' Depending on the reader's background knowledge and imagination such inferences are made. In both cases they are essential for the comprehension of implicit relationships, the prediction of outcomes, and the interpretation of authors' intentions. Inferencing in the text makes the story logical by bridging inferences, but elaborative inferences aid readers in enjoying the reading and forming a better understanding of the text more creatively and personally. They play a crucial role in the sharing of sense among simple and complex materials, showing how the interplay between linguistic cues and cognitive processes highlights the process of reading comprehension in naturalistic language (Yu, 2018).

The skills of inference and understanding go almost hand in hand because the ability to infer greatly enhances the reader's interpretation of the text. Understanding is more than a literal reading of the text; it requires synthesizing meanings by integrating the textual content with previous knowledge. Inferencing acts as the middleman between explicit content and implied meanings, allowing readers to understand deeper and more complex ideas. The ability to infer from what they read is so related to how a reader can comprehend what he or she reads. Decoding does not end with comprehension, which entails connecting textual information to prior knowledge to make meaning. This makes for explicit content, which the readers still have to guess what the implied meaning is (Sumekto, 2018).

Those who have good inference skills can make logical inferences between sentences, bridge information gaps, and point out nuances such as tones, intentions, or suggested connections (Collins et al., 2017). For instance, from the example of a character shivering and wrapping his coat tightly around him in a story, an expert reader would make an inference that the temperature in the environment is low, although it is not directly stated. These interrelations allow for deeper understanding by developing a coherent and elaborate cognitive representation of the text (Musdalifah, 2021). Moreover, inference forms the basis of some of the critical aspects of comprehension, such as prediction, figurative language, and causality. A good deal of research shows that better readers make more accurate and more frequent inferences than poorer readers. On the other hand, failure to infer often results in a broken understanding, whereby crucial links are not formed (Collins et al., 2017). The inference-making skills are very important for comprehension. They enable the reader to find hidden meanings, and in so doing, the reader becomes very active rather than just passive; thus, interest in reading and comprehension are heightened (Bayat & Çetinkaya, 2020).

2.5 Cognitive and Linguistic Factors in Semantic Processing

Semantic processing relies on complex interactions between cognitive and linguistic components in which working memory, background knowledge, and language proficiency play important roles. Such factors determine the degree to which a learner is capable of comprehending, interpreting, and making sense of a written text. Working memory is essential to semantic processing as the temporary storage and handling of information required to process language. The words, sentences and contextual information must be held by the listeners or readers while also integrating the information with the previous sentences to create meaningful interpretations. Working memory is particularly important when one needs to resolve ambiguities or interpret complex sentences. This happens because limitations of working memory disrupt semantic integration; this, in turn, leads to either misconception or insufficient understanding (In'nami et al., 2022)

Prior knowledge significantly enhances semantic processing by providing a frame within which new information is interpreted. Familiarity with a topic allows for the accelerated activation of relevant semantic networks, which enables readers to draw inferences and resolve ambiguities more effectively (Mannes & Hoyes, 1996). For example, a well-read individual on ecosystems

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easily makes connections between such concepts as biodiversity and habitat while reading about environmental conservation. Equally important are the linguistic competencies: knowledge of vocabulary, grammatical ability, and pragmatic ability (Lehmann, 2007). Broad vocabulary allows for a subtle appreciation of words and their relationships; strong grammar skills enable one to analyze sentence structures. Pragmatic abilities allow learners to infer implied meaning, contextual cues, and social nuances—thus, to understand better (Ibrahim, 2024). The interaction between these components affects the degree and depth of semantic processing. While working memory provides for immediate integration, previously acquired knowledge stabilizes meaning in appropriate frameworks, and linguistic competence supplies the tools necessary for decoding and interpretation. Together, these components give way to the cognitive and linguistic foundation necessary for adequate semantic processing, whereby a learner can derive meaning from the written text and engage in more sophisticated forms of communication (Bosha, 2019).

2.6 Previous Studies

The majority of the studies provide important insights into reading comprehension and semantic processing to show their relevance to the current study. For instance, Chen et al. (2023) tested the interaction between syntactic and semantic processing in reading complex sentences in Mandarin. The ERP approach identified an extremely dynamic syntax-semantics interface for both L1 and L2 speakers that refuted the standard syntax-first account. Similarly, Nobre and Salles (2016) also examined the coordination of lexical-semantic processing and reading comprehension and showed that semantic priming is highly correlated with reading ability and comprehension prediction as far as vocabulary richness is concerned. Subsequent research by Mouchrif et al. (2023) has examined the effects of semantic mapping strategies on Moroccan EFL students' reading comprehension ability. Experiment results show that the strategies promote inferential understanding without affecting literal understanding.

Theoretically, the experiments within the paper are well-supported by Kintsch's (1988) Construction-Integration model and Perfetti's Lexical Quality Hypothesis. These frameworks emphasize the importance of semantic retrieval and integration processes in reading and hence offer a sound foundation for investigating the impact of semantic challenges—i.e., polysemy and idiomatic phrases—on learners' abilities to decode and interpret written text. Furthermore, the methods implemented in these studies increase their utility. For example, the application of ERP by Chen et al. (2023) enabled the researcher to see neurocognitive reactions immediately, and the quasi-experiment of Mouchrif et al. (2023) through pre- and post-testing provided measurable proof of the effects of semantic mapping.

The findings obtained through such studies offer a lot of information in the area of reading comprehension. Chen et al. (2023) emphasized the integration of syntactic and semantic processes, recommending that selecting one operation over the other can be unsuccessful in Mandarin or similar structure languages. Mouchrif et al. (2023) demonstrated that semantic mapping enhances comprehension by engaging learners dynamically cognitively, whereas Nobre and Salles (2016) observed the pivotal position of vocabulary depth in bridging semantic priming and understanding. All this research emphasizes the need for incorporating semantic-purposed strategies into reading instruction. Disagreements, however, arise on the efficacy of different teaching strategies, e.g., explicit vocabulary instruction compared to practices such as semantic mapping.

While strong, these studies also have methodological limitations. Chen et al. (2023) employed an ERP measure with a highly temporal resolution, which, although strong, has been used primarily within Mandarin and lacks generalizability. Mouchrif et al. (2023), however, employed a small sample size, thereby limiting the overall generalizability of their study. Unexpectedly, little is known about the application of cultural and contextual inferencing in reading comprehension and the effect of semantic ambiguity on narrative comprehension. These leave scope for further research to cover these uncharted areas, especially the role of cultural knowledge and inferencing in overcoming semantic barriers.

Based on the synthesis of these results, it can be seen that the richness of vocabulary and semantic integration are of greatest importance in reading comprehension. Despite this agreement about the importance of these variables, differences in teaching methodology efficiency indicate the need for further research. The current research attempts to add to these findings by being able to overcome constraints associated with semantic challenges, such as polysemy and idiomaticity, and quantifying inferencing methods' effects on reading comprehension. In this way, it attempts to offer useful recommendations to improve reading comprehension and semantic processing, which is of great help to the discipline.

3. RESEARCH METHODOLOGY

3.1 Design

A qualitative content analysis framework is used for the current study to examine the semantic and linguistic features of reading comprehension resources (Kuckartz & Rädiker, 2023). This would, therefore, allow an in-depth systematic investigation into how certain aspects of semantic knowledge (Breit et al., 2023), for instance, vocabulary depth (Şen & Kuleli, 2015), semantic relations (Ardanouy & Hélène Deacon, 2024), and inferential knowledge—impact comprehension outcomes. The general purpose of the present investigation is to analyze text data collected from various sources (Serafini & Reid, 2023), including course books, language corpora, and previous empirical studies, to gain a general sense of the reading processes of semantics.

3.2 Sources of Data

The data for this research are derived from a diverse set of instructional reading materials widely utilized in school and university curricula, and professional examinations like IELTS, TOEFL, and SAT are analyzed. The materials represent a range of difficulty levels and semantic complexities. These sources are selected in a way to ensure their appropriateness and relevance to the study objectives.

3.3 Selection of Materials

The study employs purposive sampling to select text and resource materials that depict different levels of complexity. Texts with high semantic content that call for inferencing and show variety in vocabulary. Tests directly target semantic issues, for example, texts containing ambiguous expressions or complex word relations. The selection is based on research questions, and it attempts to achieve inclusiveness in the semantic phenomena within the reading process.

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3.4 Data Analysis Framework

A qualitative content analysis model is used for the systematic analysis of data. This has the following components: Vocabulary-depth analysis includes the identification and analysis of words with complex semantic properties, including polysemy, synonyms, and antonyms. The contextual meanings of lexical items are also considered to establish how they aid in realization. Semantic relations mapping deals with the relationships existing among words, such as synonyms, antonyms, hyponyms, and collocations, toward understanding how semantic networks contribute to meaning. Semantic maps are just one of several visualization techniques used for the task (Figure 1). Inferencing requirement analysis is a type of analysis in which this text is examined to identify events that necessitate inferencing. This analysis categorizes several types of inferences, including bridging inferences, elaborative inferences, and predictive inferences. Using text complexity measures variables such as lexical density, cohesion, and readability, the texts to be analyzed are assessed to identify their complexity to determine if semantic challenges exist (Figure 2).

Figure 1: Qualitative Content Analysis Model

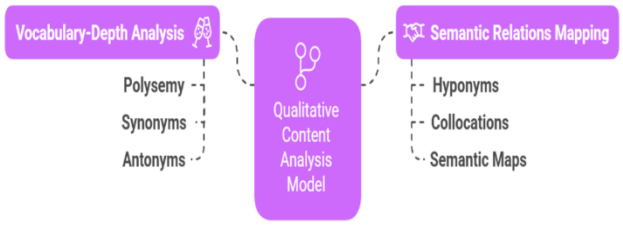
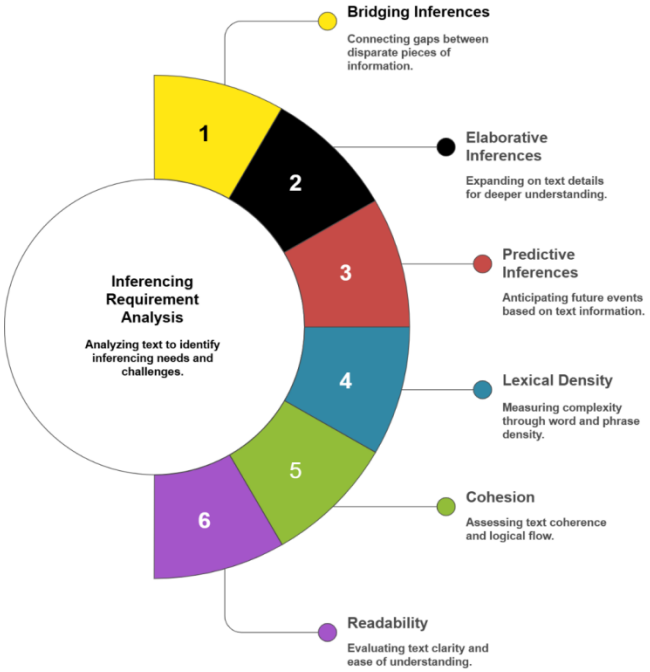
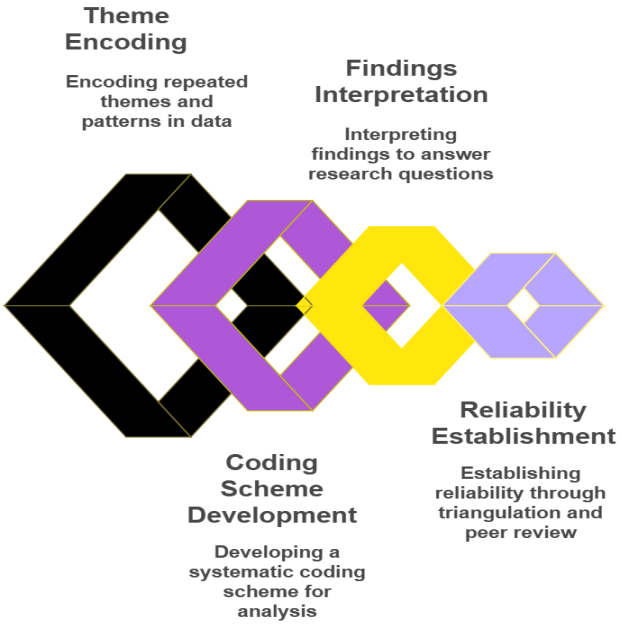


Figure 2: Exploring Inferencing Requirement Analysis



A comprehensive coding system is used across the dataset to encode repeated themes and patterns for vocabulary richness, semantic connections, and inferential reasoning. A coding scheme is developed to group semantic features, including lexical diversity, semantic connections, and indicators of inferencing, to ensure there is a systematic study of the materials. Findings are interpreted to answer the research questions of the study which include the influence of vocabulary size on comprehension of complex texts. The role of both explicit and implicit semantic relations in promoting comprehension. The impact of inferencing ability on implicature comprehension (Lee, 2013). Patterns are examined at different levels of text complexity to determine what similarities and differences exist in the semantic demands. In establishing reliability, the research triangulates information emanating from various sources, which include textual analyses, linguistic corpora, and available literature. It further involves a specialist peer review of the interpretations and findings through a structured process to validate the analysis (Figure 3).

Figure 3: From Data Coding to Validated Findings



4. RESULTS AND DISCUSSION

4.1 Results

4.1.1 Vocabulary Depth and Reading Comprehension

Vocabulary depth significantly influences learners' ability to comprehend text (Şen & Kuleli, 2015), specifically in passages with complex semantic structures, polysemous words, and idiomatic expressions. For instance, the terms "archaeological resource" and "coastal erosion" in the IELTS (Miller,2024) reading passage on coastal archaeology require knowledge of specialized vocabulary that goes beyond surface-level meanings. Learners with poor vocabulary depth fail to understand such terms in their textual contexts, with the result that their comprehension has gaps. Moreover, the TOEFL (ETS, 2023) reading passage about bycatch includes terms like "biomass," "detritivores," and "ecosystem," which require prior semantic knowledge to be understood. If readers lack an enriched lexicon, they cannot decode such terms and integrate their meanings into a larger narrative. The narrative passages also bring out the role of figurative language and nuanced expression in complicating comprehension. Thus, in the example of the SAT passage by David Malouf, idiomatic expressions such as "moiled around us" or "bright, conjectural futures" require

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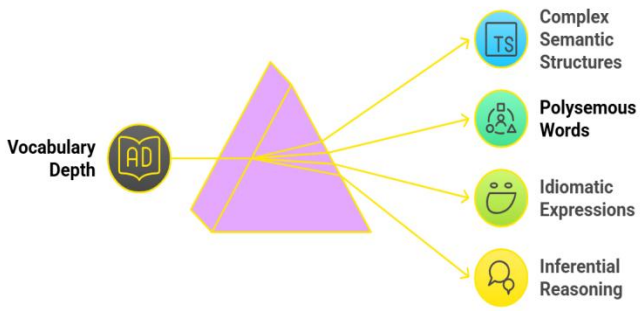
inferential reasoning that builds on both semantic and cultural understanding (McElroy Tutoring, n.d.). Readers not familiar with such expressions experience cognitive overload because their semantic retrieval systems are not adapted to these demands (Figure 4).

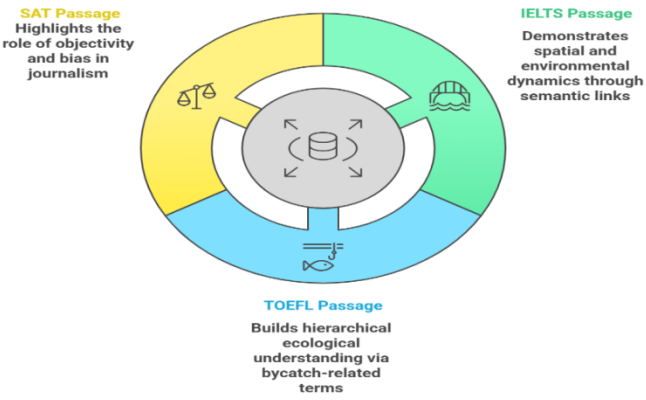
Figure 4
Exploring Vocabulary Depth's Impact on Comprehension



4.1.2 Semantic Relations and Textual Integration

The semantic relations themselves—synonymy, antonym, hypernym, and hyponym—are some of the important mechanisms for linking together textual elements and thus establishing coherence and understanding. In the IELTS passage (Miller,2024), this can be seen in terms such as "coastal zone" and "buried land surfaces," which have semantic relations that help explain the spatial and environmental dynamics being described (Ardanouy & Hélène Deacon, 2024). Similarly, in the TOEFL passage (ETS, 2023), semantic relations between terms such as "juveniles," "smaller-than-legal size limits," and "unmarketable species" build a hierarchical understanding of the ecological impact of bycatch. However, most learners do not make these relations, all because of a lack of training in semantic networks. The failure to recognize relationships among synonyms and antonyms breaks down their capacity for integrating ideas in texts. In this case, for example, the opposite semantic roles played by "objectivity" and "bias" in the SAT passage about journalism illustrate the importance of oppositional relations in developing an overall comprehension of the argument (McElroy Tutoring, n.d.) (Figure 5).

Figure 5: Semantic Relations in Text Comprehension



4.1.3 *Inferencing and Reading Proficiency*

Inference is one of the significant cognitive skills that plays an important role in effective reading comprehension, especially where cultural or contextual knowledge is demanded. The IELTS (Miller, 2024) passage about coastal archaeology presumes a baseline level of knowledge about historical and environmental contexts. Learners who cannot make inferences concerning the implications of "rising sea levels" or "climate change" fail to connect the descriptive elements with broader environmental concerns. Similarly, the TOEFL (ETS, 2023) passage on bycatch requires inferences as to how "bycatch reduction devices" reduce ecological damage—that is, the connection is not explicitly stated but must be inferred.

The SAT narrative passages further exemplify the challenges of inferencing. In the passage on Emma Harrison's research on earthworms, readers are to make inferences about the link between soil compaction and landslide risk mitigation. Learners with no skill in inferencing are incapable of connecting experimental findings to broader environmental implications (Lee, 2013). Moreover, ambiguity and figurative language exacerbate these difficulties. In Malouf's SAT passage, for example, phrases such as "revelation of bright, conjectural futures" require interpretive skills to bridge implicit meanings; learners with limited inferencing abilities experience cognitive overload and therefore grasp comprehension in a fragmented way (McElroy Tutoring, n.d.) (Figure 6).

Cognitive limitations such as slow semantic retrieval and working memory constraints further handicap reading comprehension. High-lexical-density texts, like the IELTS passage (Miller,2024), are especially overwhelming for learners with the number of semantic elements concentrated in a constrained textual space; for example, understanding terms such as "archaeological potential," "post-glacial period," and "coastal erosion" requires fast semantic retrieval to build a coherent mental model. Learners whose cognitive processing capacity is limited cannot hold the semantic elements in working memory and hence have disjointed understanding. Both the TOEFL and SAT passages further furnish evidence of how poorly designed low-coherence texts exacerbate cognitive overload. The passage on bycatch includes dense scientific terminology amid the interpolation of statistical data, which confuses readers not accustomed to either ecological or economic contexts. The SAT passage on journalism presents multiple sides of an issue of objectivity that readers are required to juggle and still retain coherence in—no small cognitive demand for less proficient readers (McElroy Tutoring, n.d.).

Strategies to overcome these require a deeper exploration of vocabulary, the teaching of explicit semantic relationships, and increased scaffolding on inferencing behavior. For instance, vocabulary practices that focus specifically on polysemy and the idiomatic aspects of language can train learners to interpret complex words or phrases. Use of semantic-mapping techniques might visually represent relationships in synonyms, antonyms, hyponyms, hypernyms, and more, to consolidate ideas from within a text. Scaffolded practice in recognizing implied meanings can facilitate inferencing abilities (Lee, 2013), helping students develop the cognitive flexibility necessary for making connections between discontinuities of understanding. Third, a curriculum should be designed to reduce the lexical density and improve coherence. Contextual clues and scaffolding should be strong in the texts, which would enable readers to make sense of complex semantic structures. Examples in this regard include glossing of the IELTS and TOEFL passages or pre-reading activities that help learners become familiar with key terms and ideas.

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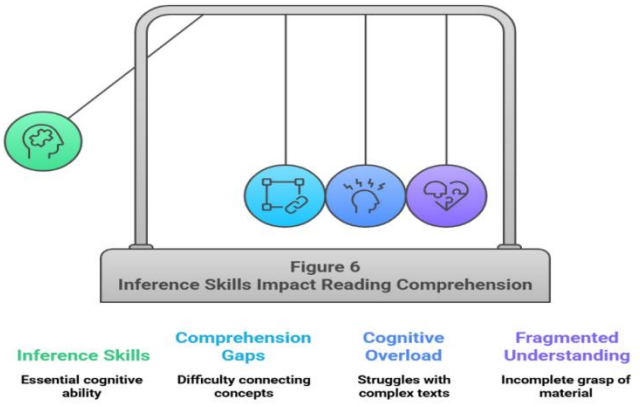

Figure 6
Inference Skills Impact Reading Comprehension

4.2 Discussion

4.2.1 Research Question 1: Vocabulary Depth and its Effect on Reading Comprehension

The findings of this study have shown that vocabulary depth is one important variable in determining reading comprehension. Those learners with limited vocabularies experience difficulty in understanding complex texts, such as the passages from the IELTS reading on coastal archaeology and the TOEFL reading on bycatch (Miller,2024). These passages contain technical terms like "archaeological resource" and "biomass," which require readers to draw on their previous lexical knowledge. With the absence of a refined vocabulary, the student cannot understand the implied meaning of these words and therefore his/her understanding is always fragmented. This opinion is shared by Nation (2012), who says that knowledge of vocabulary concerning scope and complexity affects reading. He postulates that understanding depends on an ability to recognize the meanings of words in contexts, and such an ability plays a central role in deeper engagement with texts.

Besides, Malouf's SAT narrative passage also indicates how crucial it is to comprehend idiomatic phrases and polysemous words. Phrases like "moiled around us" need inferential reasoning to comprehend their figurative senses, which could be challenging for pupils lacking vocabulary depth and richness (McElroy Tutoring, n.d.). Laufer and Goldstein (2004) pointed out that the depth of vocabulary—knowledge of polysemy and collocations—enhances learners' ability to process figurative and abstract language significantly, supporting the findings of this study. However, this study slightly diverts from the previous theories completely based on the breadth of vocabulary. Whereas breadth consists of a large number of known words, depth entails the comprehensive knowledge of words and their semantic features. For example, in the IELTS reading (Miller,2024), the word "hypernyms" is employed to describe broader categories of semantic relations; therefore, it emphasizes the significance of vocabulary depth in a bid to enable the interpretive capability of the reader. Therefore, vocabulary depth is a vital determining factor for effective understanding, especially in texts composed of specialized or abstract terms.

4.2.2 Research Question 2: Semantic Relations and Their Role in Facilitating Reading Comprehension

The findings indicate that semantic relationships—including synonymy, antonymy, and hierarchical connections such as hypernymy and hyponymy—are essential for meaning construction. Texts characterized by clearly articulated semantic networks enable readers to integrate information effectively and establish coherence. For instance, the TOEFL (ETS, 2023) passage addressing bycatch contains terms like "juveniles," "unmarketable species," and "bycatch reduction devices," which are contextually related in terms of semantics. Readers may build a cognitive framework for comprehending the ecological and economic effects of bycatch by recognizing these causal relationships.

Previous studies have placed much emphasis on the role of semantic relations during reading (Ardanouy & Hélène Deacon, 2024). Beck et al. (2002) argue that instruction in semantic mapping can significantly enhance students' ability to establish connections among words, promoting a coherent text. This agrees with the findings of this study, where semantic mapping proved to be a significant strategy in encoding relationships among lexical entities. For instance, in the context of the IELTS passage (Miller,2024), "coastal zone" is semantically related to "buried land surfaces" because of the shared environmental frame; this shows how semantic relations can help in understanding. However, the study highlights the problems that learners have when semantic relations are subtle or implicit. The SAT passage about objectivity in journalism contains contrastive terms like "bias" and "objectivity," which force the reader to work through oppositional relationships to apprehend the full nuances of the argument (McElroy Tutoring, n.d.). While this points out the complexity of semantic relations, it also points to the need for explicit teaching in identifying and interpreting these relations. As Schmitt (2014) intimates, semantic relations are not always transparent, especially in higher-level texts, and hence in need of targeted teaching strategies.

The findings indicate that texts that are poorly structured and have low coherence amplify the difficulty of determining semantic relations. Highly lexicalized texts, such as the IELTS passage (Miller,2024), swamp readers with semantic elements, making it harder to form connections. This finding is in line with Halliday and Hasan's (1976) theory of cohesion, which views semantic connections as a way to hold a text together. Therefore, improving understanding through semantic relationships necessitates both properly crafted texts and educational assistance (Ardanouy & Hélène Deacon, 2024).

4.2.3 Research Question 3: Inferencing Abilities and Their Impact on Reading Proficiency

Another important factor that emerged in the data analysis was inferencing. It refers to the act of obtaining implicit meanings from texts, something quite crucial in texts requiring cultural or contextual knowledge. For example, the IELTS passage presupposes at least a minimal knowledge of environmental and historical contexts, such as the rising of sea levels (Miller,2024). Learners who cannot make this inference cannot put together into a coherent narrative the information presented in the text. This result aligns with Kintsch's (1998) construction-integration model, which posits that comprehension involves the integration of explicit and inferred meanings into a unified mental representation.

Similarly, Emma Harrison's earthworm study SAT reading requires inferencing to connect soil compaction to fewer landslide risks (McElroy Tutoring, n.d.). The readers are expected to make inferences that the earthworms' burrowing and soil reorganization have larger environmental effects. For example, Cain and Oakhill (2007) note that inferences fill the gaps in knowledge, particularly where the relationships are not stated. They contend that proficient readers compensate for their deficiencies by employing inference, a technique that is rarely possessed by poor readers. On the other

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hand, however, results also reveal difficulties concerning inferencing, particularly in ambiguous or figurative texts. The narrative passage by Malouf in the SAT shows how such phrases as "bright, conjectural futures" depend upon a kind of interpretive competence that rests on both semantic and cultural knowledge (McElroy Tutoring, n.d.). Less skilled learners are unable to make such subtleties and hence suffer from cognitive overload. This again supports McNamara's (2007) suggestion that "inferencing is a resource-intensive process, dependent on both prior knowledge and working memory".

This study again shows how the process of inference interacts with other semantic factors in vocabulary depth and semantic relationships. For instance, the identification of polysemous words or hierarchical relationships depends on such inferencing. The interconnectedness, therefore, requires an integrated instructional approach, which focuses on varied aspects of semantic knowledge. For instance, it is suggested that teaching inferencing skills along with vocabulary enrichment and semantic mapping significantly improves reading proficiency, according to van den Broek and Espin (2012).

4.3 Comparison with Prior Studies and Theoretical Implications

The results of this study are in line with earlier research that has established the role of vocabulary, semantic relations, and inferencing in reading comprehension. Yet, they also extend existing theories by pointing out the interrelatedness of these factors. Although previous studies often regard vocabulary depth (Şen & Kuleli, 2015), semantic relations (Ardanouy & Hélène Deacon, 2024), and inferencing as separate components (Lee, 2013), the present study has shown how these aspects are interrelated. For example, semantic relation identification typically depends on the breadth of vocabulary whereas valid inferences cannot be made based on lexical knowledge alone but also on the capability of conducting semantic network navigation. The study further extends the debate between vocabulary breadth and depth. While breadth promises the coverage of a wide range of known words, depth is what provides the fine details that help in decoding complex texts. This finding agrees with Qian's (2002) argument that depth is a better predictor of reading comprehension than breadth, especially in advanced texts containing specialized language.

The findings also contribute further evidence to the supportive role of semantic relations in holding textual coherence together, a stance that was pioneered by Halliday and Hasan (1976). It does, however, extend his theoretical model in pointing out the need for such relations to be taught explicitly, especially in poorly structured texts. The findings also offer further support for Kintsch's (1998) construction-integration model with the addition of the cognitive effort of inferencing in lexically dense or ambiguous texts.

4.4 Implications

The study adds to the literature on reading comprehension by outlining the interrelations among vocabulary depth (Şen & Kuleli, 2015), semantic relations (Ardanouy & Hélène Deacon, 2024), and inferencing (Lee, 2013). It provides evidence for theoretical models such as Kintsch's (1998) construction-integration model and Halliday and Hasan's (1976) cohesion theory but extends these theories to emphasize the importance of explicit teaching of semantic relations and inferencing. This study fills the gap between lexical and inferential processing by showing that vocabulary depth is a determinant of the recognition of semantic networks and implicit meanings. The findings of this study permit the development of instructional materials by teachers to attend to multiple semantic dimensions. Reading curricula should include activities like vocabulary enhancement, semantic mapping, and guided inferencing to facilitate the ability of students to cope with demanding texts (Beck et al., 2002). It is further suggested that a decrease in lexical density and increased textual coherence might reduce cognitive load, which in turn will allow students to focus on higher-order comprehension skills.

Educational policymakers should prioritize the appropriation of funds to support teacher training programs on research-based practices in reading instruction. Curriculum standards should make clear that semantic relations and inferencing are explicitly taught, especially for high-achieving students and English language learners. National reading assessments also must include specific tasks to measure both vocabulary knowledge and inferential reasoning, ensuring there is a wide representation of what constitutes reading ability. Improved reading comprehension has huge societal benefits in that it creates avenues for the development of critical thinking, literacy, and lifelong learning. This study meets semantic problems within the education system, therefore rendering equity in that students from different linguistic and cultural backgrounds can participate in complex texts and as a result close achievement gaps (Cain & Oakhill, 2007). Further investigation is needed to provide answers about the effectiveness of instructional interventions such as technology-facilitated semantic maps—on building understanding. Additional longitudinal studies should also be done to examine the long-term effect of richness in vocabulary depth and inferencing skills (Lee, 2013; Şen & Kuleli, 2015) on academic competence in different content subjects.

4.5 Limitations and Recommendations

There are constraints on the research methodology, data sources, material choice, and analysis framework used. While the qualitative content analysis method is systematic, it doesn't have the quantitative level necessary to allow generalizations to larger populations. Indeed, this reliance on secondary sources of data, including IELTS, TOEFL, and SAT reading passages, limits the scope of what can be analyzed to pre-selected texts that may insufficiently represent the density and complexity of real-life reading problems (Beck et al., 2002). This already narrow material selection is further confined to standardized tests that, as such, often give priority to some linguistic features that may not reflect the richness of texts found both in academic and everyday contexts. Although strong in mapping semantic relations (Ardanouy & Hélène Deacon, 2024) and requirements for inferences, this framework for data analysis does not provide for psycholinguistic measures of eye-tracking or reaction times that may allow a glimpse into deeper levels of cognitive processing (Kintsch, 1998). These limitations affect the study by narrowing the generalizability of the results and reducing the scope of accounting for individual differences in terms of cultural background, prior knowledge, and cognitive abilities. Similarly, there is no primary data collection, which is meant to limit the exploration into the learner-specific challenges emotional responses or motivation during the completion of reading tasks.

These limitations can be overcome by designing future studies as a mixed-methods approach: combining qualitative content analysis with quantitative psycholinguistic experiments. For example,

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McNamara (2007) suggested eye-tracking or neuroimaging techniques to study real-time processing of semantic relations and inferencing. Moreover, future studies go further in widening the range to include varieties such as genres like narrative fiction, academic articles, and even digital text so that the generalization proximal to a reading situation in nature is much closer. Getting more detailed information regarding the problems different learners have when learning English through reading may happen more effectively through interviews, questionnaire methods, or even think-aloud protocols. Longitudinal designs might investigate the sustained effects of interventions targeting aspects like vocabulary depth and inferencing (Lee, 2013; Şen & Kuleli, 2015). Finally, not least, there is the role that technology can play in providing adaptive learning platforms and semantic visualization tools to further improve reading comprehension instruction in the years to come (Schmitt, 2014).

5. CONCLUSION

The study explored the impact of vocabulary depth on reading comprehension, semantic relations' role in facilitating comprehension, and inferencing abilities' impact on reading proficiency (Ardanouy & Hélène Deacon, 2024; Lee, 2013; Şen & Kuleli, 2015). The hypothesis held that vocabulary depth, semantic relationships, and inferencing abilities are interdependent variables that significantly influence reading comprehension. When these elements are not well developed, they become major obstacles in learners' ability to decode, integrate, and interpret textual information accurately and successfully. Depth in vocabulary is needed for any given difficult text-reading job, both professional or even abstract vocabulary. Synonymy, antonymy, and hierarchies create coherence and integrate text semantically. Besides, inferencing provides an important skill concerning the connection between implicit meanings or filling contextual gaps, especially in those texts that require more cultural or situational knowledge when trying to understand them. However, these problems are multiplied by the limitations in cognitive processing, such as slow semantic retrieval and limited working memory capacity, especially in texts with either high lexical density or low coherence. Such findings extend previous theoretical models, such as Kintsch's (1998) construction-integration model, by placing even greater emphasis on the interconnectedness of semantic entities in comprehending reading.

The study calls for coherent teaching practices that place priority on vocabulary improvement, semantic mapping, and inferencing in a coherent manner. Of importance will be well-designed texts and the integration of technology-enhanced materials supporting comprehension. Such results are especially important for teachers, education policymakers, and curriculum designers promoting better literacy outcomes and reduction of achievement gaps within a diverse student group. While this does contribute something useful, the research is restricted by relying on secondary data, the limited range of materials chosen, and a lack of primary psycholinguistic measurements. Future studies should therefore follow a mixed-methods approach by combining real-time cognitive data with a broader selection of text genres. Longitudinal studies and research in adaptive learning technologies are a rich avenue for better comprehension.

Availability of supporting data

On request, the research's supporting data are provided. Kindly get in touch with the writer personally if you seek any other materials or information.

Competing Interests

The author declares no competing interests. This research was conducted independently, and there are no financial or other relationships that could potentially bias the interpretation or presentation of the findings.

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