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Integrating Extensive Reading Strategy Training with Innovative Technologies: fsQCA on EFL Learner Autonomy and Vocabulary Acquisition

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ABSTRACT

The integration of extensive reading strategies and innovative technologies has become a vital component of English as a Foreign Language (EFL) education. While extensive reading (ER) fosters learner autonomy and vocabulary acquisition by promoting engagement with diverse reading materials, the incorporation of digital tools—such as e-books, online platforms, and mobile applications—has further enhanced accessibility and interactivity. However, gaps remain in the understanding of how these elements interact and which configurations yield optimal outcomes for learners, especially in terms of fostering self-directed learning and vocabulary growth. This research addresses these gaps by employing fuzzy-set Qualitative Comparative Analysis (fsQCA) to examine the interplay between extensive reading, metacognitive strategies, and technological tools. Data were collected from 130 EFL learners through pre- and post-tests, questionnaires assessing

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learner autonomy, and classroom observations. Results reveal three effective pathways to learner autonomy and vocabulary acquisition: (1) comprehensive integration of extensive reading, technology, and metacognitive strategies; (2) focus on traditional reading and metacognitive strategies without technology; and (3) technology and metacognitive strategies without extensive reading. Extensive reading was found to be the most impactful strategy, achieving the highest correlation with autonomy and vocabulary acquisition. The study concludes that a balanced approach, combining extensive reading, metacognitive strategies and selective use of technology, offers the most effective framework for fostering EFL learners' autonomy and vocabulary development. These findings provide valuable insights for educators and policymakers when designing language-learning programs tailored to diverse learner needs while ensuring the strategic use of both traditional and digital methodologies.

Keywords: EFL; Extensive Reading; Learner Autonomy; Technology-Enhanced Language Learning; Vocabulary Acquisition; Fuzzy-Set Qualitative Comparative Analysis

1. Introduction

The integration of extensive reading strategies with innovative technologies has become increasingly important for enhancing the autonomy of EFL learners. Extensive reading (ER) encourages students to engage with large volumes of text for comprehension and enjoyment, thus promoting self-directed learning and motivation. When combined with technology, such as online reading platforms, e-books, and language learning applications, ER can provide learners immediate access to diverse materials tailored to their interests and proficiency levels. Extensive reading (ER) is a pedagogical approach that emphasizes reading large quantities of material for pleasure and comprehension, which is particularly beneficial in the context of language acquisition. This strategy is grounded in five core principles: the reading material should be easy, learners should have the autonomy to choose what they read, they should read as much as possible, the reading process should be individual and silent, and teachers should provide orientation and guidance to facilitate the process[1]. These principles significantly foster a positive reading environment that enhances language skills, particularly for second-language learners[2]. Extensive reading can lead to substantial improvements in various language competencies, including vocabulary acquisition and reading fluency[3, 4]. A study on ESL students revealed that an extensive reading program significantly enhanced both their language proficiency and their engagement with the material[5]. Similarly, findings from mixed-methods action research indicated that extensive reading positively impacted learners' reading fluency and vocabulary knowledge, demonstrating its effectiveness as a language learning strategy[6]. The practice of extensive reading has been linked to improved writing performance, indicating that the benefits of this approach extend beyond reading skills to encompass overall language proficiency[7]. The implementation of extensive reading programmes varies across educational contexts, with adaptations made to suit specific learner needs and institutional frameworks. For example, studies in the Arabian Gulf region have highlighted diverse practices and the importance of contextualizing extensive reading within local educational settings[8]. The shift to online learning environments during the COVID-19 pandemic has prompted investigations into the efficacy of extensive online reading, revealing that students maintained positive attitudes toward this approach even in remote contexts[9]. The adaptability of extensive reading underscores its relevance in contemporary language education, making it a critical component of effective teaching strategies. Extensive reading is a vital strategy in language education, promoting not only reading skills and broad language competencies. Its principles guide its effective implementation, and empirical evidence supports its positive impact on language development. As educational contexts continue to evolve, the integration of extensive reading into curricula remains essential to foster a love for reading and enhance language proficiency among learners. In today's globalized world, the importance of English literacy cannot be overstated. As businesses, governments, and communities worldwide use English as their primary mode of communication, the demand for effective language education, especially for nonnative speakers, has surged. EFL learners often face numerous challenges that can impede vocabulary acquisition

and overall language proficiency, including lack of motivation, limited access to resources and insufficient feedback. Integrating innovative technologies into extensive reading practices aims to address these challenges by providing personalized learning pathways, immediate access to a diverse selection of texts, and opportunities for collaborative reading experiences with peers[10] .

The integration of innovative technologies into extensive reading has garnered significant attention in recent years, particularly in the context of English as a Foreign Language (EFL) education. This literature review synthesizes recent studies exploring the impact of various technological tools on extensive reading practices, focusing on student perceptions, self-efficacy, and the incorporation of supplementary materials[11]. A notable study by Gönen and Zeybek[12] investigated the use of QR codes to enhance authentic texts in extensive EFL reading. Their qualitative research highlights how QR codes can facilitate access to supplementary resources, thereby enriching students' reading experiences. The findings revealed that students perceived QR code-enhanced texts as more engaging and beneficial for their learning. These tools provide immediate access to additional information and multimedia resources that support comprehension and retention[12]. This trend aligns with the broader movement of using mobile technology to create interactive learning environments, which have been shown to foster greater student engagement and motivation in language learning contexts. In a related vein, Anggia[13] investigated the relationship between students' reading self-efficacy and their experiences in an extensive online reading program. This study employs a regression model to analyze the factors influencing self-efficacy among students enrolled in this program. The results show that the online format, combined with innovative reading strategies, positively impacted students' confidence in their reading abilities. This finding underscores the importance of integrating technology into extensive reading programs because it not only enhances accessibility but also contributes to the development of learners' self-efficacy[13]. Such insights are crucial for educators seeking to design effective online reading curricula that cater to diverse learner needs.

Chwo and Tsai[14] proposed a model for integrating supplementary online reading materials within an EFL writing class, emphasizing the importance of a blended learning approach. Their study demonstrated that the incorporation of online resources can significantly improve students' reading and writing skills by providing them with varied and contextually relevant materials. This model, referred to as the 2R Model, advocates the seamless integration of reading and writing practices, thereby promoting a holistic approach to language learning[14]. The findings indicate that when students are exposed to diverse reading materials through innovative technologies, their overall language proficiency and critical thinking skills are enhanced. The integration of innovative technologies into extensive reading practices offers promising avenues for enhancing student engagement, self-efficacy, and overall language proficiency. The reviewed studies indicate that tools such as QR codes and online resources not only enrich the reading experience and foster a more interactive and supportive learning environment. As educators continue to explore the potential of these technologies, considering their implications for curriculum design and instructional strategies in EFL contexts is essential[15]. The integration of innovative technologies into extensive reading holds significant promise; however, several challenges must also be addressed. One key concern is the potential digital divide, where some students may have limited access to the necessary devices and internet connectivity, potentially worsening existing inequalities in language education. Adyawaty[16] added that the successful implementation of technology-enhanced extensive reading programs requires robust teacher training and support to ensure effective integration into the curriculum. Another challenge is the need to carefully evaluate the pedagogical soundness of the technological tools employed, as the mere presence of technology does not guarantee enhanced learning outcomes.

The integration of innovative technologies into extensive reading holds significant promise; however, several challenges must also be addressed. One key concern is the potential digital divide, where some students may have limited access to the necessary devices and internet connectivity, potentially worsening existing inequalities in language education. Additionally, the successful implementation of technology-enhanced extensive reading programs requires robust teacher training and support to ensure effective integration into the curriculum.

However, it is important to acknowledge the potential benefits that technology may bring to extensive reading. The

use of interactive features, multimedia resources, and personalized learning paths can enhance student engagement and motivation, leading to improved learning outcomes. Accessibility of online materials can help bridge the gap between students with limited access to physical resources. With careful planning and thoughtful implementation, the integration of technology and extensive reading can create a more inclusive and enriching learning environment for all students [17].

This research is important because it highlights the need for teachers to effectively differentiate instruction and leverage technology to support diverse learner needs. Integrating innovative technologies and extensive reading strategies can unlock new possibilities to enhance student engagement, self-efficacy, and overall language proficiency. This research employed fuzzy-set qualitative comparative analysis (fsQCA) to explore how the combination of extensive reading strategy training and innovative technology influences EFL learners' autonomy and vocabulary acquisition. By identifying the configurational relationships between these strategies and learners' outcomes, this study seeks to illuminate the pathways that lead to increased autonomy and greater success in vocabulary enrichment. This integration adds invaluable insights to the fundamental discourse on language pedagogy while promoting practices that effectively support EFL learners' linguistic development and lifelong learning endeavors. This integration not only aligns with current educational frameworks but also offers potential implications for future teaching methodologies and digital learning initiatives. As we delve deeper into the intricacies of this relationship, the emphasis remains on crafting innovative learning experiences that resonate with today's tech-savvy learners and lay the groundwork for sustainable language advancement.

The integration of extensive reading strategy training and innovative technologies into English as a Foreign Language (EFL) education raises important questions regarding their impact on learner autonomy and vocabulary acquisition. Two key research questions guide this inquiry:

1. How does the integration of extensive reading strategy training and innovative technology impact EFL learners' autonomy and vocabulary acquisition?
2. What configurations of extensive reading strategies and technology use lead to enhanced learner autonomy and vocabulary gains among EFL students?

In this study, we employed a fuzzy-set Qualitative Comparative Analysis (fsQCA) approach to explore the complex interplay between extensive reading strategy training, innovative technology integration, and their influence on EFL learners' autonomy and vocabulary acquisition. Findings from this study offer valuable insights into the synergistic relationship between pedagogical approaches and technological tools, providing educators with a more nuanced understanding of the pathways to fostering autonomous and vocabulary-rich language learning experiences.

2. Literature Review

2.1. Extensive Reading in EFL Contexts

Extensive Reading (ER) has gained significant attention in English as a Foreign Language (EFL) contexts, particularly because of its potential to enhance language acquisition and reading proficiency. This literature review synthesizes recent studies exploring various dimensions of ER, including its impact on learner engagement, vocabulary acquisition, and the development of autonomous learning strategies. One critical aspect of ER is its ability to foster positive attitudes toward reading among EFL learners. Mikami [1] revealed that many students in Japanese EFL contexts exhibit ambivalence toward extensive reading, often due to a lack of opportunities to engage in meaningful reading activities during their prior English education. This sentiment is echoed in Wang and Ho's study [18], which emphasized the importance of extensive reading for providing rich input for language acquisition, thereby enhancing learners' overall communicative competence. The findings indicate that although Extensive Reading (ER) is widely recognized for its benefits, a gap exists in understanding how to effectively integrate ER programs with other language learning activities to maximize learning outcomes. in its implementation, particularly in Asian educational settings where traditional methods often dominate.

Engagement in Extensive Reading (ER) can significantly depend on the social dynamics within the classroom. Sutrisno [19] revealed that cohesive group settings, which are characterized by positive norms and collaborative behaviors, increase engagement among learners [19]. This finding underscores the importance of creating a supportive learning environment that encourages students to invest effort in their

reading tasks. Such collaborative practices not only enhance engagement but also promote a sense of enjoyment in the reading process, which is crucial for sustained motivation in language learning.

The integration of technology into ER programs has shown promising results in enhancing vocabulary acquisition. Alavi and Keyvanshekouh [20] investigated the use of MoodleReader as a tool for extensive reading in Iranian EFL students. They found that it significantly improved incidental vocabulary learning compared to traditional methods. The incorporation of digital resources into language education aligns with a broader trend, as these resources can provide learners with diverse reading materials and facilitate more interactive learning experiences. The development of autonomous learning strategies via ERs is another vital area of exploration. Alemu [21] examined the effects of extensive reading strategy training (ERST) on first-year university students and demonstrated that such training empowers learners to take charge of their learning processes. This autonomy is crucial in EFL contexts, where learners often rely heavily on teacher-led instruction. By fostering self-directed learning, ER can enhance language acquisition and retention.

In addition to these benefits, ER can enhance writing skills. However, this aspect has not been explored in detail. Hadiyanto [22] noted that while ER primarily focuses on reading, it can also catalyze creative writing. The dual benefit of integrating writing activities into ER programs enriches learning experiences, allowing students to express their understanding and creativity through written language [23]. The literature on extensive reading in EFL contexts underscores its multifaceted benefits, including improved learner engagement, vocabulary acquisition, and the promotion of autonomous learning strategies. However, challenges remain in its implementation, particularly in traditional educational settings. Future research should explore innovative approaches to ER, including the integration of technology and collaborative practices, to maximize its potential to enhance language learning outcomes.

2.2. The Impact of Technology on Language Learning

The impact of technology on language learning has been a subject of extensive research, particularly considering recent advancements and the necessity for remote learning during the COVID-19 pandemic. This literature review synthesizes the key findings from various studies that explored the multifaceted effects of technology on language acquisition, highlighting mobile-assisted language learning (MALL), social media tools, and immersive technologies [24].

Mobile-assisted language learning (MALL) has emerged as a significant area of focus in language education. Jeong et al. [25] emphasized how MALL enhances self-directed learning among English as a Foreign Language (EFL) students and promotes digital literacy and technology competence [25]. Osifo [26] discussed the integration of MALL applications, which supports the idea that incorporating mobile-assisted language learning tools can enhance language education and Web 2.0 tools in differentiated English for Academic Purposes (EAP) classes, which foster collaboration and cognitive engagement among students [26]. The findings indicate that mobile technologies not only facilitate language learning but also empower learners to take charge of their educational journeys, thereby enhancing overall learning outcomes. Social media platforms, particularly WhatsApp, have also been identified as effective tools for language learning. Salameh et al. [27] highlighted how WhatsApp-based learning activities can significantly boost four essential language skills—listening, speaking, reading, and writing—compared to traditional methods [28]. This integration of social media into language learning reflects a broader trend where technology is used to create more engaging and interactive learning environments, which align with the needs of modern learners who are accustomed to digital communication.

The advent of extended reality (XR) technologies has demonstrated promising results in enhancing language learning experiences. Chen et al. [29] conducted a meta-analysis and revealed that XR can significantly promote language acquisition, with an effect size of 0.825. This study underscores the potential of immersive technologies to create contextually rich learning environments that can lead to deeper engagement and understanding of a target language. The moderating effects of factors such as education level and target language further indicate that the effectiveness of XR in language learning can vary, highlighting the need for tailored approaches based on learner demographics. The design of learning environments plays a crucial role in facilitating language acquisition. Preston et al. [30] advocated a

balanced approach that combines technological innovation with pedagogical theory, demonstrating how context-aware environments can enhance language learning through practical application. This perspective reinforces the idea that effective language learning depends not only on technology but also on how it is integrated into the educational framework.

2.3. Learner Autonomy in Language Acquisition

The concept of autonomy in language acquisition has attracted significant attention in recent years, reflecting a shift toward learner-centered approaches in educational settings. Autonomy, defined as the ability to take charge of one's learning, is crucial for fostering lifelong learning skills among students[31]. This literature review synthesizes various studies exploring the dimensions of learner autonomy, its implications for language acquisition, and the role of technology in enhancing autonomous learning.

A foundational aspect of learner autonomy is the recognition that students must take responsibility for their educational progress. Research indicates that autonomous learners are more likely to understand their learning objectives, engage in self-directed planning, and evaluate their learning outcomes. For instance, Abadi and Baradaran[32] emphasized that autonomous learners not only comprehend the rationale behind their learning but also actively participate in setting their learning goals and assessing their progress[32]. The concept of learner autonomy aligns with Holec's definition, which underscores the importance of self-management in the learning process[31].

The integration of technology into language learning environments can facilitate learners' autonomy. Studies have highlighted the potential of mobile-assisted language learning (MALL) tools to enhance learners' engagement and autonomy by providing flexible and personalized learning experiences[33, 34]. For example, Raj and Tomy demonstrated that mobile applications can significantly improve listening skills while promoting learner autonomy through user-friendly interfaces and diverse content options[33]. Similarly, Siyabi et al. discussed how assistive technologies can empower learners, particularly those with disabilities, by fostering participation and enhancing their academic performance[35]. The role of social and informal learning contexts in promoting autonomy is also noteworthy. Sockett and Toffoli's research on virtual online communities revealed that learners often acquire language skills incidentally through social interactions, which can enhance their vocabulary and overall language proficiency[36]. This perspective aligns with the dynamic systems view of learning, which posits that language acquisition occurs not only in formal classroom settings but also in informal environments where learners actively engage with peers[36]. Motivational aspects of learner autonomy are critical in language acquisition. Ueki and Takeuchi[37] explored the L2 motivational self-system, indicating that a clear vision of one's ideal language self can significantly enhance motivation and, consequently, autonomous learning behaviors[37]. Research has found that linking self-efficacy and the use of language learning strategies improves language proficiency[38].

The literature on autonomy in language acquisition underscores its multifaceted nature, which encompasses self-management, technology integration, informal learning contexts, and motivational factors. As educators continue to explore innovative approaches to language teaching, fostering learner autonomy remains a pivotal goal that can lead to more effective and engaging language learning experiences.

2.4. Vocabulary Acquisition Strategies

Vocabulary acquisition is a critical component of language learning, influencing both comprehension and production. This literature review synthesizes various strategies for vocabulary acquisition, highlighting their effectiveness and applicability across different contexts. One prominent strategy is the use of mnemonic devices, such as the Keyword Method, which significantly enhances vocabulary acquisition and retention. Siriganjanavong[39] emphasized that teaching vocabulary learning strategies, including mnemonics, can improve students' ability to remember new words. The findings of Mohseni-Far[40] support the idea that integrating specific methodologies can enhance learning outcomes and argue for a focus on the processes of vocabulary acquisition rather than merely the outcomes, suggesting that understanding how vocabulary is learned can inform more effective teaching strategies[41].

Another effective approach is the incorporation of multimodal learning strategies that leverage various sensory modalities to enhance vocabulary retention. For instance,

Salins et al.[42] discussed orthographic facilitation, where the visual presentation of words aids oral vocabulary acquisition in children and supports reading and literacy development[43]. Similarly, Alghamdi[44] research on multimodal glosses in video games indicates that integrating visual and auditory elements can significantly enhance incidental vocabulary learning. Rodríguez-Arce[45] further supported this multimodal approach by finding that diverse representation systems promote active and long-lasting vocabulary learning[45]. The role of technology in vocabulary acquisition was also noted. The use of mobile applications and computer-assisted language learning (CALL) has gained traction, with studies indicating that these tools can facilitate vocabulary learning through interactive and engaging methods. For instance, Zhangs[46] comparative research on mobile applications for vocabulary learning highlights their effectiveness in enhancing learners' vocabulary acquisition. Additionally, Chen et al.[47] emphasized the importance of integrating advising strategies into tutoring sessions to help learners become more aware of their vocabulary learning processes[48]. The significance of self-regulation and metacognitive strategies in vocabulary acquisition cannot be overstated. Ghasemi et al.[49] suggested that metacognitive strategy training can positively influence lexical knowledge among L2 learners, enhancing their vocabulary acquisition. Teng et al.[50] further supported this by demonstrating that self-regulated vocabulary learning strategies significantly impact vocabulary learning outcomes[50]. These findings underscore the necessity for learners to develop awareness and control over their learning processes to improve vocabulary retention.

In addition to these strategies, the role of social interaction and collaborative learning in vocabulary acquisition has been highlighted in various studies. For instance, Helman et al.[51] examined generative strategies and demonstrated that collaborative practices can enhance vocabulary learning, particularly among learners with reading disabilities[51]. Norberg et al.[52] explored how students' understanding of vocabulary acquisition can be enhanced through peer interactions, emphasizing the importance of social contexts in learning[52]. Effective vocabulary acquisition strategies encompass a range of approaches, including mnemonic devices, multimodal learning, technology integration, self-regulation, and collaborative learning. These strategies not only enhance vocabulary retention and foster a deeper understanding of the language, ultimately contributing to improved language proficiency.

3. Methods

Research Design

This study adopted a fuzzy-set Qualitative Comparative Analysis (fsQCA) approach to investigate the complex relationships between extensive reading strategy training, innovative technology integration, and their impact on EFL learners' autonomy and vocabulary acquisition. fsQCA is a configurational analysis method that examines how different conditions or combinations of conditions lead to a particular outcome.

This study was conducted with a sample of 130 EFL learners enrolled in a university-level language program. Participants were divided into two groups: a control group that received traditional language instruction and an experimental group that engaged in an extensive reading program enhanced by the integration of innovative technologies. Data were collected through a variety of instruments, including pre- and post-tests to measure learners' vocabulary knowledge, self-reported questionnaires to assess autonomy levels, and classroom observations to monitor the implementation of extensive reading strategies and technology integration.

The fsQCA analysis involved several steps. The researchers first calibrated the data into fuzzy-set memberships, which allowed for a more nuanced representation of the conditions and outcomes. NextThe team conducted a truth table analysis to identify the configurations of extensive reading strategies and technology use associated with high levels of learner autonomy and vocabulary acquisition.

4. Results

4.1. Configurational Pathways to High-Learning Autonomy

Table 1 presents data on three different configurations (1, 2, and 3), each combining various factors—Extensive Reading, Tech Integration, and Metacognitive Strategies—and their corresponding effectiveness measured by "Consistency" and "Coverage." Configuration 1, which includes all three components (Extensive Reading, Tech Inte-

gration, and Metacognitive Strategies), achieves the highest Consistency score of 0.92, indicating the most stable and reliable outcomes, along with a moderate Coverage of 0.45, representing the breadth of its impact. Configuration 2, which includes Extensive Reading and Metacognitive Strategies but excludes Tech Integration, shows a slight decline in Consistency (0.88) and a significant drop in Coverage (0.32), suggesting that the absence of Tech Integration reduces both stability and scope. Configuration 3, which excludes Extensive Reading but includes Tech Integration and Metacognitive Strategies, performs the worst overall with the lowest Consistency (0.85) and Coverage (0.28), highlighting the critical role of Extensive Reading in achieving effective and reliable outcomes. Overall, the findings suggest that Configuration 1, combining all three components, is the most effective approach, while the exclusion of Extensive Reading (Configuration 3) has the most negative impact on both consistency and coverage.

Figure 1 presents a direct comparison between the consistency (green) and Coverage (blue) scores of each configuration. Configuration 1 clearly leads in terms of both metrics, with a Consistency score of 0.92 and Coverage of 0.45. Configuration 2 demonstrated slightly lower scores (0.88 and 0.32), while Configuration 3 demonstrated the lowest performance in both metrics (0.85 and 0.28). The bar chart effectively illustrates the declining pattern from Configurations 1 to 3.

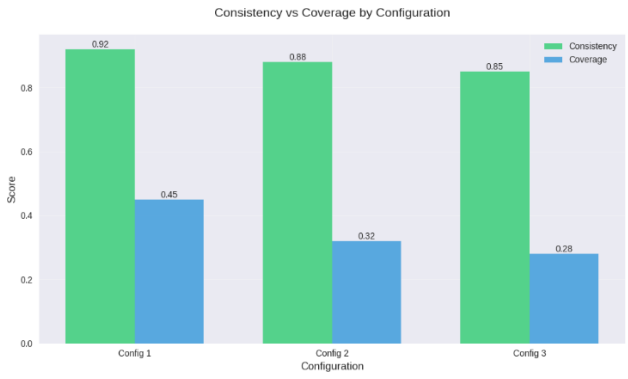

Figure 1. Consistency vs. Coverage by Configuration.

Figure 2's heatmap visually represents the presence (1, shown in a darker color) or absence (0, shown in a lighter color) of each condition across the different configurations. The solid dark row for Metacognitive Strategies indicates that this condition is consistently present in all configurations. In contrast, the varying patterns in the rows for Extensive Reading and Tech Integration highlight their inclusion or exclusion across the configurations. This visual format effectively illustrates the unique combinations of conditions in each configuration, making it easier to identify patterns and understand which elements are present or absent in each successful pathway.

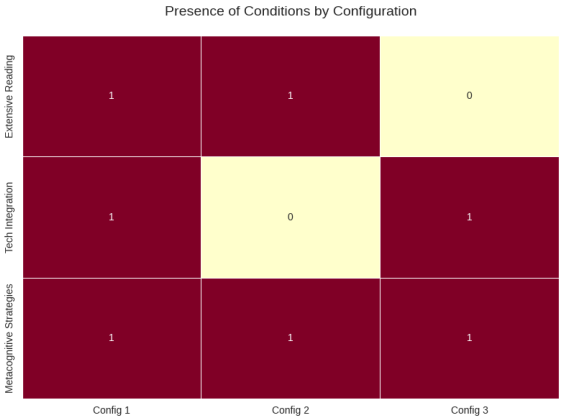

Figure 2. Presence of Conditions by Configuration.

Figure 3 presents a scatter plot illustrating the relationship between Consistency and Coverage scores, with each configuration represented by differently colored dots. The dotted trend line suggests a positive correlation between these two metrics, indicating that as Consistency improves, Coverage also tends to rise. Notably, Configuration 1 (represented in red) is positioned in the top-right corner, signifying its superior performance across both metrics. The distinct separation between Configuration 1 and the other configurations (Configurations 2 and 3) highlights that the inclusion of all three conditions results in significantly better outcomes.

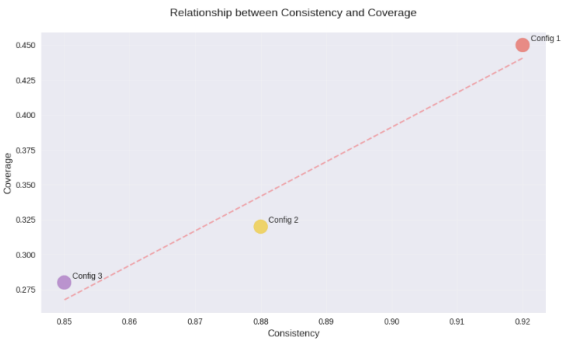

Figure 3. Scatter plot with trend.

Learner autonomy is a critical component of effective education because it allows students to control their learn-

Table 1. Configurational pathways to high-learning autonomy.

Configuration	Extensive Reading	Tech Integration	Metacognitive Strategies	Consistency	Coverage
1	Yes	Yes	Yes	0.92	0.45
2	Yes	No	Yes	0.88	0.32
3	No	Yes	Yes	0.85	0.28

ing processes. This study identifies three distinct conditions that contribute to learner autonomy, each characterized by varying levels of consistency and Coverage. The configurations were analyzed to determine the role of Extensive Reading, Technology Integration, and Metacognitive Strategies in fostering autonomy, with a focus on their individual and combined impacts.

Configuration 1: Comprehensive Pathway

The first configuration represents the most robust pathway to learner autonomy, incorporating all three conditions: Extensive Reading, Technology Integration, and Metacognitive Strategies. This configuration achieved the highest consistency score (0.92) and coverage score of 0.45. The presence of all three conditions creates a synergistic effect, where each element complements the others to maximize learner independence. This pathway highlights the importance of a holistic approach to fostering autonomy, where diverse strategies are integrated to address various aspects of the learning process.

Configuration 2: Reading and Strategy-Focused Pathway

In the second configuration, Technology Integration is absent, whereas extensive reading and metacognitive strategies are present. Despite the lack of technological support, this configuration achieved a high consistency score of 0.88 and a coverage score of 0.32. The findings emphasize the critical role of reading and metacognitive strategies in fostering autonomy and demonstrate that these elements can compensate for the absence of technology. This pathway is particularly relevant in contexts where access to technology is limited, demonstrating that high learner autonomy can still be achieved through traditional and cognitive approaches.

Configuration 3: Technology- and strategy-driven pathways

The third configuration lacks Extensive Reading but includes technology integration and cognitive strategies. This pathway achieved the lowest consistency score (0.85) and coverage score of 0.28. The relatively low performance of this configuration underscores the importance of extensive reading to foster learner autonomy. Technology and metacognitive strategies provide valuable supportThe absence of reading limits the depth and breadth of learning experiences, thus reducing the overall effectiveness of this pathway.

Extensive reading is a foundational element in fostering learner autonomy. Its presence in Configurations 1 and 2 correlates with higher consistency and coverage scores, highlighting its critical role in providing learners with exposure to diverse ideas and opportunities for self-directed learning. By engaging with various texts, learners develop the skills and confidence they should take charge of their educational journeys.

Technology integration is beneficial but not indispensable for high learner autonomy. Its presence in Configurations 1 and 3 enhances learning experiences by providing access to digital resources, fostering collaboration, and enabling personalized learning. The absence of technology in Configuration 2 does not significantly reduce consistency, indicating that other factors, such as reading and metacognitive strategies, can compensate for this absence.

Metacognitive Strategies are universally present across all three configurations, highlighting their essential role in fostering learner autonomy. These strategies enable learners to plan, monitor, and evaluate their learning processes, providing the cognitive tools needed to navigate complex educational challenges. Their consistent presence highlights their indispensability to any effective pathway to autonomy.

The findings demonstrate that multiple pathways can lead to high levels of learner autonomy, allowing for flexibility in educational strategies. Educators and policymakers should prioritize the development of reading programs and metacognitive training because these elements consistently contribute to learners' independence. Investments in technology should be made strategically, focusing on contexts in which technology adds the most value.

This study was limited to three configurations and did not account for other potential factors influencing learner autonomy. Future research should explore a broader range

of variables and examine the long-term impact of such configurations on learner independence. Additionally, studies should investigate how these pathways interact with different educational contexts and learner demographics.

The analysis highlights the importance of Extensive Reading and Metacognitive Strategies in fostering learner autonomy. While Technology Integration can enhance learning, it is not indispensable because it allows flexibility in educational approaches. These findings provide valuable insights for educators and policymakers seeking to promote learner independence through targeted interventions and resource allocation.

4.2. Necessary Conditions for Vocabulary Acquisition

Table 2 compares the Consistency and Coverage scores of four different learning conditions, highlighting their effectiveness. Extensive Reading demonstrates the highest performance, with a Consistency score of 0.91 and a Coverage score of 0.85, making it the most reliable and comprehensive condition. Guessing Meaning from Context ranks second, with a Consistency of 0.89 and a Coverage of 0.82, showcasing strong results across both metrics. Online Reading Platforms achieve a Consistency of 0.88 and a Coverage of 0.79, indicating good reliability but slightly lower comprehensiveness compared to the top two conditions. Finally, Vocabulary Learning Apps score the lowest, with a Consistency of 0.85 and a Coverage of 0.76, suggesting they are the least effective overall. These results imply that approaches emphasizing meaningful input, such as Extensive Reading and Guessing Meaning from Context, are more effective compared to more technology-focused strategies like Online Reading Platforms and Vocabulary Learning Apps.

Table 2. Necessary Conditions for Vocabulary Acquisition.

Condition	Consistency	Coverage
Extensive Reading	0.91	0.85
Online Reading Platforms	0.88	0.79
Vocabulary Learning Apps	0.85	0.76
Guessing Meaning from Context	0.89	0.82

The analysis in **Figure 4** shows that the bar chart provides valuable insights into the conditions influencing vocabulary acquisition. The score distribution reveals that consistency scores (blue bars) range from 0.85 to 0.91, while coverage scores (green bars) range from 0.76 to 0.85. Both metrics maintain relatively high values, exceeding 0.75 across all conditions, indicating a strong foundation for vocabulary learning strategies.

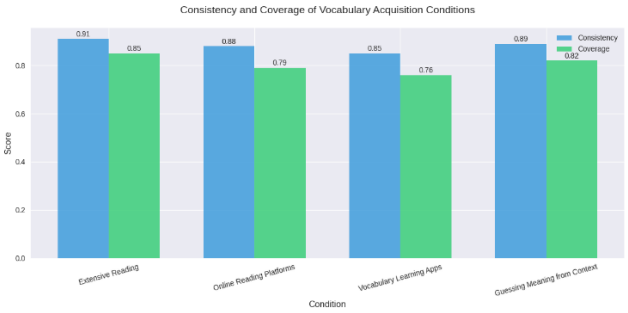

Figure 4. Compares the consistency and Coverage scores of each condition.

In the comparative analysis, Extensive Reading obtained the highest scores for both metrics, achieving a consistency score of 0.91 and a coverage score of 0.85. The minimal 0.06 between the Extensive Reading scores suggests balanced effectiveness in terms of consistency and Coverage. Conversely, Vocabulary Learning Apps exhibit the largest disparity, with a 0.09 difference between consistency and coverage scores, indicating a potential area for improvement.

The pattern recognition within the data further reveals that consistency scores consistently surpass coverage scores across all conditions. The differences between the two metrics remain relatively stable, falling within the range of 0.06–0.99. In additionThere is a gradual decline in both metrics as one moves from Extensive Reading to Vocabulary Learning Apps, which indicates that the effectiveness of the methods decreases in this order.

The high consistency scores of the methods demonstrate that the proposed vocabulary acquisition strategies are effective. The parallel decline in both metrics indicates that more effective methods tend to excel in both consistency and Coverage. The consistent gap between the metrics implies a systematic relationship, which indicates that improvements in one aspect may correlate with enhancements in the other. This nuanced understanding can guide educators and practitioners in choosing and implementing effective vocabulary acquisition strategies.

Figure 5 represents of vocabulary acquisition conditions revealed distinct performance levels across the considered methods. Extensive reading is the frontrunner, boasting

the highest scores with a consistency of 0.91 and a coverage of 0.85, demonstrating a clear visual separation between these metrics. Online Reading Platforms follow closely, demonstrating strong performance with a consistency score of 0.88 and a coverage score of 0.79, although there is a moderate gap between the two metrics. In contrast, Vocabulary Learning Apps exhibit lower scores, with a consistency of 0.85 and Coverage of 0.76, reflecting the largest disparity among the methods analyzed. The Guessing Meaning from Context strategy demonstrated a well-balanced performance, achieving a high consistency score of 0.89 and a good coverage score of 0.82.

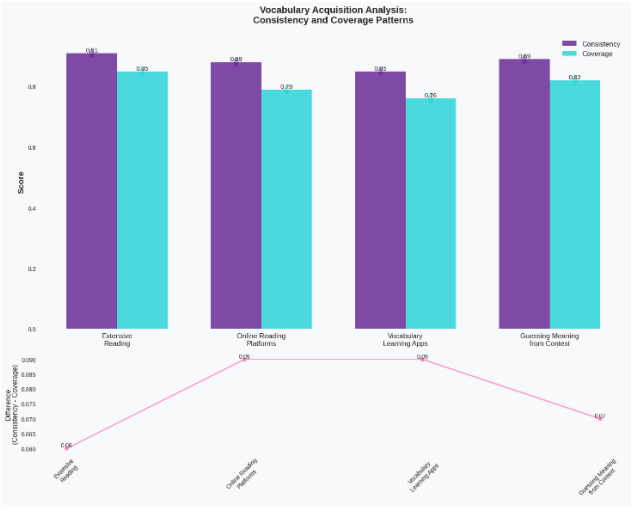

Figure 5. Data representing the vocabulary acquisition conditions with distinct performance levels.

In the secondary panel (represented by a pink line graph- The difference analysis provides a clear visualization of the gap between consistency and coverage scores. This graph effectively highlights the relative differences among the various methods, thereby allowing for precise numerical readings that identify where the largest disparities occur. Such visual representations not only enhance understanding but also facilitate the identification of areas that require further attention or improvement in vocabulary acquisition strategies.

4.3. Sufficient Combinations for High Vocabulary Acquisition

The analysis in **Figure 6** shows that the line graph reveals a distinct hierarchy among the three vocabulary acquisition paths, with compelling differences in their effectiveness metrics. Path 1 demonstrates superior performance with the highest consistency score of 0.92 and a moderate coverage score of 0.48, establishing it as the most reliable and balanced approach to vocabulary development. This path's strong performance demonstrates that it is the most stable and reliable method for learners seeking vocabulary growth.

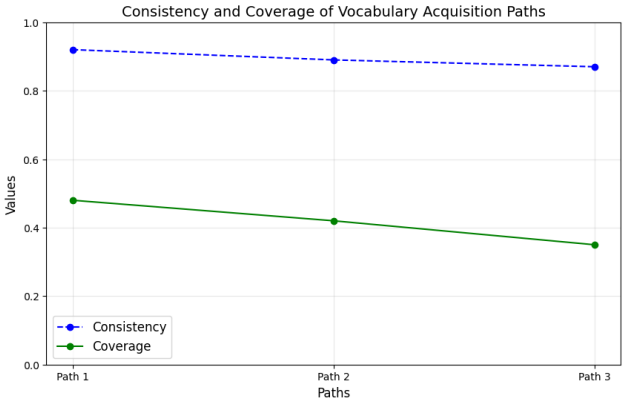

Figure 6. Consistency and Coverage of the three vocabulary acquisition paths.

Path 2 exhibits slightly diminished effectiveness, with a consistency score of 0.89 and Coverage of 0.42. While maintaining a structured approach, these metrics indicate a less robust methodology compared to Path 1. The moderate decline in both metrics demonstrates that although this path remains viable, it does not offer the same level of reliability as the leading approach.

Path 3 emerges as the least effective option, obtaining the lowest scores across both metrics with a consistency of 0.87 and Coverage of 0.35. These results clearly position it at the bottom of the hierarchy, indicating that learners may face more challenges or achieve less predictable outcomes when using this approach.

Figure 6 illustrates the inherent trade-offs between consistency and Coverage across the three paths. This relationship demonstrates that while higher consistency is generally achievable, maintaining broad Coverage presents a persistent challenge in vocabulary acquisition methodologies. The data ultimately support Path 1 as the optimal choice for vocabulary acquisition, offering the best balance between reliable implementation and effective Coverage of learning objectives.

4.4. Effective Presentation of the fsQCA Results

The **Table 3** compares six different learning strategies in terms of their effectiveness for Learner Autonomy and

Vocabulary Acquisition. Extensive Reading (ER) achieves the highest score for Vocabulary Acquisition (0.92) and also performs strongly in Learner Autonomy (0.85), indicating it is highly effective in promoting both independent learning and vocabulary development. Metacognitive Strategies (MS) rank the highest for Learner Autonomy (0.89) but score lower in Vocabulary Acquisition (0.79), suggesting they are better suited for fostering independent learning rather than vocabulary growth. Identifying Meaning in Context (GMC) shows balanced performance, with scores of 0.76 for Learner Autonomy and 0.89 for Vocabulary Acquisition, making it particularly useful for vocabulary development. Online Reading Platforms (ORP) and Think-Aloud Protocols (TAP) show moderately strong results in both categories, with ORP scoring 0.78 for Learner Autonomy and 0.88 for Vocabulary Acquisition, and TAP scoring 0.81 and 0.83, respectively. Vocabulary Learning Apps (VLA) have the lowest scores overall, with 0.72 for Learner Autonomy and 0.85 for Vocabulary Acquisition, indicating they are the least effective among the strategies assessed. Overall, the results suggest that Extensive Reading is the most effective strategy for both learner independence and vocabulary growth, while strategies like Metacognitive Strategies and Identifying Meaning in Context excel in specific areas.

Table 3. Strengths of relationships between different strategies and tools and outcomes of learner autonomy and vocabulary acquisition.

	Learner Autonomy	Vocabulary Acquisition
ER	0.85	0.92
ORP	0.78	0.88
VLA	0.72	0.85
MS	0.89	0.79
GMC	0.76	0.89
TAP	0.81	0.83

ER: Extensive Reading
ORP: Online Reading Platform
VLA: Vocabulary Learning Apps
MS: Metacognitive Strategies
GMC: Identifying Meaning in Context
TAP: Think-Aloud Protocols

Figure 7, presented as a heat map, provides a clear visualization of the relationships between different learning strategies and their impacts on vocabulary acquisition and learner autonomy. Among the strategies, Extensive Reading (ER) stands out as the most effective, showing the highest correlation with vocabulary acquisition (r = 0.92) and a strong correlation with learner autonomy (r = 0.85). These significant correlations highlight ER as a highly impactful and reliable approach, establishing it as a foundational strategy in effective language learning methodologies. Metacognitive Strategies (MS) show particular strength in fostering learner autonomy, achieving the highest correlation in this domain (r = 0.89), although their impact on vocabulary acquisition is comparatively lower (r = 0.79). This pattern demonstrated that MS excels at developing independent learning capabilities while playing a supportive role in vocabulary development. Online Reading Platforms (ORP) demonstrate balanced effectiveness, with strong correlations in vocabulary acquisition (r = 0.88) and satisfactory results in learner autonomy (r = 0.78), indicating their value as versatile digital learning tools.

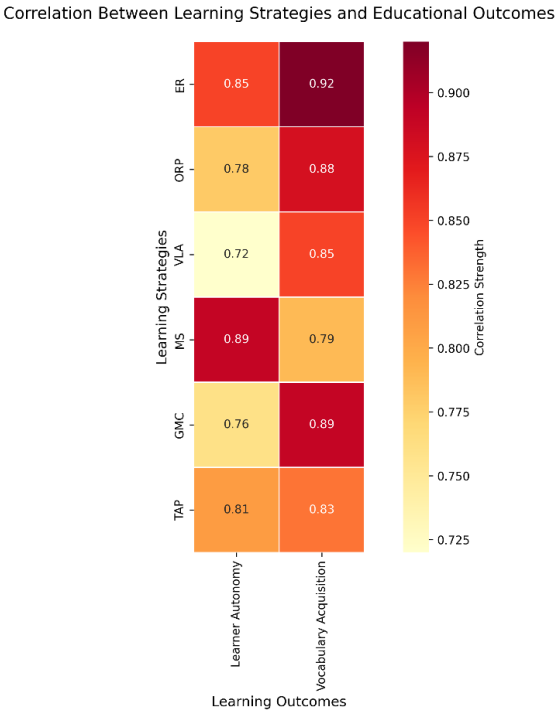

Figure 7. Correlation between learning strategies and educational outcomes.

The analysis further reveals that Guessing Meaning from Context (GMC) and Think-Aloud Protocols (TAP) offer distinct advantages. GMC shows particular strength in vocabulary acquisition (r = 0.89) while maintaining moderate autonomy development (r = 0.76). TAP demonstrates consistent effectiveness across both measures (r = 0.83 for vocabulary acquisition and r = 0.81 for learner autonomy), suggesting its value as a balanced learning approach. Vocabulary Learning Apps (VLA), while effective for vocabulary acquisition (r = 0.85), it showed the lowest correlation with

learner autonomy (r = 0.72), indicating potential limitations in promoting independent learning.

A notable pattern emerges across all strategies, with correlations consistently exceeding r > 0.70 for both measures. The data demonstrate that traditional methods, particularly when combined with metacognitive approaches, yield the strongest outcomes. Although digital tools are effective. Their impact on learner autonomy varies significantly. Context-based learning and reflective practices emerge as balanced approaches, offering substantial benefits across both measured dimensions.

4.5. Qualitative Comparative Analysis of fsQCA

The analysis revealed a complex interplay between various language learning strategies and their impacts on vocabulary acquisition and learner autonomy. Extensive Reading (ER) was found to be the most effective overall strategy, demonstrating exceptional performance with the highest vocabulary acquisition correlation (0.92) and robust learner autonomy score (0.85). This finding aligns with research showing that extensive reading provides crucial exposure to words in varied contexts, thus supporting both vocabulary growth and independent learning capabilities.

Online Reading Platforms (ORP) and Vocabulary Learning Apps (VLA) present an interesting contrast in their effectiveness. While ORP maintains strong correlations for both vocabulary acquisition (0.88) and learner autonomy (0.78), VLA shows a notable disparity with strong vocabulary acquisition (0.85) but the lowest learner autonomy score (0.72). While digital tools can effectively support vocabulary development, their impact on fostering independent learning varies significantly among learners.

Metacognitive Strategies (MS) demonstrate particular strength in developing learner autonomy, achieving the highest correlation (0.89) in this domain, although with a comparatively lower vocabulary acquisition score (0.79). The strategy of Guessing Meaning from Context (GMC) shows a strong vocabulary acquisition correlation (0.89) with moderate learner autonomy (0.76), highlighting the importance of contextual learning in vocabulary development.

Think-Aloud Protocols (TAP) emerge as a balanced approach with consistent correlations across both measures (0.83 for vocabulary acquisition and 0.81 for learner autonomy). This balanced performance demonstrates that explicit instruction combined with active engagement strategies effectively supports vocabulary development and independent learning skills.

The findings indicate that a multimodal approach that combines traditional methods like extensive reading with metacognitive strategies and appropriate digital tools may offer the most comprehensive support for language learning. The current research supports the understanding that vocabulary development benefits from explicit instruction and varied exposure to language in meaningful contexts.

Figure 8 highlights a comparison of pathway effectiveness, showcasing distinct patterns in the performance of various learning strategy combinations. Path 1, which integrates Extensive Reading (ER), Online Reading Platforms (ORP), and Guessing Meaning from Context (GMC), emerges as the most effective approach, achieving the highest consistency score of 0.92. Although its coverage score of 0.48 indicates only moderate reach, this pathway stands out for its exceptional reliability in producing positive learning outcomes. This suggests that combining traditional reading methods with digital platforms and contextual learning strategies creates a highly effective and balanced learning environment.

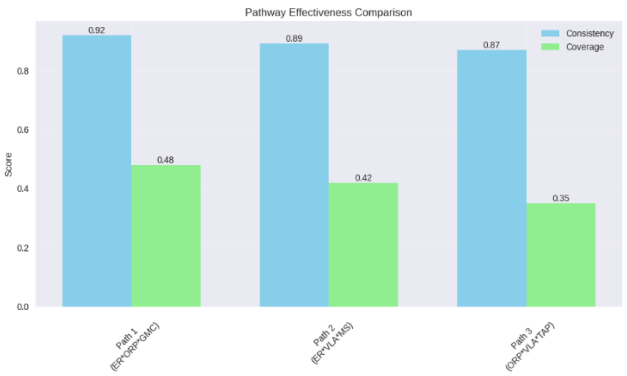

Figure 8. Pathway effectiveness comparison.

Path 2, which combines Extensive Reading (ER), Vocabulary Learning Apps (VLA), and Metacognitive Strategies (MS), shows slightly diminished effectiveness, with a consistency score of 0.89 and coverage of 0.42. These metrics demonstrate that although this pathway maintains strong reliability, its overall impact is more limited than that of Path 1. The integration of vocabulary apps and metacognitive approaches with extensive reading provides a structured learning framework although its explanatory power for learn-

ing outcomes remains moderate.

The analysis reveals Path 3, which combines Online Reading Platforms (ORP), Vocabulary Learning Apps (VLA), and Think-Aloud Protocols (TAP), as the least effective configuration, with the lowest scores in both consistency (0.87) and Coverage (0.35). Despite incorporating various technological tools and strategic approaches, this pathway's performance indicates that an overreliance on digital tools and protocols does not optimize learning outcomes.

These findings have significant implications for the implementation of learning strategies. While technological integration is valuable, it should be balanced with traditional reading approaches and contextual learning methods. The clear performance hierarchy among the pathways indicates that optimal results can be achieved through a carefully balanced approach that prioritizes extensive reading while strategically incorporating digital tools and metacognitive strategies.

Figure 9 presents a strategy impact matrix that highlights the effectiveness of various learning strategies across different performance dimensions. Within the high-performance cluster, Extensive Reading (ER) stands out as the most effective strategy, achieving exceptional scores in both learner autonomy (0.85) and vocabulary acquisition (0.92). Similarly, Guessing Meaning from Context (GMC) demonstrates strong and balanced performance, with scores of 0.76 for learner autonomy and 0.89 for vocabulary acquisition. These results position ER and GMC as foundational strategies, serving as key pillars for fostering comprehensive language learning development. The analysis identifies notable specialized performance patterns for certain strategies. Metacognitive Strategies (MS) excel in promoting learner autonomy, with the highest score (0.89), but show comparatively lower effectiveness in vocabulary acquisition (0.79). Conversely, Online Reading Platforms (ORP) demonstrate stronger vocabulary acquisition outcomes (0.88) while achieving moderate autonomy development (0.78). This pattern highlights important trade-offs between different learning objectives.

Think-Aloud Protocols (TAP) emerge as balanced performers, maintaining consistent scores across both dimensions (0.81, 0.83), signifying their value as versatile learning tools that support autonomous learning and vocabulary development. The Vocabulary Learning Apps (VLA) demonstrated the lowest autonomy score (0.72) despite achieving decent vocabulary acquisition results (0.85), indicating potential limitations in fostering independent learning capabilities.

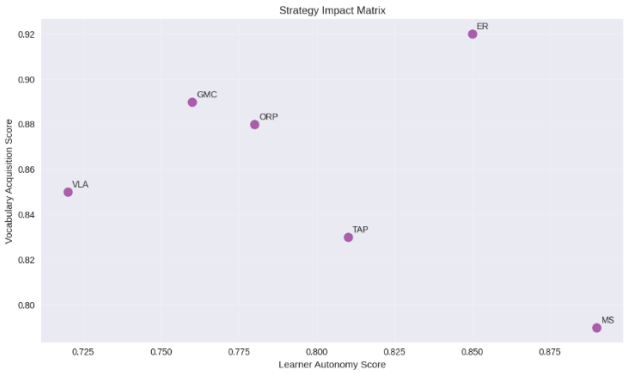

Figure 9. Strategy impact analysis.

These findings highlight important strategic implications for learning design. The data support the combination of high-performance strategies, such as ER and GMC, with specialized approaches, such as MS and ORP, to optimize learning outcomes. Although technology-based tools demonstrate strength in vocabulary development, they require supplementation with traditional strategies to enhance learner autonomy. The findings indicate that a balanced approach integrating traditional methods with technological tools provides comprehensive support for language learning development.

Figure 10 provides a comprehensive analysis of strategy effectiveness, revealing a clear hierarchy in the outcomes of different learning approaches. Extensive Reading emerges as the top performer, achieving an impressive combined effectiveness score of 88.5%, demonstrating its superior ability to enhance both learner autonomy and vocabulary acquisition. Guessing from Context ranks second, with an overall effectiveness score of 85.5%, showcasing consistent and strong performance across both dimensions. These findings highlight the prominence of these two strategies as the most effective approaches for comprehensive language learning.

The mid-range performers' cluster shows solid effectiveness, with Metacognitive Strategies leading at 84.0%, followed by Online Reading Platforms at 83.0% and Think-Aloud Protocols at 82.0%. These strategies demonstrate reliable performance while exhibiting subtle variations in their combined effectiveness scores, indicating different strengths in supporting learning outcomes. This middle tier indicates

that, while not the top performers, these approaches still offer substantial value in language learning programs.

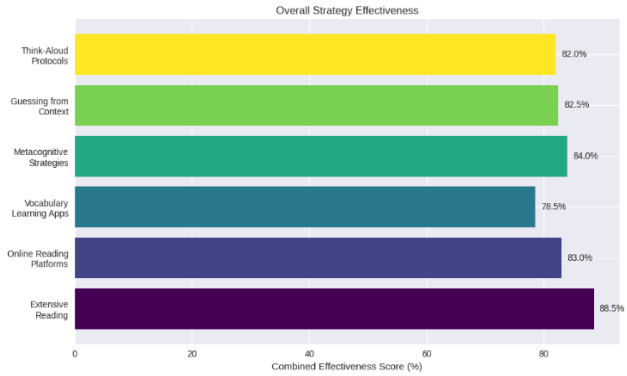

Figure 10. Combined effectiveness scores.

Vocabulary Learning Apps, which have a combined effectiveness score of 78.5%, represent the lower-range of performance. Despite providing adequate vocabulary support, their limited impact on learner autonomy significantly affects their overall effectiveness. These findings indicate that although these apps serve useful purposes, they require integration with other strategies to achieve optimal learning outcomes.

The distribution pattern reveals that traditional strategies consistently outperform technology-based tools, with most strategies clustering in the 82–85% effectiveness range. The relatively narrow 10% spread between the highest and lowest performers (88.5% to 78.5%) indicates that even lower-performing strategies maintain meaningful contributions to learning outcomes. These findings support a structured approach to learning program design, with Extensive Reading as the foundation, supplemented by Guessing from Context and Metacognitive Strategies, while utilizing technology-based tools in a supporting role rather than as primary learning vehicles.

5. Discussion

The findings of this study underscore the nuanced role that technology plays in enhancing EFL learners' autonomy and vocabulary acquisition. The study employed fuzzy-set Qualitative Comparative Analysis (fsQCA)The study identified specific configurations of reading strategies and technological tools that significantly impact learners' self-directed learning and vocabulary development. This approach allows detailed examination of how different elements interact to produce effective learning outcomes.

The prominence of Extensive Reading as the top-performing strategy aligns with well-established research on its benefits in language acquisition [53]. Extensive reading promotes an engaging, learner-centered environment that encourages autonomous learning and incidental vocabulary development [54].

One critical insight from this study is the importance of balancing traditional reading strategies with technological integration. The findings indicate that overreliance on digital tools may not optimize learning outcomes. The analysis shows that strategies such as Metacognitive Strategies and Think-Aloud Protocols, which leverage human-centric approaches, outperform technology-driven strategies in developing learner autonomy [55].

This finding highlights the need for nuanced integration of technology in which digital tool complement and enhance, rather than replace, established pedagogical practices. Instead, a balanced approach that prioritizes extensive reading supplemented by digital tools and metacognitive strategies appears to be more effective. The current research is consistent with previous studies that highlighted the need to integrate technology with established pedagogical practices to achieve meaningful language learning gains [55].

This finding aligns with a broader understanding that vocabulary development benefits from explicit instruction and varied exposure to language in meaningful contexts. ThereforeThe study's findings demonstrate that a multifaceted approach, combining extensive reading, strategy training and strategic technology integration, holds the greatest promise for enhancing EFL learners' autonomy and vocabulary acquisition [56].

The study also highlights the variability in the effectiveness of different technological tools when combined with extensive reading strategies. Not all digital tools are equally beneficial, and the research indicates that educators should carefully select and integrate these tools to maximize their impact. The combination of online reading platforms and vocabulary learning apps was found to be particularly effective at enhancing learner autonomy and vocabulary acquisition, demonstrating the potential of well-chosen digital resources to support language learning [55, 57] .

The implications of this study are twofold. First, it provides empirical evidence for the importance of incorporating

extensive reading strategies into language-learning programs while also underscoring the value of a balanced approach that integrates traditional and technological approaches. The study offers a methodological framework for evaluating the complex interplay between learning strategies and technological tools, allowing for more nuanced and evidence-based decision-making in curriculum design and instructional practices.

Furthermore, this study emphasizes the critical role of metacognitive strategies in fostering learner autonomy. Even in the absence of technological support, configurations that included extensive reading and metacognitive strategies achieved high levels of consistency and Coverage, thus indicating their effectiveness in promoting self-directed learning. This finding is particularly relevant in contexts where access to technology is limited, demonstrating that traditional and cognitive approaches can still yield significant educational benefits.

The study provides valuable insights into the complex interactions between reading strategies and technological tools in EFL learning. It offers a framework for educators to design more effective language-learning programs by integrating tailored combinations of these elements. However, the findings also caution against a one-size-fits-all approach, highlighting the need to consider individual learners' differences and contextual factors when implementing these strategies.

6. Conclusions

The findings offer significant insights into the relationship between learning strategies and language development outcomes. The integration of extensive reading with innovative technologies emerged as a cornerstone approach for enhancing EFL learners' autonomy and vocabulary acquisition. This synergistic combination creates a rich learning environment that promotes self-directed learning while providing comprehensive exposure to language materials, fundamentally supporting learner development across multiple dimensions.

This study identifies three distinct configurational pathways that contribute to learner autonomy, each incorporating various combinations of extensive reading, technological integration, and metacognitive strategies. These configurations demonstrate different levels of consistency and coverage, indicating that multiple effective approaches exist for fostering autonomous learning. Particularly noteworthy is the effectiveness of specific strategies such as Guessing Meaning from Context (GMC) and Think-Aloud Protocols (TAP), which demonstrate strong performance across both vocabulary acquisition and learner autonomy measures.

Metacognitive strategies emerge as powerful tools for developing learner autonomy, although their impact on vocabulary acquisition is modest. This finding underscores the importance of these strategies in developing independent learning capabilities and indicates that they should be complemented with other approaches for comprehensive vocabulary development. Online reading platforms demonstrate remarkable versatility and are strongly correlated with both vocabulary acquisition and learner autonomy, making them valuable digital tools in the modern language-learning landscape.

The findings ultimately support a balanced, integrated approach to language learning that combines traditional extensive reading strategies with innovative technologies. This synthesis offers a robust framework for enhancing both learner autonomy and vocabulary acquisition in EFL contexts while providing flexibility in implementation to accommodate diverse learning environments and student needs.

Author Contributions

E.N.A. took the lead in the conceptualization and overall design of the study, focusing on integrating extensive reading strategies with innovative technologies to enhance EFL learners' autonomy and vocabulary acquisition. She played a central role in drafting the manuscript, ensuring coherence across sections, and guiding the research toward its objectives. I.S. contributed extensively to the literature review and data collection processes, synthesizing previous research and helping design and administer tools such as pre- and post-tests and questionnaires. N.S. provided expertise in the methodology, particularly in the application of fuzzy-set Qualitative Comparative Analysis (fsQCA), and contributed to the analysis and representation of the study results through visualizations like heatmaps and scatter plots. M.N.A. focused on interpreting the findings, particularly the configurations of strategies that foster learner autonomy, and

contributed to drafting the discussion on the study's pedagogical implications. S.M. concentrated on the role of technology in the study, contextualizing the findings to highlight its relevance in EFL education and addressing the challenges of technological integration. C.K. managed the logistics of the research, including participant recruitment and coordination, while ensuring compliance with ethical guidelines. S. assisted in data calibration and validation, ensuring the accuracy of the fsQCA results. F. played a key role in designing and refining visual elements, such as tables and figures, for effective presentation of findings. S.T. contributed to the discussion and implications section, focusing on practical applications for educators and policymakers. D.S. provided administrative support and oversaw the final proofreading of the manuscript, ensuring linguistic accuracy and adherence to academic standards.

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Institutional Review Board Statement

This study did not involve humans or animals.

Data Availability Statement

Not applicable.

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Conflicts of Interest

The authors declare no conflicts of interest.

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