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AN EXPERIMENTAL STUDY ON THE EFFECT OF SPACED REPETITION TECHNIQUE ON VOCABULARY RETENTION AMONG PRIMARY SCHOOL STUDENTS

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Abstract
Vocabulary development is fundamental to effective language learning, as it enhances learners' ability to recall, comprehend, and use words meaningfully. The Spaced Repetition Technique (SRT) has shown promise in improving long term vocabulary retention; however, its application in regular classroom settings remains limited. This experimental mixed-methods study examined the impact of SRT on vocabulary acquisition and retention among Pakistani primary school students, where conventional instruction often depends on rote memorization with minimal lasting benefits. Data were collected through pre- and post-tests administered to control and experimental groups, complemented by teacher and student questionnaires. Quantitative findings revealed that students exposed to SRT demonstrated significantly greater vocabulary retention and application in both oral and written contexts compared to those taught through traditional methods. Qualitative results further indicated that participants found SRT tools such as flashcards, scheduled reviews, and interactive activities, are more engaging and effective than mechanical drills. Grounded in cognitive learning and memory reinforcement theory, the study concludes that incorporating SRT in primary-level English instruction enhances vocabulary learning and student engagement, offering valuable implications for curriculum design and pedagogical practices in Pakistani education.

Keywords: *Spaced repetition technique, vocabulary retention, primary education, language learning, experimental study.*

1. Introduction

Language is a priceless treasure from God to humanity. Without it, humans would have stayed foolish animals. Language is everywhere. This presence is evident in our thoughts, dreams, relationships, discussions, prayers, meditations, traditions, and ceremonies. Language is the most effective means to acquire information of the past, assess the present, and forecast the future. Language unites society through both verbal and nonverbal means. Sapir (1921) states that language's main purpose is to enable self-expression through a system of constructed symbols, which is not intuitive. Language consists of various parts. Phonological, structural, lexical, and grammatical elements make up the English language. Listening, speaking, writing, and reading

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are the four key skills of vocabulary. Vocabulary building aids language learning. Building a pupil's vocabulary depends on the enthusiasm of the instructor and the student. Language learners should focus on building their vocabulary. Progress in grammar is noted, but significant advancement requires vocabulary (Wilkins, 1972). Native speakers and language learners often differ in the size of their mental lexicon (Laufer, 1998). A large vocabulary is essential for effective communication. Laufer (1989) stated that 95% of vocabulary is needed for understanding written tests, while Hu and Nation (2000) suggested that 98% to 99% is essential for comprehending written speech. Nation (2006) states that reading authentic materials requires about 8,000 to 9,000 word families, emphasizing the importance of vocabulary mastery for primary school students learning real words.

Vocabulary is the foundation of communication. Anyone learning a second language has likely felt the frustration of forgetting a word they just encountered. Teachers who design specific classroom environments help students remember new vocabulary. Key factors for a positive learning environment are student motivation, vocabulary introduction methods, and memory criteria. A strong vocabulary is essential for language learning in many areas. It aids students in understanding written and spoken language, expressing thoughts clearly, and engaging in better conversations. A large vocabulary enhances reading comprehension by making it easier to decode new words and boosts writing creativity and quality. A large vocabulary aids students in understanding others and expressing themselves clearly, crucial for effective listening and speaking. Understanding academic materials with specialized vocabulary and excelling in language exams, essays, and presentations requires a large vocabulary. Understanding a language's idioms and culturally unique phrases requires awareness of its cultural traits, which can be enhanced by expanding vocabulary. Vocabulary growth aligns with language proficiency, enhancing students' overall competence. Not knowing enough words can limit understanding, communication, academic success, and overall language skills. To enhance language learning, learners should focus on expanding their vocabulary. Vocabulary instruction is essential for language acquisition as words are the building blocks of all languages (Alqahtani, 2015).

Learning a language is nearly impossible without words; human interaction relies on them. Teaching vocabulary is challenging as many teachers lack confidence in current techniques and are unsure how to prioritize vocabulary acquisition in the classroom (Berne & Blachowicz, 2008). Enhancing a student's vocabulary is essential for language instruction, according to educators and students (Walters, 2004). Teaching English involves introducing new words to non-native speakers. Educators will face various challenges during instruction. They struggle to teach students effectively for positive outcomes. Teachers worry about their students' future due to the distinct nature of vocabulary teaching compared to their native language. Teaching English to youngsters differs from teaching it to adults. The instructor must find and prepare the best teaching methods for students. A good teacher should equip themselves with various techniques. Teachers need to be innovative and knowledgeable to engage students effectively. Teachers should recognize their students' traits. To achieve language instruction goals, effective methods and suitable materials must be established first. There are various ways to expand vocabulary. English teachers introducing new vocabulary to students should consider a few factors. English teachers must ensure students learn, practice, and review new vocabulary regularly to aid retention. Teachers' approaches are influenced by course material, available time, and their emphasis on student learning (Takač & Singleton, 2008).

Spaced repetition is a widely recognized method that teachers can use to help students enhance their vocabulary learning. Spaced repetition enhances memory retention and aids in recalling

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information over time. Review sessions are scheduled at increasing intervals over time (Karpicke et al, 2011). This approach is grounded in cognitive psychology, particularly the spacing effect, which posits that retention is enhanced when learning is distributed throughout time rather than concentrated in a single session (Cepeda et al., 2006).The spacing effect occurs when people study the same material repeatedly over time instead of in one session. Studies show that space helps people remember spoken information longer. Research examples include vocabulary acquisition (Bloom & Shuell, 1981), fact learning (DeRemer & D'Agostino, 1974), and word list learning (Zechmeister & Shaughnessy, 1980). Studies show that the spacing effect significantly benefits language acquisition in adults. Vocabulary learning is essential for reading and academic success, but traditional memorization often leads to quick forgetting. Teachers can enhance young learners' retention, engagement, and vocabulary by using spaced repetition, which revisits knowledge at increasing intervals. This study reviews literature on spaced repetition, evaluates its application in primary education, and experimentally examines its effectiveness in vocabulary instruction.

1.1 Background of the study

Vocabulary is acknowledged as the foundation of language acquisition, as it directly affects understanding, communication, and academic achievement. Hunt and Beglar (2005) emphasize the significance of the lexicon in comprehending and utilizing language, whereas Smith (1941) and other researchers (Anderson & Freebody, 1981; Graves, 1986; Stahl, 1998) have shown that children with more extensive vocabularies achieve superior academic performance, especially in reading. Vocabulary not only enhances confidence in second language learners but also influences cognition and communication, as linguistic vocabulary is frequently associated with intellectual capacity. Research indicates that children with extensive vocabularies frequently have superior scores on IQ assessments (Matthews et al., 2004; Hodapp & Gerken, 1999). Stahl (2005) differentiates between understanding a word's definition and utilizing it in practical circumstances, emphasizing the significance of vocabulary in self-expression and social engagement. Cummins (1999) classifies vocabulary into reading, writing, speaking, and listening, however Neuman and Dwyer (2009) emphasize the equilibrium between receptive and expressive vocabularies for effective communication. Despite its significance, educators frequently encounter difficulties in determining optimal strategies for prioritizing vocabulary teaching (Berne & Blachowicz, 2008; Harmon, Wood, & Kiser, 2009), rendering it one of the most problematic yet vital domains of pedagogy.

Children's vocabulary development commences early, with research indicating that a four-year-old may possess a lexicon of 5,600 words (Seashore, 1947), and young learners generally assimilate between 2,000 and 4,000 new words annually (Nagy, Anderson, & Herman, 1987; Brabbham& Villaume, 2002). Reading exposure plays a crucial role, since kids are exposed to more than 100,000 words throughout their education (Ruddell & Shearer, 2002) and may acquire 3,000–5,000 words per year through extensive reading (Graves, 2000). Evidence indicates that many students learn merely 2,000–3,000 new words year, suggesting that by the second grade, they may possess a vocabulary of approximately 6,000 words (Biemiller, 2005). L2 learners necessitate a vocabulary of at least 10,000 words for text comprehension (Schmitt, 2000), but fluent L1 readers often require around 40,000 words (Stahl, 2005). In light of these requirements, Grabe (2009) approximates that L2 learners need to assimilate approximately 2,000 words each year to maintain progress. This underscores the necessity for comprehensive, engaging, and effective vocabulary education, as conventional rote techniques may inadequately prepare learners with the linguistic depth required for sustained success.

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In Pakistan, vocabulary teaching mainly uses teacher-centred methods like loud reading, rote memorisation, word lists, and translation into the native language. These techniques might help students remember words for a short time, but they often lead to shallow learning, decreased motivation, and a limited ability to use vocabulary in real-life situations. Textbooks often offer lists with short definitions instead of practical usage, and activities such as dictation highlight memorization rather than application. Students find it hard to understand deeply or use words spontaneously. Digital games and multimedia can make learning engaging but are often overlooked. Paul Pimsleur (1967) proposed systematic spacing of reviews to improve long-term retention by revisiting vocabulary at scheduled intervals, avoiding overload in classroom time. The Repetition Hypothesis highlights the significance of repeated exposure in second language learning, asserting that vocabulary, grammar, and linguistic structures are optimally kept through consistent practice and revision. Repetition strengthens memory, enabling learners to progressively internalize linguistic components and utilize them in practical situations. Engaging with words and structures several times not only enhances comprehension but also builds confidence and fluency. Significant repetition, especially when applied in diverse contexts, guarantees that learners go beyond mere memorizing to actual application. The spacing effect emphasizes that the timing of practice is equally significant as the act of repetition. Studies indicate that retention is enhanced when review sessions are spaced across time rather than conducted in a single session (Cepeda et al., 2006). Ebbinghaus's (1885) forgetting curve demonstrated that memory deteriorates swiftly without reinforcement but stabilizes when information is reviewed at spaced intervals. This notion underpins the Spaced Repetition Technique (SRT), which organizes reviews at progressively extended intervals, so aiding learners in the long-term retention of language. Research by Pimsleur (1967), Kornell and Bjork (2008), Dunlosky et al. (2013), and Varela (2020) substantiates the efficacy of this strategy, demonstrating that spaced repetition enhances retention and enhances learners' capacity to recall and utilize vocabulary effectively. Consequently, integrating repetition with deliberate spacing establishes a robust basis for vocabulary acquisition, especially at younger ages where cultivating strong language habits is essential.

1.2 Statement of the problem

Researchers need to do additional investigations with grade school groups, especially primary schools, in order to generalize the findings from studies that have focused on undergraduates and the spacing effect. Also, when it comes to helping primary school students with their unique vocabulary acquisition issues, there is a lack of literature on spaced repetition strategies and repetitive theory. Pakistani students' language skills are declining, thus it's critical to reevaluate curricula and pedagogy with an eye towards expanding pupils' vocabulary. Scientific research has shown that spaced repetition, which is a means of revisiting knowledge at regular intervals over a long period of time, is an effective way to improve long-term language recall. To overcome this knowledge gap, this study looks at how primary school children can benefit from a blended strategy that uses spaced repetition and repetitive theory to improve their vocabulary acquisition.

1.3 Research Questions

1. What are teachers' and students' perceptions of using the Spaced Repetition Technique (SRT) in vocabulary learning at the primary level?
2. What are the key challenges and feasibility factors in implementing the Spaced Repetition Technique in primary school classrooms?

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3. To what extent is the Spaced Repetition Technique effective in enhancing vocabulary acquisition among ESL primary learners?
4. What is the impact of the Spaced Repetition Technique on the vocabulary retention of primary school students?
5. How do the vocabulary retention rates of students taught through the Spaced Repetition Technique differ from those taught through traditional instructional methods?

1.4 Significance of the study

The research study on integrating space repetition technique in teaching vocabulary at primary level is multifaceted and extended to various stakeholders, including educators, students, parents and the broader educational community. The study was helpful to provide valuable insights into innovative methods for teaching English vocabulary to primary-level students. Vocabulary is a crucial element in language development, especially for young children in the initial phases of language acquisition. By examining the effects of spaced repetition on vocabulary retention, the study aimed to offer a technique that supported long term retention, allowing the student to build a stronger language foundation. Enhanced vocabulary skills contributed to improved reading comprehension, communication abilities and overall academic performance, providing a solid base for future learning. Traditional methods often require extensive repetition without guaranteeing lasting retention. Spaced repetition, by contrast, focuses on strategic review intervals that may reduce the need of repetitive memorization exercises, thereby improving teaching efficiency. This approach could help teachers maximizing classroom time, focus on higher order skills, and reduce vocabulary learning loss among students, especially during academic breaks. Spaced repetition has rooted in cognitive science and aligns with how memory retention works, potentially benefiting young learners' unique cognitive development. By adopting this method to primary education, the study could provide insights into age-appropriate review intervals and techniques, helping teachers cater to the memory development patterns of young students and enhance learning outcomes more effectively.

2. Literature Review

It is generally agreed that the acquisition of vocabulary is the most important aspect of learning a second language because it contributes to the development of understanding, fluency, and linguistic communication. It is difficult for students to comprehend even the most fundamental texts or discussions if they do not have a sufficient vocabulary foundation (Hunt & Beglar, 2005). This holds true regardless of their levels of grammatical understanding. Consequently, vocabulary transcends being merely a component of language; it serves as the foundation upon which abilities such as reading, writing, listening, and speaking are built. According to the findings of more than a few researchers, the quantity of one's vocabulary has a direct impact on one's language competency, with both receptive and productive vocabularies playing important roles in both understanding and communication (Nation, 2013). Learning the basics of vocabulary is crucial for schoolchildren in contexts like Pakistan, where English is typically taught as another dialect or foreign language. This is because its acquisition paves the way for academic achievement, worldwide communication, and professional growth. Nevertheless, despite the significance of vocabulary, numerous classes in Pakistan continue to rely largely on traditional methods of instruction, such as rote memorization and grammar-translation, which do not ensure that students will retain the information for an extended stretch of time (Rahman, 2011). Because of this, there is a continual gap between the language exposure that students receive in schools and the communicative demands of students, which necessitates the development of creative techniques. Repetition-based and teacher-centered language learning

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maneuvers that place an emphasis on the memory of word lists, direct translation, and recitation drills have been the predominant methods of instruction in traditional vocabulary instruction. For decades, methodologies like the Grammar Translation Method (GTM) and the Audio-Lingual Method depended on translating vocabulary into the original language or engaging in structure drills.

While these methods may have been effective in building short-term familiarity, they were not successful in promoting meaningful retention and contextual usage (Richards & Rodgers, 2014). Similarly, word lists that are offered in textbooks emphasize surface memorization rather than a profound engagement with the meaning of many words. The ability to employ vocabulary in a flexible manner in communicative settings is rarely fostered by exercises such as dictation and oral repetition, according to Nunan (2004). However, these exercises are designed to improve spelling and pronunciation. These techniques are especially prevalent in Pakistan's primary classrooms, where kids frequently utilize memorization to prepare for examinations, only to forget the content in a short amount of time afterward (Rahman, 2011). These methods, even though they are easy for teachers, have been inclined to disengage students and limit their motivation, which has been recognized for a long time as a barrier to the development of language in a sustainable manner (Berne & Blachowicz, 2008). It is possible that as a consequence of this, pupils may acquire a superficial understanding of vocabulary, but they will be unable to effectively use it when doing oral and written tasks.

In the meantime, numerous academics have highlighted the significance of vocabulary acquisition, pointing out that vocabulary knowledge has a strong correlation with reading comprehension and general academic achievement (Anderson & Freebody, 1981; Stahl, 1998). This correlation exists because vocabulary knowledge is correlated with academic achievement. According to Matthews et al. (2004), statistically speaking, children who have greater vocabularies tend to have higher levels of academic performance and even higher IQ scores. In addition, Stahl (2005) emphasized that vocabulary knowledge encompasses not only the definitions of words but also the recognition of words in real-life circumstances, which makes it an essential component of effective communication. According to Neuman and Dwyer (2009), researchers differentiate between receptive vocabulary, which refers to words that learners can comprehend while reading or listening, and productive vocabulary, which also refers to words that learners can actively use when speaking or writing. Both types of vocabulary need to be developed with the aim to achieve holistic proficiency. The breadth of vocabulary acquisition is enormous: learners of a first language may require as many as 40,000 words to be proficient, whereas learners of a second language require at least 10,000 words to comprehend academic literature with ease (Schmitt, 2000; Grabe, 2009). For pupils in primary school, this indicates that it is necessary to employ methods that are both methodical and interesting for the purpose to construct the foundations of vocabulary development. Traditional approaches, on the other hand, place a greater emphasis on rote memorization, which frequently fails to produce the repetitive and meaningful exposure that is necessary for language to become ingrained in indefinite memory. As a response to the constraints of traditional methods of instruction, the idea of spaced repetition has arisen as a solution. According to Cepeda et al. (2006), the Spaced Repetition Technique (SRT) is founded on the foundational psychological theory known as the spacing effect. This principle states that acquiring knowledge that is spaced out for longer intervals leads to higher retention than material that is delivered in a single, massed session. Ebbinghaus (1885) was the first person to conduct a thorough study of this idea. He established the forgetting curve

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to demonstrate how memory fades rapidly in the absence of reinforcement, but how it may be considerably improved through strategically scheduled reviews.

Figure 1 is an adaptation of Ebbinghaus's 1885 work, which depicts the Forgetting Curve, which illustrates the decline in memory retention and the effect that spaced review plays. The forgetting curve makes it clear that most of the newly acquired information is forgotten within a few days if it is not revisited at the appropriate intervals. Through the utilization of this phenomena, spaced repetition can increase memory consolidation by reviewing content just before it is likely to be forgotten (Bjork, 1994). In contrast to massed practice, which promotes cramming, Spaced Repetition Technique (SRT) systematically lengthens the intervals between reviews, which provides learning that is both effective and long-lasting. In addition, Roediger and Karpicke (2006) revealed that retrieval practice between spaced intervals enhances deeper memory than simple restudy. This discovery has been validated by later studies in cognitive psychology and applied linguistics. Moreover, most persons acknowledge from personal experience that a singular exposure is generally inadequate for efficient long-term retention when striving to master a collection of information, concepts, abilities, or procedures. We are all familiar with the adage "practice makes perfect." The timing of the practice is critically crucial. Distributing the initial study and subsequent review or practice over time generally leads to improved learning compared to performing repetitions in close temporal succession, provided that the total study duration remains consistent in both cases. The spacing effect, sometimes referred to as the advantage of scattered practice, was first recognized by scholars over a century ago (Ebbinghaus, 1885/1913). Since then, numerous experiments conducted by cognitive psychologists have evidenced the superiority of spaced or distributed practice compared to massed practice (Cepeda, Pashler, Vul, Wixted, & Rohrer, 2006). A recent extensive review of various learning strategies ranked distributed practice among the highest based on the existing research evidence (Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013).

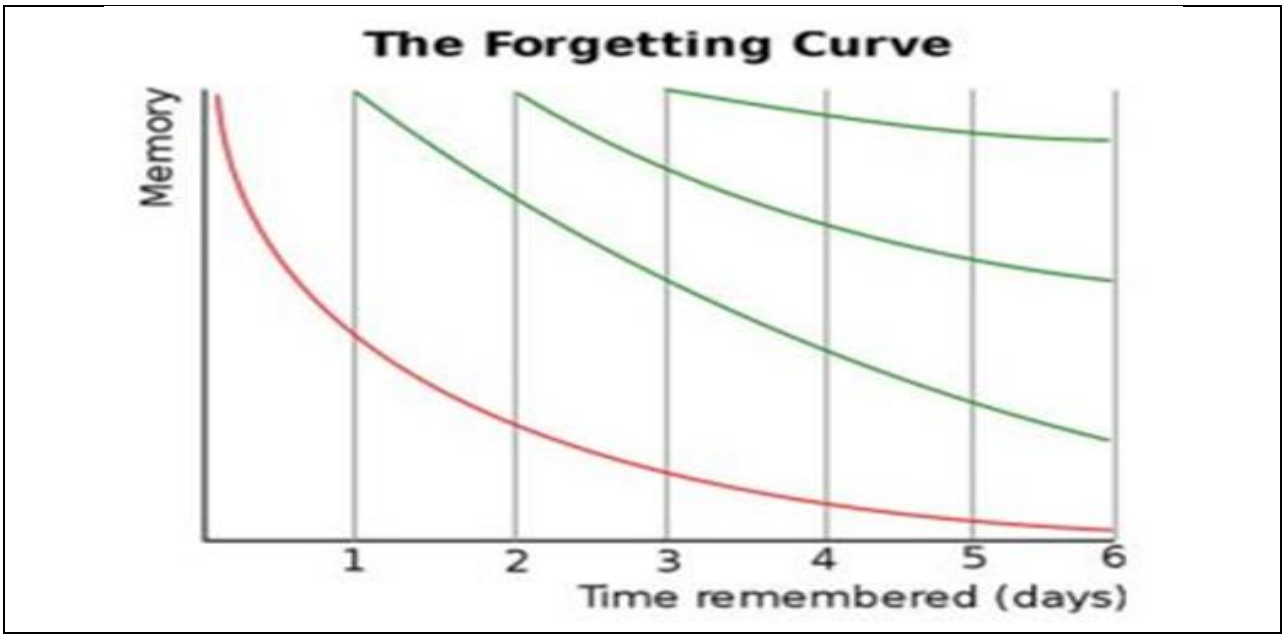

Figure 1.1: The Forgetting Curve
Note. *Adapted from the Forgetting Curve by Hermann Ebbinghaus. (Ebbinghaus, 1885*)

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In addition to cognitive explanations of the spacing effect, vocabulary learning can be examined through the lens of comprehensive educational theories. Constructivist learning theory asserts that learners actively build knowledge by significant engagement, interaction, and reflection, rather than passively absorbing information (Piaget, 1972; Vygotsky, 1978). Students acquire vocabulary most effectively when they encounter words repeatedly in diverse, authentic contexts, thereby reinforcing the connections between form and meaning. The theory of repetitive learning posits that repeated exposure and practice are essential for transferring knowledge from short-term to long-term memory, particularly in language acquisition (Stahl, 2005). Traditional rote repetition may lead to diminished interest, whereas integrating constructivist methodologies with structured repetition, such as spaced repetition, establishes a harmonious balance between generating meaning and systematically reinforcing it. This integration enhances students' retention and facilitates a more adaptable and conversational use of language. This is particularly crucial at the primary level, where foundational language skills are developed.

It has been postulated and tested that there are several different practical models of SRT. A graduated interval schedule was proposed by Paul Pimsleur (1967) for the purpose of reviewing language material. This timetable stressed the importance of frequent exposures in the days immediately after initial learning. According to a similar approach, Sebastian Leitner (1972) presented the flashcard-based Leitner Box System. In this system, cards are examined at intervals that gradually increase in frequency based on the learner's performance.

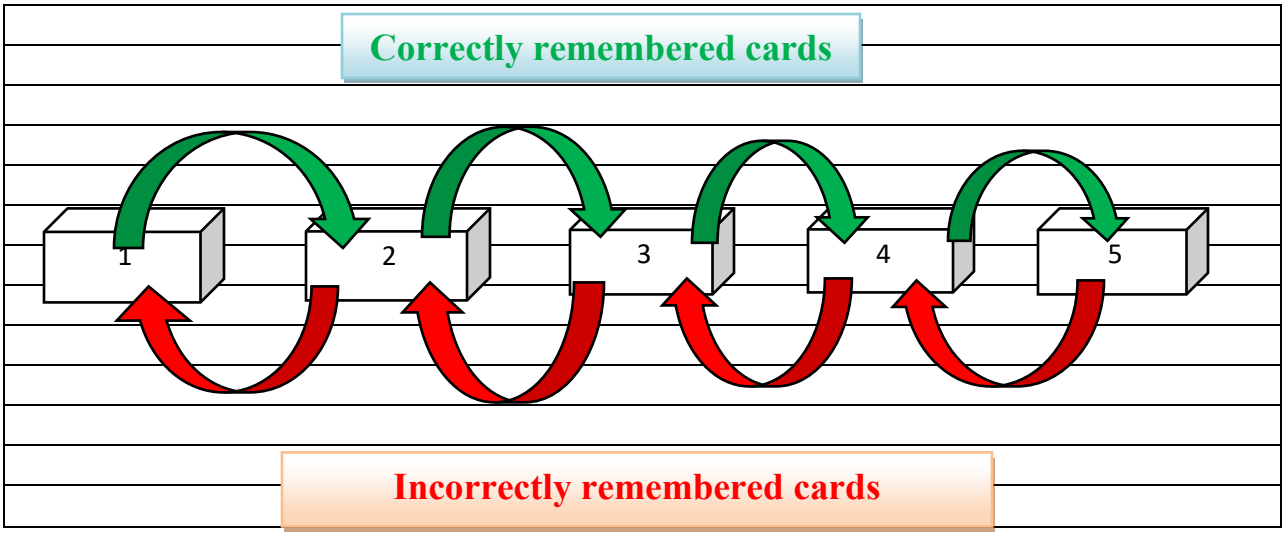

Figure 2.: The Leitner system for flashcards (Seetles & Meeder 2016 p. 1850

Figure 2 is an adaptation of Leitner's Box System for Spaced Repetition, which was originally published in 1972. According to this technique, words that are correctly recalled are moved to boxes that have longer review intervals, while those that were forgotten are returned to the first box for more frequent practice exercises. Through the use of this adaptive mechanism, learners

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are able to spend more time on challenging objects while decreasing the frequency with which they reinforce easier items. The proliferation of digital technologies has resulted in the development of software apps such as Anki and Quizlet, which have automated SRT and made it available to students all around the world (Nakata & Suzuki, 2019). Flashcards, word games, and review schedules that are in line with the natural forgetting curve are some of the ways that SRT can be adapted for use in educational settings. Teachers can implement SRT into lesson planning for primary students by blending repetition with entertaining activities. This will ensure that reviews are interesting rather than repetitive, creating a more positive learning environment.

Evidence from real-world situations demonstrates over and again that SRT is an excellent method for vocabulary acquisition. Spaced practice has been shown to be superior to massed practice in terms of both short-term acquisition and long-term retention, according to research conducted in a variety of settings (Kornell & Bjork, 2008; Dunlosky et al., 2013). For instance, Bloom and Schuell (2001) discovered that students who studied French vocabulary using spaced schedules performed 35% better on delayed assessments than their counterparts who used massed schedules. This was the case when comparing the two groups of students. A similar set of findings was reported by Barcroft (2007) regarding the acquisition of Spanish vocabulary. More specifically, spaced learners demonstrated higher recall across numerous post-tests. The results of more recent research conducted by Schuetze and Weimer-Stuckmann (2011) indicated that spaced schedules consistently increased vocabulary retention, even in online situations. In addition, extensive research, such as the meta-analysis conducted by Donovan and Radosevich (1999), demonstrated that spacing had a moderate but dependable impact on a variety of learning domains, with notably robust outcomes in the area of language acquisition. Despite these findings, the implementation of SRT in primary schools is still not fully investigated. This is especially true in multilingual situations such as Pakistan, where traditional teaching approaches are the predominant methods of instruction. Moreover, only a little amount of study has been conducted on the topic of incorporating SRT into vocabulary instruction for younger students in the Pakistani context. There is a lack of awareness regarding the potential of the spacing effect throughout the foundational phases of language learning because the majority of the studies that have been conducted on the phenomenon have focused on adult or university-level learners. Considering that students in pre-school are at a vital stage in the process of acquiring their vocabulary, this is a cause for concern because inefficient methods can hamper long-term performance. The current teaching techniques continue to place a significant emphasis on examinations, with only a limited amount of attention being paid to memory-based strategies that strengthen long-term retention (Rahman, 2011). As a result, this gap is addressed by the current study, which investigates the ways in which SRT might be systematically used in primary classrooms in Pakistan to improve vocabulary development.

2.1 Conceptual Framework

The Spaced Repetition Technique (SRT) is thought to be a powerful tool for improving vocabulary learning in elementary school pupils, which is the foundation of this study. Based on the Spacing Effect theory (Ebbinghaus, 1885), which holds that knowledge is better recalled when revisited over longer time periods, the study suggests that repeated and organized vocabulary exposure improves long-term usage and retention. Consistent reinforcement improves memory and understanding, according to the Repetitive Learning Theory. Furthermore, the Constructivist Learning Theory highlights that students acquire knowledge by active participation, which makes spaced repetition a perfect approach for younger students. The use of SRT in teaching vocabulary is the independent variable in this framework, whereas student

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engagement, vocabulary retention, and vocabulary application in sentences and communication are the dependent variables. Between the experimental and control groups, control variables including student age, classroom environment, and language content do not change. The success of SRT implementation may be impacted by moderating variables such as student interest, instructor facilitation, and accessible classroom resources. Overall, the conceptual framework indicates that when effectively included into the teaching of vocabulary; spaced repetition will give primary-level kids more lasting, interesting, and successful vocabulary learning experiences, which will eventually improve their language proficiency and academic performance.

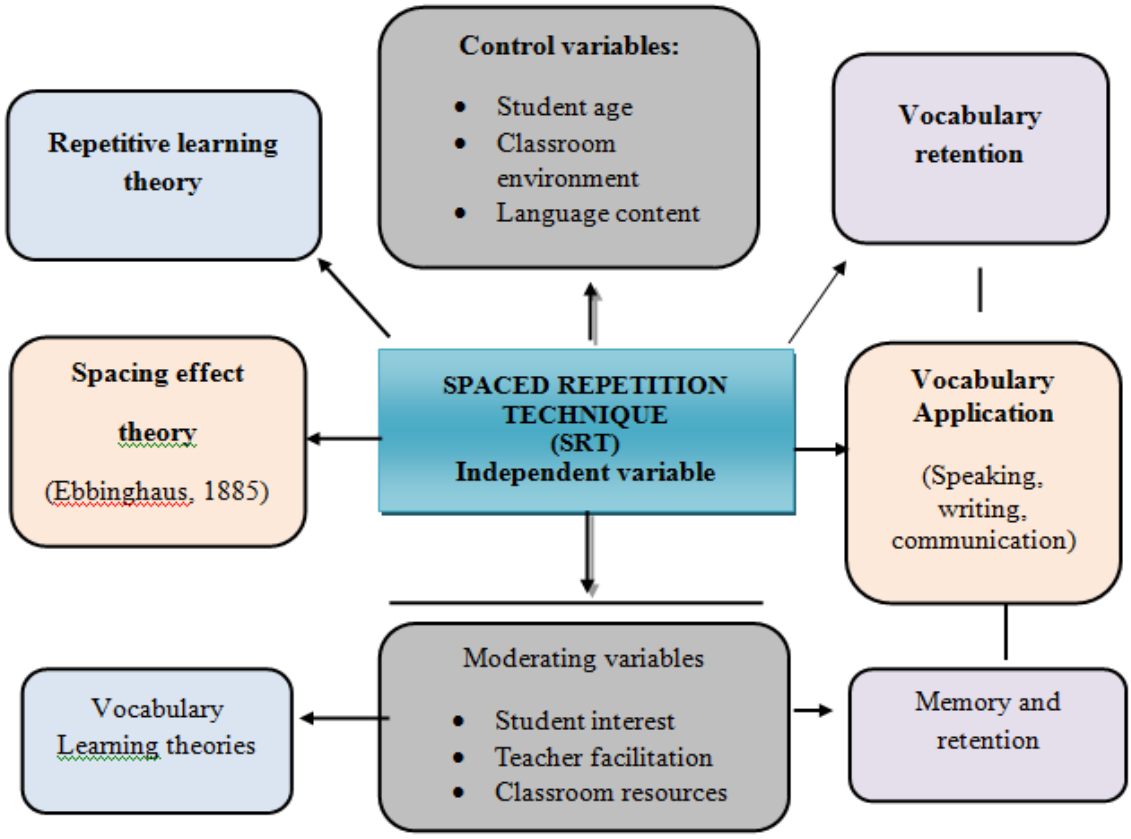

Figure 3. Conceptual Framework

3. Methodology

This study employed a mixed method research approach that integrated both qualitative and quantitative approaches to evaluate the effectiveness of the Spaced Repetition Technique (SRT) in instructing English vocabulary to primary school children. The research combined qualitative and quantitative methods to expansively understand the impact of SRT on language acquisition and retention. Two separate groups have been established: an experimental group that instructed vocabulary by spaced repetition training (SRT) with fixed review intervals (daily, every three days, and weekly), and a control group that followed traditional rote memorization methods. The

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two groups were compared one to another. The design used a combination of pre-tests and post-tests to evaluate both short-term and long-term language retention. In addition, questionnaires were conducted for learners as well as teachers to obtain insights on engagement, motivation, and teaching experiences.

The population of this research comprised primary school teachers and fifth-grade students (ages 10–11) from government schools in Tehsil Ahmed Pur East, District Bahawalpur. The sample consisted of sixty children (thirty from each group) and forty teachers, employing both disproportionate (in the beginning) and proportionate random selection methods after the intervention period employed. This was implemented to ensure that the sample accurately represented all groups and allowed for comparative analysis among them. Data collection was conducted with structured questionnaires (incorporating Likert scale and open-ended items) along with standardized vocabulary pre- and post-tests (each measured at fifty marks and encompassing vocabulary acquisition, retention, application, composition, and oral recall). The use of Google Forms enabled the dissemination of questionnaires and the gathering of responses from participants. Descriptive statistics (mean, standard deviation, percentage) and paired sample t-tests have been employed using SPSS to analyse quantitative data, encompassing test scores and questionnaire assessments. The objective was to identify significant differences in performance across different groups. A study on perceptions and engagement levels was performed by analyzing qualitative data derived from open-ended responses through content and descriptive analysis. The methods employed in the research were validated by experts and pilot testing to determine their clarity, reliability, and suitability for the targeted age group. The research was conducted in accordance with ethical standards, ensuring informed consent; anonymity, voluntary participation, and cultural sensitivity were upheld.

3.1 Framework of Analysis

The proposed study employed a mixed-methods analytical framework, which incorporates both quantitative and qualitative research to attempt to provide a thorough assessment of the efficacy of SRT in vocabulary learning at the primary level. The extent to which the intervention was successful in improving vocabulary knowledge was determined by examining the quantitative data gathered from the pre-tests and post-tests. This was accomplished from the use of descriptive statistics, such as the mean, percentage, and standard deviation, as well as the paired sample t-test, which was particularly useful. Descriptive analysis has been used to look at qualitative data from student questionnaires, focusing on things like student engagement, vocabulary retention, and how useful the classroom is. The framework also includes content validation of the data collection instruments. Pilot testing and expert reviews have been conducted to ensure that both the tests and the questionnaires accurately capture the constructs of vocabulary knowledge, engagement and instructional effectiveness. In broad terms, the analytical framework is designed to do a comprehensive and evidence-based assessment of the SRT as a method for improving vocabulary education in primary schools.

4. Analysis and Discussions

This research study involved a comprehensive analysis and interpretation of data obtained from pre-tests, post-tests, and questionnaires distributed to both teachers and students. The primary purpose of this study is to integrate the efficacy of the Spaced Repetition Technique (SRT) in terms of enhancing the acquisition, retention, and application of English vocabulary among students in primary school. By incorporating both quantitative and qualitative data, the analysis provide a far-reaching understanding of the impact that SRT has on the learning of vocabulary, the involvement of learners, and the pedagogical methods used in primary schools. The

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integration of data guarantees that the numerical results are substantiated by actual experiences, rendering the entire interpretation more detailed and significant. Participants in this study were sixty students and forty teachers from public primary schools located in Tehsil Ahmed Pur East, District Bahawalpur. The information was collected for this study were sixty students evenly divided into two groups: thirty in the experimental group, instructed in vocabulary using the Spaced Repetition Technique, and thirty in the control group, taught by traditional methods. In addition, the teachers took part in a questionnaire in which they were asked to provide their knowledge, perspectives, and experiences with the implementation of SRT in vocabulary education. An examination of the quantitative data was carried out with the assistance of the Statistical Package for the Social Sciences (SPSS). Descriptive statistics such as the mean, standard deviation, and percentage were employed with the purpose to provide a comprehensive summary of the individuals' performance and the way they responded. Qualitative data derived from open-ended students' questionnaire responses were subjected to descriptive analysis to discern prevalent perspectives, themes, and experiences associated with vocabulary acquisition. Collectively, these analyses offered an extensive and nuanced understanding of the functioning of SRT as an instructional approach at the primary level. According to the results of the questionnaire given to the instructors, many of the teachers had highly favorable sentiments regarding the Spaced Repetition Technique.

The questionnaire results revealed that teachers generally held highly favourable perceptions of the Spaced Repetition Technique. The findings from the teachers' questionnaire indicated an overall favorable disposition towards the Spaced Repetition Technique. Of the forty participating teachers, 85% expressed familiarity with SRT as a pedagogical approach, whereas 72% reported having implemented it or a comparable method in their classrooms. The average ratings for essential elements varied from 3.6 to 4.4 on a 5-point Likert scale, indicating majority consensus that SRT boosts memory retention, improves classroom engagement, and fosters drive. Educators largely concurred that pupils who acquired language via spaced repetition exhibited enhanced concentration and excitement compared to those who depended on rote memorization. A teacher noted that "students who reviewed words weekly retained them longer and employed them accurately in sentences," emphasizing the role of spaced repetition in enhancing learning. Nevertheless, several problems were observed. About 40% of educators reported challenges in allocating time for planned reviews, whilst 35% indicated insufficient institutional support for the adoption of novel practices. Notwithstanding these challenges, nearly all of teachers (90%) concurred that SRT was an efficacious and viable method that markedly enhanced learning results when implemented systematically. The results from instructors' feedback indicate that SRT not only aids learners but also offers educators a systematic, data-informed approach to enhance vocabulary acquisition.

The learners' pre-test and post-test results yielded compelling quantitative evidence of the efficacy of SRT. The pre-test mean scores for the control and experimental groups were comparable ($M = 23.4$, $SD = 4.8$ for the control group; $M = 24.1$, $SD = 5.2$ for the experimental group), suggesting that both groups possessed equivalent vocabulary knowledge prior to the intervention. After six weeks of teaching, the post-test results indicated significant disparities. The control group's mean score rose to $M = 28.0$ ($SD = 5.0$), indicating a modest rise of 4.6 points. Conversely, the experimental group's mean score increased to $M = 39.6$ ($SD = 4.3$), indicating a significant enhancement of 15.5 points. The results of the paired sample t-test further validated the statistical significance of these alterations. The control group exhibited improvement with $t(29) = 3.42$, $p < .05$, but the experimental group displayed a substantially

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greater and highly significant enhancement with $t(29) = 8.76$, $p < .001$. The independent sample t-test revealed a highly significant difference in post-test outcomes between the two groups, $t(58) = 6.94$, $p < .001$. The results demonstrate that SRT has a significant and quantifiable impact on students' vocabulary acquisition and retention.

An in-depth examination of the five test components demonstrated uniform improvements across all domains. In vocabulary development, the experimental group's mean improved from 4.8 to 8.9, whereas the control group increased from 4.7 to 6.2. The experimental group exhibited an enhancement in vocabulary retention from 4.5 to 9.2, whereas the control group increased from 4.6 to 6.1. The experimental group enhanced from 5.0 to 8.6, while the control group exhibited a minor improvement from 5.2 to 6.4. In a comparable manner, the experimental group exhibited a significant increase in composition and oral recall scores (from 4.6 to 8.4 and 5.2 to 9.0, respectively), whereas the control group demonstrated more modest improvements. The comprehensive results indicate that SRT improves both the retention and utilization of language in oral and written contexts. The outcomes of the students' questionnaire corroborated these quantitative results. Eight percent of students in the experimental group indicated that SRT enhanced the enjoyment and reduced the stress of vocabulary acquisition, whereas 75% noted that repetition via flashcards, games, and collaborative activities facilitated the retention of challenging terms. Approximately 70% reported an increased confidence in employing new language in both speech and writing. A number of students remarked that they appreciated the organization of the review process, as it ensured they would repeat prior lessons. A student remarked, “It was easier to recall because we engaged in the same game with previously learnt words after a few days.” This observation demonstrates the motivational impact of SRT, transforming repetition into a mode of active learning. Students articulated that SRT enhanced their focus and self-regulation. They indicated heightened alertness throughout courses, aware that previously acquired content would be revisited in subsequent sessions. Numerous individuals reported that the spaced review plan alleviated their anxiety around forgetfulness and fostered a sense of responsibility over their learning. Nevertheless, certain students observed that lengthier or more intricate vocabulary posed challenges for retention and necessitated further practice or contextual application. These observations indicate that SRT is most effective when integrated with additional techniques such as segmenting words into smaller units, utilizing images, and employing terminology in relevant circumstances.

When both the quantitative and qualitative findings are considered combined, a distinct pattern emerges, indicating that the Spaced Repetition Technique is a significant educational tool that assists students in primary school in learning and remembering new vocabulary. On the other hand, the qualitative data revealed the emotional, motivational, and cognitive benefits that are associated with SRT. The quantitative data provided concrete proof of improved test performance. This confluence of studies suggests that SRT is not just an efficient technique of instruction but also one that makes it easier for students to acquire a holistic understanding of the subject matter. There is a strong correlation between the findings and the theoretical frameworks that were utilized in the research, specifically the Spacing Effect Theory, the Repetitive Learning Theory, and the Constructivist Learning Theory. Knowledge that is checked at increasing intervals is more likely to be preserved in long-term memory, according to the space effect theory, which proposes that this is the case. The Constructivist Learning Theory states that learners derive meaning by active engagement and practical application, in contrast to the Repetitive Learning Theory, which proposes that repetition improves comprehension and

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retention of information. This study's findings substantiate these theoretical concepts, indicating that SRT is an efficacious approach for enhancing vocabulary acquisition due to its successful incorporation of repetition, interaction, and learner engagement components.

The findings of this study have important implications for the development of curricula and for the teaching of languages. It is clear from the success of SRT that teachers have the ability to significantly enhance students' vocabulary learning by employing structured repetition cycles, activities that are interesting to the students and exercises that are pertinent to the students' lives. The classroom is transformed into a place where students learn by doing rather than simply memorising information through the use of activities of this nature. In addition to ensure that students retain and comprehend the information that they learn for an extended time period, it is recommended that teachers include SRT into their courses on a consistent basis. But to make effective use of SRT, you need to receive training, have sufficient time, and receive assistance from the administration. It is necessary for educators to participate in professional development programs that instruct them on how to create schedules for repetition, how to make use of the appropriate resources, and how to implement SRT in their classrooms in a manner that is effective. It is also possible for schools to improve implementation by providing students with resources such as digital platforms, flashcards, and multimedia materials that allow them to rehearse and see things repetitively. Teachers would be able to maintain consistency and creativity in their SRT sessions in the classroom with the assistance of these aids.

In conclusion, the findings of this research provide substantial evidence in favour of the notion that the Spaced Repetition Technique is an effective method for assisting pupils in primary school to acquire new vocabulary. The learner's confidence is boosted, their short-term and long-term memories are significantly improved, and they are encouraged to actively participate in the learning process. Not only can SRT improve academic achievement, but it also encourages positive attitudes about learning English, as demonstrated by the combination of quantitative and qualitative findings. The research suggests that SRT transforms the process of learning vocabulary into an experience that is both significant and engaging, which in turn supports profound learning and long-term retention among students. Despite the fact that there are still certain drawbacks with SRT, such as insufficient training and insufficient time, the benefits significantly outweigh these types of problems. The findings of this study, taken as a whole, provide more proof that SRT is a powerful and evidence-based method of education that is compatible with both contemporary educational theories and the requirements of the classroom. Therefore, it is strongly suggested that it be incorporated into English language curricula to assist children in the acquisition of new vocabulary and to make studying more enjoyable and productive for students in primary school.

5. Justification of Research Questions

5.1 What are teachers' and students' perceptions of using the Spaced Repetition Technique (SRT) in vocabulary learning at the primary level?

The results showed that teachers as well as students expressed very favorable opinions of the Spaced Repetition Technique (SRT). Instructors typically reported that SRT improved vocabulary learning by becoming it more interactive and efficient than rote memorization, since

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it enabled systematic term review by students. When enquired about students' favorable responses to SRT-based activities, a significant number of teachers selected "often" or "always" on the questionnaire. Students indicated that SRT exercises, such as flashcards, word games, and review sessions, were more enjoyable and less tedious than conventional drills. Students' responses emphasized fun, motivation, and enhanced retention, whereas teachers' responses highlighted utility and enduring learning. These data revealed that SRT is perceived as a learner-centered, engaging, and effective approach to vocabulary acquisition.

5.2 What are the key challenges and feasibility factors in implementing the Spaced Repetition Technique in primary school classrooms?

Studies have highlighted that SRT is feasible and beneficial in primary-level classrooms, despite the existence of specific issues that require resolution. School teachers commented that the system is adaptable and cost-effective, rendering it suitable for large classrooms. A vast majority of educators reported that they could readily include SRT into their daily lesson plans. Several issues were identified, including insufficient classroom time, the necessity to address diverse curricular requirements, and the demand for more formal training on the creation of SRT activities. Despite these challenges, educators stated that the advantages of enhanced language retention and student engagement outweighed the issues. Thus, even if it is feasible, it will not succeed without adequate assistance, preparation, and training for educators.

5.3 To what extent is the Spaced Repetition Technique effective in enhancing vocabulary acquisition among ESL primary learners?

Results from both the pre- and post-tests showed that SRT significantly improved vocabulary acquisition. Students in the experimental group, who underwent SRT-based instruction, demonstrated substantial enhancements in vocabulary acquisition compared to the control group. These improvements were not only in recognition; they also included using terminology in both speaking and writing assignments in a way that made sense. The answers to the questionnaire also backed up this data, since students said they were sure they could use the new vocabulary they had learnt in class. It was also clear to teachers that students were able to acquire language more efficiently and remember it for more time. The results show that SRT techniques significantly help ESL learners in learning new words.

5.4 What is the impact of the Spaced Repetition Technique on the vocabulary retention of primary school students?

The research provided substantial evidence that SRT markedly enhances vocabulary retention. When the experimental group's post-test scores were compared to their pre-test scores, they showed significant improvements in all skill areas: building and remembering words, using words, writing, and speaking. Students consistently remembered vocabulary they had learnt weeks before, and many said in open-ended comments that going over the terms repeatedly made them simpler to remember and use. Teachers also noted that the rates of forgetting went down and that pupils were able to remember things better in later classes. These results strongly

suggest that SRT helps students remember words for a long time, which supports its usage in primary-level classrooms where long-term learning is important.

5.5 How do the vocabulary retention rates of students taught through the Spaced Repetition Technique differ from those taught through traditional instructional methods?

A comparative examination of the experimental and control groups indicated that students instructed with SRT attained greater retention rates compared to those subjected to traditional methods. In spite of the fact that both groups started off with practically identical scores on the pre-test, the experimental group had a clear edge in the post-test findings. Students who studied using SRT not only recalled a greater number of vocabulary items but also employed them more confidently in speaking and writing tasks. Educators validated these results by indicating heightened motivation and classroom involvement among SRT learners. The findings reveal that SRT exceeds traditional rote learning by promoting improved memory retention and more effective language usage. The justification for the research questions highlights a persistent tendency observable in teacher as well as pupil data. Individuals held highly favorable opinions of SRT, demonstrating its feasibility despite minor issues, and it received enthusiastic endorsement as a method for acquiring and retaining new vocabulary. The comparative results unequivocally demonstrated that SRT surpasses traditional teaching methods. This demonstrated the study's objectives and illustrated the potential utility of SRT in primary-level classrooms.

6. Conclusion

The purpose of this research was to fill a substantial vocabulary teaching gap that exists at the primary school level. Adult learners have been the primary focus of the extensive research on spaced repetition, with only a limited amount of investigation being conducted into its effectiveness among younger children, who have peculiar challenges in the process of learning new vocabulary. In Pakistan, declining language proficiency and an overreliance on rote memorization highlight the urgent need for innovative teaching methods that foster long-term retention and meaningful application. This study examined the efficacy, feasibility, and impact of the Spaced Repetition Technique (SRT) in vocabulary training for primary level students. The findings indicated that both educators and learners possess a favourable perception of SRT. Educators appreciated its systematic and structured methodology, while students found the exercises enjoyable and motivating. This validated the initial research objective and corroborated the notion that SRT enhances engagement. SRT was both adaptive and cost-effective; yet it faced challenges including time management, teacher preparation, and insufficient resources. These factors did not diminish its utility; rather, they underscored the significance of training and institutional support, which is the secondary objective. We also identified effective methods to implement the plans. Educators reported employing flashcards, review games, visual aids, and collaborative activities. Conversely, students preferred exercises that were enjoyable and suitable for their age group. This aligns with the third objective and supports the notion that SRT facilitates not only word retention but also practical application in real-life contexts. The pre-test and post-test data provided particularly clear evidence of the impact on retention. These data showed that the experimental group exhibited significant progress in all assessment measures when compared to the control group. The students' feedback highlighted that regular review facilitated the retention and application of material, so fulfilling the fourth objective and reinforcing the notion that SRT enhances memory and long-term learning efficacy.

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7. Recommendations

1. Educators ought to be incentivized to incorporate the Spaced Repetition Technique as a standard method for teaching vocabulary. Flashcards, word walls, interactive games, and structured review sessions are effective methods to enhance the enjoyment and organization of learning. SRT ought to be integrated into daily courses to ensure long-term retention among pupils rather than ephemeral recall.
2. Regular training opportunities for instructors should be established to enhance their skills in designing and implementing SRT-based activities. Professional development programs can enhance teachers' preparedness, provide valuable resources, and facilitate lesson organization and time management.
3. Curriculum planners and textbook authors assert that lesson plans must incorporate organized review cycles and SRT-based exercises. Incorporating repetition schedules into official materials may provide teachers with standardized frameworks, reducing their need on personal initiative.
4. Educational administrators ought to allocate time and resources for periodic vocabulary review seminars. Collaborative lesson planning, provision of economical teaching resources, and acknowledgment of innovative methodologies exemplify support mechanisms that will facilitate the continued implementation of SRT in educational settings.
5. Researchers should expand the scope of SRT studies by investigating its application across many fields, educational levels, and contexts. In order to assess the long-term impact of SRT on academic achievement and language development, longitudinal studies must be conducted

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