



**An-Najah National University
Faculty of Graduate Studies**

**THE IMPACT OF NANO-LEARNING
TECHNIQUES ON ENGLISH GRAMMAR
PROFICIENCY IN THIRD-GRADE STUDENTS:
A STUDY IN AL-ZAHRA PRIVATE SCHOOL**

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**This Thesis is submitted in Partial Fulfillment of the Requirements for the
Master's Degree of Methods of Teaching English Language, Faculty of Graduate
Studies, An-Najah National University, Nablus, Palestine.**

2025

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Dedication

To my beloved mother, You are the most patient and resilient person I have ever met, and I dedicate this work to you. Your unending love, prayers, and silent strength were the core of every step I took to reach this goal. It is your success, not just mine. Since you are the reason I dared to reach the moment, I hope you are proud of me.

To my Father, Thank you for teaching, guiding, and believing in me throughout this journey. Without your support, I would not be where I am now. This achievement is as much yours as mine.

To my Brothers, Thank you for being my support, strength, and safe place throughout this journey. You never gave up on me, never tired of sticking by my side, and always had faith in me. I am eternally grateful for your unending love and encouragement.

To my dear sisters, Throughout this trip, you have been the strength of my soul and the comfort of my heart. Your love appears in every word, every effort, and each achievement of this accomplishment. Having you by my side throughout my life is an eternal blessing.

To Zaid, You arrived as a soft promise at the end of a hard and exhausting journey. You cherished my dreams as if they were your own, and you supported me when the going got tough. This success bears your name between the lines since your faith in me enabled every step. This is for you, for all the days you believed in me and silently prayed for me. I am eternally grateful that destiny saved the greatest for last—you.

To my second family, thank you for welcoming me with open arms and hearts. Every step of the way, your pride, love, and support have made me feel welcome. You have just as much appreciation for this success as I do.

To my Uncle Marwan, thank you for always being there for me and treating me like a second father. Thank you for every time you encouraged, assisted, and pushed me forward. I will always appreciate what you have done for me.

To my dear friends, thank you for your love, support, and never-ending encouragement. This journey was made brighter because you were a part of it.

Acknowledgment

With great gratitude, I thank Allah, the Most Gracious, for providing me with strength, patience, and direction during my academic journey. Without His favour, none of this would have been possible. I'd like to thank my supervisor, Dr. Walid Salameh, for his ongoing support, useful insights, and professional guidance. His encouragement and intelligent input helped shape this research and enrich my academic experience. I am also grateful to An-Najah National University for providing a supportive study atmosphere as well as chances for academic and personal development. My gratitude also extends to the Faculty of Graduate Studies for their ongoing collaboration and assistance during our trip.

Declaration

I, the undersigned, declare that I submitted the thesis entitled:

THE IMPACT OF NANO-LEARNING TECHNIQUES ON ENGLISH GRAMMAR PROFICIENCY IN THIRD-GRADE STUDENTS: A STUDY IN AL-ZAHRA PRIVATE SCHOOL

I declare that the work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student's Name Marah Mazen Aref Rahhal

Signature: 

Date: 16/07/2025

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THE IMPACT OF NANO-LEARNING TECHNIQUES ON ENGLISH GRAMMAR PROFICIENCY IN THIRD-GRADE STUDENTS: A STUDY IN AL-ZAHRA PRIVATE SCHOOL

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Abstract

This study focuses on how Nano-learning affects third-graders' grasp of English grammar and their ability to remember it. Nano-learning is a new way of teaching that gives short, direct lessons made for how kids think and how long they can pay attention. The study used a mix of methods, including set interviews with five English teachers at Al-Zahra Private School and tests before and after for fifty students. Looking at the data with SPSS showed that the students got much better at grammar, with the tests after showing big gains. Teachers said that adding game-like parts, things to interact with, and online materials could get students more involved and help them remember better. The data shows that Nano-learning helps focus attention, reduces mental stress, and makes learning more active and important. However, not having enough online tools and not wanting to try new teaching methods were seen as problems. Overall, the study says that Nano-learning is a versatile and promising way to teach grammar and suggests more studies on how well it works over time and how useful it is in different learning settings.

Keywords: Nano-learning, grammar instruction, cognitive overload, English language learning, third-grade students, digital tools, gamification, student engagement, SPSS analysis, mixed-methods research.

Chapter One

Introduction and Literature Review

1.1 Background and Rationale

Nano learning is the educational method in which providing information about specific topics is focused on since it is based on teaching specific parts of the lesson in order to decrease mental exhaustion. It is used in various academic routes including schooling and professional training because it is the lifestyle coping with the modern generations preferring quick and direct learning. It is a flexible method accessible anytime and anywhere, so it is an effective method in improving academic results (Aburizaizah & Albaiz, 2021).

It is an educational method which depends on presenting the information per concentrated parts which can be comprehended in short time as a kind of response to the needs of the modern-day system which can be distinguished by speed and knowledge availability. It focuses on dividing the educational content to nano units divided according to the subject learnt. Then, they are free to choose whatever they need gradually and in an organized manner (Mariappan, 2024).

Multimedia through nanolearning such as videos, animated presentations as well as electronic platforms make lessons more interesting and less boring since one of the aims of nano learning is developing students' problems solving as well as comprehension skills (Kalyuga, 2011).

By offering short and clear classes that work with the reduced focus and online habits of today's learners (Pham & Nguyen, 2023). This short-format method is very helpful in topics such as English grammar, where learners often become tired or lose interest; it gives fun learning parts that are easy to get to. Nano-learning is helpful for learning a language, mainly because it lets you teach small grammar rules or vocabulary words one step at a time by splitting material into lessons about just one idea. Locations like English as a Foreign Language (EFL) class, such as Al-Zahra Private School.

This way of doing things not just makes grammar easier to grasp and remember, but it also makes thinking easier and pushes people to use what they learn right away (Alghameeti, 2022).

A key benefit of Nano-learning is how well it helps our minds work. When information is split into smaller pieces and methods such as reviewing at certain times are used, it helps us remember better, keeps students interested, and makes us less tired mentally. It's often used with normal teaching in classrooms (Hu & Du, 2022). Also, nano-learning uses online tools to give short, fun facts using sites students like, such as TikHub. Grammar exercises assist in easily adding learning to what students do each day and making it more fun (Anumanthan & Hashim, 2022). These tools change learning into something fun and hands-on, which then boosts interest and drive.

Also, using computer programs that can talk like people, which use artificial intelligence, in very short learning situations can give grammar practice that changes to fit each person through pretend conversations. This way of making learning fit each person, using technology, helps students learn on their own, makes them want to learn more, and makes them feel surer of themselves—which is really important when learning tricky things like grammar (Chumdoem, Boonlue, & Narmluk, 2023). Artificial intelligence helps students learn as fast or slow as they need to and gives them help that is just right for what they need to learn, which really helps them do better overall because they get feedback made just for them.

Besides just thinking and technology benefits, nano-learning also makes people feel good. It makes students want to learn more, feel like they have achieved something, and feel in charge of how they learn—all very important in learning that focuses on the student. Al-Zahra Private School (Denojean-Mairet, Dubois, & Tremblay, 2024) and other similar schools. This way lets students with different skills learn at their own pace, meeting each person's needs while keeping the class together. Students who

are better at learning can work on harder grammar topics, helping to create a learning space where everyone is included and things can change easily. Students who need extra help can improve their basic skills.

Nano learning is the perfect method of improving students' concentration since it enables them to comprehend the information gradually without being tired. Also, it is easier for teachers to design the educational content in the educational periods which will promote independent learning in students' minds. It helps students choose what they want to learn based on their needs. It also develops critical thinking through providing information clearly enhancing the continuous learning process (Chamorro-Atalaya & Flores-Velásquez, 2024).

Hence, nano-learning is a flexible and good way to teach, especially when teaching grammar. It helps people remember what they learn, makes it easier to think, and gets students interested through short, focused, and interactive lessons. Letting people learn at their own speed, along with feedback that changes based on how they do and using digital tools, helps create a learning experience that is made for each person and helps them grow mentally and emotionally. Using Nano-learning methods in schools can create lively classrooms that focus on students, give them the basic language skills they need, and help them want to keep learning as the world keeps becoming more connected.

In education, nano learning is used in long lessons and complex content in which information is presented in several levels which helps students to understand the lesson and analyze the data comprehended in the lecture. It is also used in providing summaries of the hard material developing research skills and practical research leading to considering it one of the main modern methods in the educational process (Halim & Halim, 2024).

1.2 Objectives of the Study

The primary objective of this study is to investigate the impact of Nano-learning on third-grade students' English grammar proficiency. To achieve this, the study aims to:

1. Examine the effect of Nano-learning on third-grade students' grammar proficiency.
2. Determine whether Nano-learning improves students' attention and retention of grammar rules.
3. Explore teachers' perceptions of using Nano-learning for grammar instruction.
4. Investigate possible gender differences in students' grammar achievement after using Nano-learning.

1.3 Questions of the Study

To fulfil the mentioned objectives, this study aims to address the following research questions:

1. Does Nano-learning significantly enhance grammar proficiency among third-grade students?
2. Does Nano-learning improve students' attention and retention of grammar rules?
3. What are teachers' perceptions of applying Nano-learning in grammar instruction?
4. Are there gender-based differences in grammar achievement after the Nano-learning intervention?

1.4 Hypotheses of the Study

Based on the theoretical framework and previous research in the field, this study presents the following hypotheses:

H0 (Null Hypothesis): Nano-learning technology does not significantly impact students' comprehension and retention of English grammar.

Ha (Alternative Hypothesis): Nano-learning technology positively influences students' understanding and retention of English grammar.

H0: Integrating nano-learning into the English curriculum does not significantly affect educational outcomes for third-grade students in private schools.

Ha: Nano-learning integration within the curriculum enhances educational outcomes for third-grade students in private schools.

H0: Nano-learning does not significantly affect students' attention and concentration during grammar lessons.

Ha: Nano-learning improves attention and concentration in grammar instruction for young learners.

1.5 Statement of the Problem

Little kids find learning English grammar extremely challenging since they must grasp complex ideas and also acquire reading ability. and usually cannot focus for long stretches. Third-graders may not concentrate, remember, or successfully use the grammar concepts if they receive too much conventional grammar teaching that primarily consists of memorizing facts and long classes.

Although nano-learning, which presents information in brief, concentrated, and enjoyable segments, appears to be a helpful teaching method, most research has concentrated on adult learners or higher education environments. Our knowledge is limited regarding its effectiveness in assisting young children learning English, such as third graders, to improve their grammar abilities. Given that we haven't investigated this sufficiently, we're lacking crucial information, especially because children at this stage develop and reason in their unique ways.

This study seeks to address this gap by investigating the impact of Nano-learning on grammar proficiency among third-grade students at Al-Zahra Private School. By focusing on this specific group, the study aims to provide insights into how Nano-learning can serve as a practical and developmentally appropriate approach to grammar instruction for young EFL learners.

1.6 Significance of the Study

This study is important since it examines the modern learning obstacles presented by younger students, who frequently lack focus spans. Splitting grammatical lessons into little, clear chunks improves the understanding and recall of difficult grammatical structures via Nano-learning. For teachers and legislators keen on including Nano-learning techniques into conventional classroom instruction, therefore encouraging a more engaging and interactive setting, the results provide useful insights. Learning experience devoid of damage to academic success.

Nano-learning is flexible, unlike traditional "one-size-fits-all" techniques; it lets courses be customized to the wide range of needs and capacities of students, hence guaranteeing each learner moves at a suitable rate. Generally speaking, it shows how digital educational approaches may help to change modern learning settings, especially in pre-service elementary education, by exhibiting how technology-driven strategies can be used successfully to advance individualized, student-centered instruction.

1.7 Limitations of the Study

This study admits a number of limitations that need to be taken into account while analyzing its results. First, because it was limited to a single private school, the findings may not be as applicable to other educational settings like public schools or rural locations. Second, the sample size was tiny, which made it difficult to record a variety of student differences. Third, it did not examine whether the advantages of nano-learning are long-lasting; instead, it concentrated solely on immediate results.

Finally, it used the assumption that students were accustomed to using digital tools and had access to them, which may not be the case in all educational settings.

These limitations may affect the extent to which the findings can be generalized; however, they also highlight areas for future research, such as conducting longitudinal studies, applying Nano-learning in more diverse school settings, and examining its long-term impact on grammar learning.

1.8 Definitions of Terms

Nano-Learning

Researcher Definition: Nano-learning is a very short-form learning session, generally no longer than five minutes, to deliver a small piece of information or a single skill. It is informed by the digital habits of today's student, allowing for short, just-in-time learning experiences (Denojean-Mairet, Dubois, & Tremblay, 2024).

Operational Definition: This study defines nano-learning as a short-length learning session of no more than five minutes. In our research, students will learn grammar in nano-lessons. Nano-lessons are delivered through digital platforms in order to create engaging, bite-sized learning experiences tailored to today's students.

English Grammar Proficiency

Researcher Definition: Knowledge of language is demonstrated in use. The ability to produce and understand English grammar is a key measure of knowledge of language. It refers to a learner's ability in the use of the structures of a language. Learners must systematically use and apply grammatical rules in English grammatical structures following the grammar rules in the right places and at the right times, using the right forms and tenses. Conjugating is not limited to verb tenses. Learners should use the appropriate form for all grammatical structures including nouns, pronouns, and adjectives (Amakhina, Dmitrieva, & Timokhina, 2023).

Operational Definition: English grammar proficiency in the context of this study means the capability of third grade students to understand and apply grammar rules for a grade three language arts curriculum. This includes completing quizzes and activities that show grammar and concepts are successfully comprehended and retained.

Attention Span

Researcher Definition: Attention span refers to the duration a person can focus on and retain information. Generally, attention spans for elementary school-aged children are quite brief. Because of this, instructors must adapt their educational strategies to account for these limited attention spans.

Operational Definition: third-graders' grammar learning time will be focused on in this study comparing the traditional methods with nano-learning methods.

1.9 Literature Review

Introduction

There are two main methods of teaching and learning grammar, namely: nano and traditional. The first depends on the degree of retention students have while the second depends on traditional methods and rote memorization (Chamorro-Atalaya & Flores-Velásquez, 2024).

Highlighting cognitive principles such as spaced repetition, micro-content delivery, and the reduction of cognitive overload, a complete examination of past studies helps to define the practical benefits and drawbacks of Nano-learning. Furthermore, review of the literature helps to find knowledge gaps, so guiding fresh research toward evidence-based approaches for incorporating Nano-learning into both conventional classrooms and mobile-based flexible learning settings (Chamorro-Atalaya & Flores-Velásquez, 2024).

This literature study seeks to analyze recent studies on how Nano-learning improves English grammar competence, assess its pedagogical value, cognitive underpinnings, and adaptability. Emphasizing how cognitive variables—such as attention, memory retention, and decreased cognitive load—interplay to maximize learning results, the review investigates the advantages and obstacles of nano-learning. Furthermore, the review covers how Nano-learning may be used in a range of educational approaches, from fully face-to-face classrooms to wholly online or blended learning settings, thus highlighting Top methods for a range of educational environments.

1.9.1 Theoretical Framework and Key Concepts

Nano-Learning Definition

Nano-learning is a revolutionary, modern means of educating people whereby the contents of learning are presented in small, concentrated segments that generally last just a few minutes. This is based on the principle of delivering micro-content, where very condensed portions of information are provided to ensure comprehension and utilization take place with the least amount of time possible (Chamorro-Atalaya & Flores-Velásquez, 2024).

Nano- learning focuses on short sessions in which students handle a number of tasks changing learning environments and developing students' mentality. This model distinguishes itself in the extreme dedication it makes toward maximizing retention and engagement over a short amount of time . (Chamorro-Atalaya & Flores-Velásquez, 2024)

Al-Shehhi (2024) says that Nano-learning is intended for "just-in-time" learning, where students concentrate on brief, pertinent material at a particular time. Nano-learning makes the cognitive load less than before focusing what is being understood (Chamorro-Atalaya, Flores-Velásquez, & Saavedra, 2024). It depends on methods such as student center approaches and other approaches which encourage students to learn grammar.

1.9.2 Related Learning Theories

Constructivist Learning Theory and Cognitive Load Theory crystalize the reason behind choosing nano-learning as the most suitable method in modern classrooms since it is concerned with the amount of the information load students get in each session. This offers an active-learning process in which students benefit the most in their classrooms.

Cognitive Load Theory

Having an excellent structure in the educational process is important reducing educational loads which aligns with the principles of Nano-Learning focusing on students as the center of the educational process and having information more effectively (Sweller, 2010).

Reducing the educational load according to Kalyuga (2011) is a crucial part of the educational process that applying creative techniques in nano-learning methods motivates students' memory and creativity and enables students to master the language more fluently (Al-Shehhi, 2022; Sweller, 2010).

Constructivist Learning Theory

Unlike information learned passively, theoretical points of view from Piaget (1954) and Vygotsky (1978) emphasize that students construct it actively via participation, investigation, and social interaction. It focuses on learning via writing notes, solving problems and urging students build their own experiences and understanding of the material (Al-Shehhi, 2022).

This active learning process adds flexibility to the educational process and adds meaningful construction of knowledge in students' minds through the adaptability of materials to their daily life activities (Chamorro-Atalaya & Flores-Velásquez, 2024; Denojean-Mairet, Dubois, & Tremblay, 2024).

1.9.3 Relevance of Nano-Learning to Language Acquisition

In Second Language Acquisition (SLA), students in the Nano-learning process get more information and less educational learning load which develops their excellence in English and their construction of experiences (Desiderio, Poutrain, & Karda, 2024). This approach aligns with the Communicative Language Teaching approach (CLT) which focuses on the learner not the teacher considering students the center of the educational process (Krasnova & Kouznetsova, 2023).

Both methods ease the educational process showing a high level of confidence among student whenever they use language since they controlled their learning process as well as their learning environment by following teachers' instructions (Mariappan, 2024); Krashen, 1985; (Amakhina, Dmitrieva, & Timokhina, 2023; Pham & Nguyen, 2023)

1.9.4 Historical Development of Nano-learning and Digital Pedagogy

Early Forms of Digital and Microlearning

Learning through digital devices started in 960s using computer assisted instructions using order lines as the internet started to spread all over the world (Mykytiuk, 2024). Learning Management Systems (LMS) and virtual classrooms enabled teachers to effectively design, arrange, and present digital courses by the early 2000s. Although the focus initially stayed on whole modules and full-length courses, it became abundantly clear that breaking material into smaller, more digestible portions could greatly Improve learner participation and memory especially for those trying to balance learning with other time pressures (Mykytiuk, 2024).

Microlearning rose as a major invention during this time, stressing brief-format, focused content delivery in lieu of long lectures or conventional courses. Contemporary nano-learning evolved from the fundamental microlearning tenets of brevity, concentration, and accessibility. Microlearning fits the short attention spans of students especially in digital and mobile environments by giving information in

brief, focused segments. The rise of tablets and phones in the late 2000s intensified the success of microlearning by allowing students to access educational resources everywhere and whenever. Learning became more adaptable, individualized, and in accordance with the fast-paced lives of today's pupils thanks to this technology change, therefore laying the groundwork for the adoption. and effective nano-learning methods (Mykytiuk, 2024).

Nano-learning became a natural consequence of developments in microlearning principles, given the growing demand for flexibility, immediacy, and personalization in learning. While microlearning involves brief lessons that generally range from five to ten minutes, nano-learning extends this further by delivering content in even smaller units of time, often less than two minutes. This hyper-focused approach is designed to fit into the daily routines of learners effortlessly, enabling them to experience content on short breaks, commutes, or other areas when gaps appear in their schedules. According to Pham & Nguyen (2023), nano-learning capitalizes on the shift toward self-managed or self-directed learning sessions in small bits that can be accessed anywhere, anytime, meeting expectations brought about at the back of instant access to information.

While nano-learning normally develops at a gradual pace, the COVID-19 pandemic greatly accelerated this with the urgent need to adapt educational settings around the world. As traditional classrooms pivoted to digital formats, educators and institutions alike realized the need for accessible, flexible learning that would meet the diverse needs of students navigating new and often remote learning environments as AI assisted retaining information and engagement in the classroom (Mykytiuk, 2024); Nguyen ,2023). Also, it enhances nano-learning by granting immediate feedback to strengthen the excellence and retention of the grammatical material through engaging more in the lesson. (Mykytiuk, 2024; Pham & Nguyen, 2023).

It is also used in training because of its implementation speed since it helps employees to learn new skills without hindering their daily chores. It gives short units which can be done directly enhancing students' performance and increase their proficiency (Al-Shehhi, 2022).

It is also suitable for children since the bits of information are short helping students to concentrate more without feeling bored since it is all about using games and short videos to attract their attention. It improves students' critical thinking and problem solving which can be adjustable according to students' educational level (Chen & Liu, 2022).

Nano-learning is projected to grow even more sophisticated with the continuous development of artificial intelligence, able to properly customize educational material to personal learning preferences, goals, and performance patterns. Nano-learning helps to create adaptive, learner-centered environments that give engagement, skill development, and ongoing improvement top priority by combining digital activity with data analytics (Mykytiuk, 2024).

Finally, artificial intelligence-enhanced nano-learning offers a revolutionary approach in digital education. With its ability for personalization, quick feedback, and flexible delivery, it serves as a foundation of next educational approaches that provide scalable and efficient solutions for many learners in both official and unofficial learning settings.

Nano-learning: a trend in contemporary education

Fast technical developments and changing preferences of modern students who prefer short, concentrated, flexible learning have contributed to the rise of nano-learning. Learning techniques that readily fit into their everyday schedules. Because it provides content in little, easy to handle portions easily available on mobile devices and online channels, nano-learning fits naturally with these tastes. Learning on-the-go is made

possible by this form, which lets pupils easily fit academics into their hectic schedules (Al-Shehhi, 2022).

By providing brief, flexible lessons that may be delivered via several media, Al-Shehhi (2022) points out that nano-learning meets modern educational requirements. For topics needing regular reinforcement and practice, such language learning or technical subjects, this method is especially appropriate. The accessibility of nano-learning has been enhanced by the availability of smartphones and tablets, which also allows students to interact with educational material at anytime and anywhere, therefore increasing efficiency and convenience.

Nano technology is distinguished from traditional methods that is focuses on a specific these in each educational unit. Also, the presentation of the educational content is presented easily. Hence, using digital means such as short videos and cartoons enables teachers to interact with the lesson effectively. Finally, students can review information repeatedly enabling students to comprehend the educational content practically (Chen & Liu, 2022).

According to Radzitskaya & Islamov (2024), nano-learning also fits current trends in self-directed and tailored learning. Its small and targeted design lets students assume full responsibility for their academic growth, revisiting material as necessary and managing the pace and objectives of their studies. Critical elements of student-centered education, self-discipline, motivation, and involvement result from this autonomy. Nano-learning is, above all, a contemporary, adaptable, and learner-centric instructional technique that satisfies the requirements of current digital and mobile learning settings.

This advantage of nano-learning has been multiplied with the integration of advanced technology, which allows educators to incorporate elements of multimedia, such as video, interactive quizzes, and instantaneous feedback, within the learning modules. Vivekananth (2022) notes that such features enable higher engagement and retention

through multiple learning styles, thus making nano-learning versatile within various fields. Such integration within a module not only enhances the educational experience but also caters to the diverse needs of the learners concerning visual and auditory preference.

Technology plays a central role in enhancing nano learning that electronic educational platforms help students establish short units easing the process by producing interactive multimedia to attract students' attraction. The Internet is such a powerful method to get to the educational sources making it possible to use the educational content anywhere and anytime measuring the development of their level instantly.

The COVID-19 pandemic accelerated nano-learning because all institutions in the world had to rush into remote and online education modalities. A bibliometric review by Chamorro-Atalaya & Flores-Velásquez (2024) shows that, after the pandemic, researches and applications for nano-learning suddenly increased because it allowed educators to maintain the engagement of their students online. They cited, "The most important benefits of nano-learning, especially domination by reducing cognitive load and digital fatigue, passed it into the remote learning shelter."

As nano-learning continued to evolve, so did its capacity for personalized education. Advanced data analytics and technologies in AI enable today's nano-learning platforms to study the behavior and progress of learners, thus tailoring content to the individual needs of each learner, according to (Pham & Nguyen, 2023). The essence of such a personalized approach is that students receive content pitched at their current level of understanding and at a pace at which they are able to learn, maximizing educational outcomes.

Nano learning develops independent learning giving students the freedom to choose the educational content suiting their needs which enable them to organize learning schedule as they want. This enhances their ability to determine students' priorities and

understand the information quickly. It also helps improve their research skills giving them time to implement learnt information practically and quickly (Emmanuel, 2018).

Apart from technological development, the change in learning behavior of Generation Z learners has also contributed to making nano-learning more popular. The authors Qamar & Zardari (2023) explain that the students of this day and age, who are accustomed to instant access and fast consumption of information provided by social media and digital technology, expect the mode of learning to be no different. Nano-learning, therefore, with short and interactive lessons, would appeal greatly to such learners, making the strategy viable and quite appealing for contemporary students.

Key Milestones in the Adoption of Nano-learning

Nano-learning grew more and more linked to gamification techniques and digital platforms throughout the 2010s. Incorporating bite-sized lectures, quizzes, and interactive activities, platforms like Duolingo, Khan Academy, and many learning management systems showed nano-learning's real efficacy in increasing retention and engagement. This era underlined how beneficial it is to use microlearning with prompt feedback and multimedia resources to create more dynamic and inspiring learning (Hosseini, Rezaei, & Gholami, 2021).

The transformation of nano-learning from a new instructional theory to a broadly accepted teaching strategy mirrors both its technical growth and the changing needs of modern students. Being a flexible educational tool, its adaptability, flexibility, and effects span conventional academic settings, corporate training, and healthcare education. According to Al-Shehhi (2022), simplifying difficult topics like English grammar into brief, digestible lessons allows pupils to interact more successfully with difficult material, therefore improving memory and comprehension.

Studies assured that nano learning contributed in increasing students' ability to retain their learnt information by dividing the units into smaller ones to store them in the long-term memory which eases learning without being tired. Using multimedia

solidifies information which makes revising information easily and deeply (Desiderio et al., 2024).

As schools moved to remote learning, the COVID-19 epidemic quickened the uptake of nano-learning. Chamorro-Atalaya & Flores-Velásquez (2024) found that traditional long-format instruction usually resulted in digital fatigue, whereas nano-learning kept students interested in virtual classrooms. This era emphasized the approach's capacity to provide intense learning experiences quickly, even in adaptable and accessible formats.

Promoting self-regulated learning (SRL), nano-learning is another important milestone in its evolution. This strategy encourages students to gain their educational independence and self-discipline using mobiles (Radzitskaya & Islamov, 2024; Qamar & Zardari, 2023).

Professional and healthcare education have also used nano-learning quite well. Ibrahim, Abd El-kader, & Ibrahim (2024) showed that nano-learning modules increased nurses' confidence and knowledge when Learning diagnostic techniques shows its capacity for high-stakes, skill-based disciplines where precise, focused education is vital. Attri (2023) highlighted the use of nano-learning in fast-paced professional environments in corporate situations since it helps staff members to quickly get knowledge without slowing down productivity, therefore supporting ongoing skill development.

By tailoring material to meet every learner's needs, the incorporation of artificial intelligence promotes nano-learning even further. AI-driven systems, according to Kamoun, Kakon, Fenniri, & Lisimachio (2023), can examine student behavior and growth and modify lesson delivery to fit personal tastes and pace, therefore improving involvement and efficiency. Furthermore enhancing student pleasure and participation is the inclusion of nano-learning videos into online and remote education. Such

movies let remote students to rewatch content, therefore strengthening retention and understanding, according to (Emmanuel, 2018).

1.9.5 Empirical Studies on Nano-Learning

Impact of Nano-Learning on Student Engagement

Classic modes of learning call for long-term attention, frustrating for modern learners whose spans of attention may be shorter. Nano-learning information is in concise, digestible segments, usually two to five-minute dimensions, fitting well with the rapid-flying digital culture to which most of today's students have become accustomed (Pham, Nguyen, & Nguyen, 2023). It would, therefore, apply to keeping attention, with a deeper interest in the subject matter, that nano-learning makes learning more accessible and adaptable. During the last years, research constantly shows how nano-learning engages students and covers their learning preferences and, so, is promising in educational settings.

Its concise format makes nano-learning particularly effective for those students who cannot focus on long material. A recent study by Pham, Nguyen, & Nguyen (2023) found that the nano-learning format is very attractive to the younger generation due to its appealingly small bits of information, which generally would be preferred by this generation, being short and easy to access. This contributed to the students feeling more motivated and vested when information was provided in this simplified structure. Modular approach with nano-learning allows students to receive the material at their own pace, which makes it easier to recall information without feeling overwhelmed by the process. In nano-learning, the removal of pressure to absorb large volumes at any given time allows students to be active in each segment, progressing at their rates of learning speed and focus capability.

Nano-learning is especially engaging because of interactive and immersive contents, in particular. It especially becomes valuable in those disciplines needing hands-on understanding.

New studies indicate that using interactive, small-scale learning techniques boosts how well students understand and how involved they are. Schönborn, Höst, & Palmerius (2016) explained that adding virtual reality (VR) to small learning classes helps students connect with science ideas on a tiny level, which makes learning more interesting and suited to them. This way of teaching changes learning from just listening to doing things and exploring, which gets students involved and keeps them interested.

Adding computer learning systems to small online learning parts to watch and change based on how involved students are greatly improved how well they did, (Hussain, Zhu, Zhang, & Abidi, 2018) found. Their study showed that, unlike normal, long lessons, shorter, more specific learning times helped students focus better, stay driven, and be more involved. Computer learning-based systems could then Change small-scale learning by altering how content is given based on personal involvement habits to get the best learning results. Besides getting people excited, small-scale learning helps to lower mental overload. It's simple, separate design lets students quickly process information without getting tired, which helps them feel good about learning.

According to Vivekananth (2022), small-scale learning's organized way helps lower mental fatigue caused by long study periods, so it works very well in places far away or online where people can't focus for long. Small-scale learning pushes students to take part regularly by putting learning into fun, easy chunks, which grows passion and dedication to the topic.

The ease that small-scale learning gives is another big plus. This method fits different student needs unlike typical classrooms that treat everyone the same, letting them learn at their own speed and look back at information when needed. (Pham, Nguyen, & Nguyen, (2023) made clear that this freedom lets students control their learning journey, which improves drive, lowers stress, and builds skill before moving to new

material. This ease helps students make learning more specific and focused on them based on what they like and can do.

Small-scale learning also works with how students today live digitally, since they are used to short, interactive, and pretty content on social media and internet sites. Small-scale learning meets current wants for fun, easy learning events by using things like videos, images, and fun quizzes (Hussain, Zhu, Zhang, & Abidi, 2018). This mix of interactive tech makes learning more fun and helps people remember and learn things better.

Small-scale learning then gives a big change in how we teach, which is especially good for students who can't focus for long and like learning experiences that are easy, interactive, and involve tech. Studies by (Pham, Nguyen, & Nguyen, 2023; Vivekananth, 2022; Hussain, Zhu, Zhang, & Abidi, 2018; Schönborn, Höst, & Palmerius, 2016) all show a rise in drive, help for how the mind works, push for freedom, and improve involvement, so it is a good way for today's learning. Its small, tech-boosted design lets students really get into the material, remember things better, and enjoy a good, easy learning place.

Furthermore proven to improve student involvement is the use of nano-learning together with digital tools and platforms. For example, using TikTok for vocabulary development shows greater student engagement and interest. Using multimedia components and social interaction, such platforms develop a dynamic learning experience that helps pupils to relate to their lessons (Al-Samarraie, Shamsuddin, & Alzahrani, 2023).

Nano-Learning and Academic Performance in English Grammar

Breaking down learning into small chunks has been very successful in helping students improve their English grammar by providing information in short, focused, and simple parts. This way of teaching deals with the short attention spans of today's students, helping them understand better, remember more, and improve their overall

language skills. Many research papers show how well it works: Koşar & Bedir (2018) discovered that quick, repeated lessons in learning settings based on how the brain works helped people remember grammar for longer and made things easier to understand.

Serfaty & Serrano (2022) revealed that grammar lessons that were short and spread out helped improve memory, especially for those who were already good at learning. Nakata & Suzuki (2019) pointed out that mixing different grammar subjects in short periods made students more interested and helped them remember things longer, even if they made mistakes at first. He & Suzuki (2023) proved that short, spaced-out practice helped students correctly connect grammar knowledge over time. Alahmadi (2019) showed that using computers to learn languages (CALL) with short learning ideas led to better grammar learning and overall better English skills compared to old-fashioned ways.

Taken together, these studies suggest that breaking learning into small chunks makes people less tired mentally, helps with teaching that is tailored to different needs, and lets students learn at their own speed, going back to the material when they need to. The fact that it can easily be used on computers also makes it more flexible in different learning situations. In general, proof from research by Koşar & Bedir (2018), (Serfaty & Serrano, 2022), (Nakata & Suzuki, 2019), (He & Suzuki, 2023), and Alahmadi (2019) emphasizes that breaking learning into small chunks is a new, helpful way to build grammar skills, memory, and lasting language ability.

The foundation of nano-learning is technology, which helps to provide customized, interesting, and brief learning opportunities. Often under two minutes, micro-lessons often created and distributed on digital platforms are accessible across several devices, therefore guaranteeing flexibility and availability for students. Catering to many learning styles and enhancing engagement, these platforms encourage multimedia integration—that is, videos, quizzes, interactive elements. Nano-learning's

technological adaptability lets for the accommodation of several learning styles and preferences, hence fostering a more inclusive and effective education (Balasundaram, Mathew, & Nair, 2024; Reynolds, 2023).

Additionally, technology improves the responsiveness and interaction of nano-learning. Learning Management Systems (LMS) and mobile apps can deliver real-time feedback, monitor student progress, and adjust material to fit individual requirements. For example, websites such Moodle and Canvas provide tools that help to develop short, focused lessons supplemented by assessments and analytical features. This technological synergy encourages a dynamic learning environment where students can actively interact with content and get instant assistance, therefore increasing retention and results in learning (Gorham, Majumdar, & Ogata, 2025; Reynolds, 2023).

1.10 Role of Technology in Nano-Learning Implementation

Online spaces, especially TikTok, have greatly helped put nano-learning into action by making it quicker, more engaging, and very easy to get to. These spaces let teachers share small, specific learning bits that students can take in well. Khlaif & Salha (2021) showed that TikTok's less than one-minute video style fits very well with nano-learning ideas, giving short, easy-to-understand lessons that help create useful and good learning times. Likewise, Garcia, Juanatas, & Juanatas (2022) pointed out TikTok's part in teaching coding, proving that brief, focused videos draw lots of attention and do a good job of sharing learning stuff outside regular schools, linking planned and unplanned learning.

Middleton (2022) looked at TikTok in a college-level Strategic Management class, discovering that short videos got students more involved and helped them remember ideas better, mainly for Generation Z students who like getting quick info through different media. Finally, Hu & Du's research in MALL with EFL students in China showed that content using TikTok made them want to learn more and gave fun,

relaxed nano-learning chances to work on language skills. Taken together, these studies show that online spaces like TikTok offer good and interesting ways to use nano-learning, especially in making hard topics simpler and getting students excited to learn in both school and other settings (Garcia, Juanatas, & Juanatas, 2022; Middleton, 2022; Hu & Du, 2022; Khlaif & Salha, 2021). It is concluded that Tiktok is one of the tools of nano-learning encouraging engagement and motivation in learners' lives.

1.11 Nano-Learning in Language Education

1.11.1 Benefits of Nano-Learning into the Learning of English as a Foreign Language

Nano-learning focuses on very small units of learning, which are easily digestible, unlike those in traditional learning methods, and is particularly helpful for providing opportunities for students who have difficulties in retaining language. It has been evidenced that nano-learning facilitates language acquisition because it is concentrated on small chunks, and a learner can handle and retain such information faster due to higher review rates.

Other research, such as, by Laloan (2022), showed that the use of digital technology in teaching nano-learning format vocabulary enhances such vocabulary retention and the comprehending of the language in young learners. This systematic and frequent exposure to vocabulary will allow learners to build his language competence little by little, so that retention and retrieval of the words would become more effective.

In like manner, Jirin et al. (2023) found how nano-learning principle-based language learning strategies helped young learners in grammar and vocabulary acquisition in English. For example, nano-learning decreases the cognitive overload of students by allowing them to focus on one little skill or concept at a time.

Moreover, interleaving grammar exercises, referring to presenting varied grammar tasks in short, mixed intervals, supports long-term retention according to (Nakata & Suzuki, 2019). Another related approach is that it replicates nano-learning with the provided concise and varied chunks of information, thus giving an opportunity to learners to retain their attention span and understand complex grammar patterns more effectively.

A different study on Simulation-Based Instruction was pursued by Angelini & García-Carbonell, (2019) where nano-learning strategies were implemented to note the improvement in students' communicative skills, particularly vocabulary and pronunciation. Thus, learners, through emulating real-life scenarios in concise and focused lessons, practice more real language applications that help reinforce the retention of language. Angelini and García-Carbonell (2019) further gave support that such nano-learning is effective to acquire vocabulary.

Fadzil & Sulaiman (2022) also reported that game-based learning, designed as concise and focused tasks, enabled learners to learn new vocabulary in an enjoyable and low-stress environment. If vocabulary acquisition were divided into small, interactive bites of information, then the learning process of the students could proceed incrementally without becoming overwhelming (Fadzil & Sulaiman, 2022).

1.11.2 Barriers to Nano-Learning Adoption for Language Teaching

Although nano-learning has several advantages with regard to language learning, a number of challenges intervene to limit its pervasive diffusion in teaching and learning languages. One major constraint involves the dependency on technological resources. (Pinto-Llorente, Sanchez-Gomez, Garcia-Pealvo, & Casillas-Martin (2017) have indicated the deficiencies of the asynchronous learning tools regarding a blended learning environment. Not all students have the same accessibility to the technology which would support nano-learning. Since some of the students may not be in a position to access the internet or appropriate devices, their participation in the nano-

learning activities may not be active as have been suggested by (Pinto-Llorente, Sanchez-Gomez, Garcia-Pealvo, & Casillas-Martin, 2017).

The element of resistance from the educators also contributes to an issue regarding the successful implementation of nano-learning strategies. In the words of Tamilselvi (2016), most of the language classes are still taught through traditional teaching methods, whereby teachers seem to know what works best and are unwilling to make any drastic shift toward new technology-based teaching methods. Some teachers may receive too little training in using nano-learning tools, which once again diminishes the effectiveness of such methodology in the classroom.

The reason why nano-learning does not fit easily into many educational systems is that it is based on inflexible curricula, which are usually designed for extensive and in-depth lessons rather than shorter and segmented learning approaches. Hossain (2017) cites that in some cases, especially when there is a traditional way of grammar teaching, there is limited room for innovative approaches such as nano-learning.

Another area of challenge in implementation level is due to the differential nature of the engagement and motivation level of the students. According to Palasan (2017), nano-learning, on one hand can be quite useful in cases of motivated learners, while less motivated students may find it hard to engage with such brief focused content, lacking the benefit of interval learning without the supporting structure that a longer lesson format traditionally would have provided them. This thus requires educators to explore possibilities of keeping the motivation of students in the nano-learning context continuously high (Palasan, 2017).

1.11.3 Case Studies in Language Learning Using Nano-Learning

Several case studies illustrate how nano-learning has been put into practice with success in language education. Among these, the 2023 study by Prasetya & Raharjo on the use of Grammarly-an AI-based tool in writing through instant feedback-showed that among all students, grammatical accuracy and vocabulary use significantly

improved. For example, Grammarly made grammar and vocabulary skills more digestible into nano-learning units with immediate corrective feedback so that learners can work with the language in a structured, iterative way toward better performance (Prasetya & Raharjo, 2023).

Zamanpour & Gorjian (2016) looked at using concept maps in a short learning setup to help people learn new words. By giving learners brief lessons with pictures, they could neatly arrange new words, see how words relate, and remember them better. This method also helped students learn alone, letting them study and strengthen their word knowledge whenever they wanted.

In summary, nano-learning is an influential tool in language education. Some of the advantages it has over traditional learning environments include better retention of vocabulary and grammar, a reduced cognitive load, and even better language understanding. Potential barriers to adopting nano-learning in traditional institutions of learning are impediments in teaching and learning because of technological limitations, resistance to new challenges, and a lack of standardization by educators and other stakeholders. Case studies will therefore demonstrate the pragmatic effectiveness of nano-learning within a range of language learning contexts, especially where digital tools apply pre-structured, chunked content that fosters incremental learning. Nano-learning is thus bound to play a more significant role in language education, as it increasingly gains popularity and becomes an invaluable resource among modern language learners.

1.12 Methodological Approaches in Nano-Learning Research

1.12.1 Qualitative Studies on Nano-Learning

Researchers have often used qualitative methods to understand what students and teachers think about nano-learning by doing interviews, group discussions, and watching what happens. For example, Anghel, Gorghiu, & Măntescu (2016) used interviews with some set questions and surveys to see what people thought about

educational teamwork, and they discovered good feelings, especially about how nano-learning lets people work together. Likewise, Jo (2022) studied quick lessons used in early schooling, which showed that teachers thought kids got better at thinking about their own thinking and looking back on what they do. Sewagegn & Dessie (2021) looked at what college students thought and found that students liked that nano-learning was short and easy to get to, mostly when used with regular teaching in mixed learning settings (Jo, 2022; Sewagegn & Dessie, 2021; Anghel, Gorghiu, & Măntescu, 2016).

1.12.2 Quantitative Research into Nano-Learning's Effectiveness

Research that involves numbers has greatly helped show how well quick lessons work to help people learn languages and get better results in school. Hendri, Syarkowi, & Rasmi (2020) used questionnaires and number analysis to judge quick lessons in science, technology, engineering, and math classes, and they discovered it made students understand better, remember more, stay interested, and do better overall.

Likewise, Ikma & Nirwana (2019) studied how teaching styles and student interest are connected, proving that there is a strong link between short, lively quick lessons and higher drive, which hints that quick lessons can make learning better even in normal classes. Monroy & González-Geraldo (2018) also backed up these ideas by proving that quick lessons help people learn deeply, because simple and focused material lets students understand hard subjects in a better way (Hendri, Syarkowi, & Rasmi, 2020; Ikma & Nirwana, 2019; Monroy & González-Geraldo, 2018).

1.12.3 Mixed-method approaches in nano-learning research

Mixed-method approaches help provide a full view in nano-learning by integrating qualitative insights with quantitative data. For example, Galloway & Bretz (2016) conducted a mixed-method study in an undergraduate chemistry course, using video recordings along with survey data to analyze the students' perception of nano-learning. Results proved that short, focused nano-learning episodes resulted in meaningful

learning, which enhanced students' cognitive and effective engagement of the course material, as they perceived it. Other studies such as (Rohmawati, Fawaiz, Adam, & Purwaningsih, 2023; Tirre, Kampschulte, Thoma, Höffler, & Parchmann, 2018) demonstrate that nano-learning improves students' level of English specially while learning English language.

Diversity in the methodology carried out to explore nano-learning stimulates scientific thinking in our understanding of how it works in the educational environment. Qualitative research describes students' and teachers' perceptions in depth, while quantitative studies provide measurement for learning outcomes. Mixed-methods approaches embed these views into a comprehensive overview of nano-learning's impact in diverse educational settings. Together, these methods underline the potential of nano-learning to enhance both engagement and academic success by offering a flexible and accessible approach to modern education.

1.13 Gaps in the Literature

1.13.1 Scarcity of Research into Long-Term Effects of Nano-Learning

A key area missing from studies about nano-learning is a lack of knowledge about what happens in the long run, especially how well people remember things later on. Most studies on teaching methods have usually looked at quick or short-term success, which means we don't know enough about how nano-learning affects keeping memories for a long time. Rawson, Vaughn, Walsh, & Dunlosky (2018) did well in a study about relearning, highlighting how repeating sessions helps memory stick better, and they noted these methods could help improve learning results in the long run.

However, using these ideas directly with nano-learning hasn't been done much, so there's still a need to prove it helps you remember languages or technical information well over time. Other studies, like the one by Witherby & Tauber, show benefits in thinking about how well you're learning to help you remember things better. The

researchers say that making these kinds of judgments can really boost both short-term and long-term learning results. One interesting area for future studies is using these judgments in nano-learning, but it hasn't been looked into very much yet (Witherby & Tauber, 2017).

Maxcey, Shiffrin, Cousineau, & Atkinson (2021) shared examples of very long-term memory that showed how long knowledge can last under the right circumstances. These examples show how nano-learning could help with this kind of very long-term memory, but nano-learning studies don't often check back after more than a couple of months. Therefore, checking in the long run in nano-learning studies could help show how much nano-learning really helps with remembering information.

It focuses on presenting the information of short units easing the understanding of information leading to increasing the concentration and decreasing exhaustion because of the length and complexity of information. It enables learners to get to the information in different environments at any time . However, lack of technological infrastructure diminishes all its benefits (Mariappan, 2024).

Another gap pertains to the need for nano-learning research to undertake comparative studies across diverse educational contexts, such as age groups, subjects, and types of educational institutions. Larsen, et al. (2015) examined the process of test-enhanced learning in neurology courses. Even though this study was done in a motor-learning environment, the principles could be explored in nano-learning environments to understand whether motivational tactics in the same vein support better learning outcomes across diverse demographics. In addition, the research by Emke, Butler, & Larsen (2015) on team-based learning suggested that group work has been helpful when considering short-term learning but is not as effective for long-term retention. For example, comparative studies in nano-learning would reveal if these collaborative approaches also fail to sustain knowledge retention in diverse subjects and age cohorts

at roughly similar rates (Hamel, Côté, Matte, Lepage, & Bernier, 2019; Emke, Butler, & Larsen, 2015).

1.13.2 Unexplored Potential for Nano-Learning in Multicultural, Diverse, or Low-Tech Classrooms

The last point deals with the unexplored potentials of nano-learning across multicultural, diverse, or low-tech learning environments. While nano-learning is digitally centered, most environments lack the technological framework to apply these technologically heavy methods.

Nano-learning restricts its application in diverse educational systems. In this respect, the studies by Park & Sternad (2015), concerning skill retention within self-paced, sparse feedback environments, indicate that low-tech nano-learning strategies may still allow for retention when students are provided with structured guidance. But, there isn't much research about how well very short lessons work in classrooms with limited technology and diverse cultures when students are able to use digital learning tools.

Snow, et al. showed in 2016 that using non-digital methods can help people remember things better, finding that doing a bit of exercise that gets your heart pumping after learning something helps you remember physical skills better. Looking more closely at non-digital methods in very short lessons, especially in places with few resources, could really help us understand how these methods can be changed to fit many different situations.

There aren't enough long-term studies about nano-learning to see how it affects people over time, or studies that compare it in different school systems, and research is needed into how nano-learning can be changed for use in simple or varied classrooms. Because of this, we could learn more about what nano-learning is good and bad for in different age groups, cultures, and situations.

1.14 Conclusion

1.14.1 Summary of Major Literature Findings

Very short lessons have become a special and useful way to teach now, especially for learning languages and subjects where remembering details and accuracy are key, like knowing grammar well. It gives information in small, separate parts that match how our brains work, like how much information we can handle at once and how we build our own understanding, helping us remember things better and not get too tired mentally. Its brief, concentrated parts make it easier to see and remember things again and again, which helps us keep vocabulary in mind, learn grammar, and understand what we read or hear. Very short lessons also fit well with computers and phones, letting students learn in quick, easy sessions that fit with today's busy and changing lives.

Studies show that very short lessons are good at getting students interested, improving their skills, and helping them remember things for a long time by showing them the information regularly over time; this helps both in-person and online learning, including on sites like TikTok. However, there are problems in places with fewer resources because they might not have enough technology, and some teachers might not want to use very short lessons if they don't get the right training. There aren't many studies that compare it to other methods or look at it over a long time, so we don't know if it works for everyone in different learning situations and groups.

Nano learning represents the future of digital and interactive future as educational technology is in constant development as merging it with artificial intelligence led to presenting a specific educational content to each learner. It also makes access to necessary information available to all students which makes it an essential part of the modern educational learning methods (Aburizaizah & Albaiz, 2021).

It is a revolutionary method on the traditional methods focusing on enhancing students and retaining their information despite present challenges. Still, good planning in nano learning is an effective means in various educational fields. As a result, teachers should cope with these methods to create new windows for the educational processes (Mariappan, 2024).

It is a flexible means through which access to required information and knowledge can be done through smartphones, tablets and computers. In schools, nano learning simplifies hard-to understand information in order to make it easy to understand and ease the process of self-revision and students' participation in the classroom (Logenthini, 2024).

Dividing lessons to short lessons through summaries, lessons can be reviewed through students' critical skills and their ability to comprehend complicated material. The application of this educational method enhances students' cooperation and knowledge building (Hossain, 2017).

In general, the research shows that very short lessons are a smart, flexible, and helpful way to learn, especially when learning a language. More research should be done to see how well it works over time, how well it works without a lot of technology, and how well it can be changed to fit different kinds of students. If its problems are solved, very short lessons could change how we teach by making learning easy to get to, effective, and focused on the student in online settings.

Chapter Two

Methodology

This chapter deals with the study method, population and sample, in addition to the tool, credibility, reliability, variables, procedures and statistical processes.

This study adopts an integrated quantitative-qualitative method in the assessment of nano-learning strategies on third-grade students' proficiency in English grammar at Al-Zahra Private School. Consequently, this chapter delineates the methodology by defining the study population, explaining sampling techniques, and describing the research tool, including the measure undertaken to validate and ensure reliability. This includes extending the description of an experimental design framework and statistical approaches applied during the analyses of the data collected. In this way, the chapter is well-organized with detailed information that enhances clarity in the research process for better replicability by future scholars.

2.1 Population of the Study

The study population included all third-grade students at Al-Zahraa Private School in Nablus during the second semester of the 2022/2023 academic year. A total of 200 students participated, representing a mixed-gender cohort aged 8–9 years. This group reflected the broader characteristics of primary school students in the region, making the findings widely applicable. And 5 teachers were interviewed.

2.2 Sample of the Study

A purposive sample of 50 students was selected from the third grade. The sample was divided into two equal groups:

- Experimental group: 25 students (13 males, 12 females).
- Control group: 25 students (17 males, 8 females).

The selection was based on the following criteria:

- Students' availability and willingness to participate.
- Representation of both genders.
- Similarity in academic background and exposure to English instruction.

The sample was considered suitable to reflect the characteristics of the larger population and to allow for meaningful statistical analysis.

2.3 Research Design

The study employed a quantitative experimental design, specifically a pre-test/post-test control group design. This design is appropriate for determining the causal effect of the nano-learning intervention on grammar achievement by comparing results between the experimental and control groups.

2.4 Intervention

The intervention was designed to apply nano-learning strategies in teaching grammar to the experimental group.

- Duration: Six weeks.
- Sessions: Two sessions per week, each lasting 15–20 minutes.
- Content: Selected grammar topics from the third-grade curriculum (present simple tense, subject–verb agreement, plural forms, pronouns, and prepositions).
- Tools and Materials: Digital micro-videos, Wordwall activities, and TikTok-style clips designed by the researcher.
- Teacher's Role: The researcher, as the teacher, introduced the topics, facilitated the nano-learning activities, guided students in using the materials, and connected the digital tasks to the formal lesson objectives.

The control group, by contrast, received instruction through traditional teaching methods as prescribed by the curriculum, without the use of nano-learning materials.

2.5 Instrumentation

The primary instrument used in this study was a grammar achievement test prepared by the researcher. The test consisted of multiple-choice and short-answer questions aligned with the grammar topics covered during the intervention. The total score for the test was 30 points. The test was administered as both a pre-test and a post-test to the experimental and control groups.

Additionally, semi-structured teacher interviews were conducted to gather qualitative insights into students' engagement, motivation, and challenges when learning through nano-learning.

2.6 Validity

The grammar test was reviewed by a panel of three experts in English language teaching and curriculum design to ensure content and face validity. The items were checked for clarity, alignment with study objectives, and appropriateness for third-grade learners. A pilot study was conducted with 15 students from the same grade level but outside the study sample. Feedback from experts and the pilot study was used to refine the test items.

2.7 Reliability

Reliability was tested using Cronbach's alpha on the pilot data. The reliability coefficient was 0.872, which is considered high and indicates strong internal consistency of the test items. This ensures that the test provides stable and consistent results.

2.8 Procedures

The study was conducted in the following steps:

1. Preparation of the grammar test and nano-learning materials.
2. Selection of the sample (experimental and control groups).
3. Administration of the pre-test to both groups.
4. Implementation of the nano-learning intervention with the experimental group for six weeks.
5. Teaching the control group using traditional methods.
6. Administration of the post-test to both groups.
7. Conducting teacher interviews.
8. Entering and analyzing data using SPSS..

2.9 Statistical Processing

Data were analyzed using the Statistical Package for the Social Sciences (SPSS). The following analyses were performed:

- Descriptive statistics: means, standard deviations, and percentages.
- Paired t-test: to measure differences between pre-test and post-test scores within each group.
- Independent samples t-test: to compare post-test results between the experimental and control groups.
- Effect size (Cohen's d): to determine the magnitude of the effect of nano-learning.
- 95% confidence intervals: to ensure accuracy and generalizability of the results.

Chapter Three

Results

3.1 Introduction

This study aims at identifying nano-learning technology impact third-grade students' ability to learn and retain English grammar by measuring short attention spans and improve focus.

For achieving the study purpose, an pre- and post-exams each consisting of five questions have been developed, distributed among of 50 student of study sample, gathered, corrected, codified, entered the computer and statistically processed by using the statistical package of social science (SPSS).and the result of teacher interview .

3.2 The Study Result

Results related to the main study question are as follows:

How does nano-learning technology impact third-grade students' ability to learn and retain English grammar?

In order to answer the main study question about the impact of nano-learning technology on third-grade students' ability to learn and retain English grammar, descriptive statistics (means and standard deviational were used and the following table shows the results.

Table (1)

Descriptive Statistics of the study sample scores

Group	N	Minimum	Maximum	Mean	Std. Deviation
Pre	50	9.00	30.00	18.6800	5.83599
Post	50	8.00	30.00	23.5400	6.74676

Table 1 shows the descriptive Statistics of the study sample scores. The results show that pre –test mean is 18.86 with standard deviation of 5.83 while post –test mean is 23.54 with standard deviation of 6.74. Also, the results show the Minimum and Maximum scores for each test.

Results related to the main hypotheses which is:

H0 (Null Hypothesis): Nano-learning technology does not significantly impact students' comprehension and retention of English grammar.

And "

Ha (Alternative Hypothesis): Nano-learning technology positively influences students' understanding and retention of English grammar.

To answer the main study hypotheses (Null and Alternative), Paired t test and Independent sample t test have been used and the following tables show the results:

Table (2)

Paired t test results of the pre-posttests due to using the guessing Nano-learning technology

Test	Mean	N	Std. Deviation	t	df	Sig. (2-tailed)	Difference
Pre- test	18.68	50	5.83	-4.469	26	0.000*	4.86
Post- test	23.54	50	6.74				

*. The mean difference is significant at the 0.05 level.

Table (2) shows that Nano-learning technology significantly impacts students' comprehension and retention of English grammar in the pre –test and post- test of the experimental group in favor of the post-test. The significant level is (0.000) which is less than (0.05). Also, the difference is 4.86 in favor of post-test. This result means that there is effect of using are Nano-learning technology on improving 3rd graders'

grammar skills. So, Alternative Hypothesis: Nano-learning technology positively influences students' understanding and retention of English grammar is accepted. On the contrary, Null Hypothesis: Nano-learning technology does not significantly impact students' comprehension and retention of English grammar is refused.

Table (3)

Independent sample t test about students' scores in pretest due to gender

Grammar	Gender	N	Mean	Std. Deviation	t	Sig.*
Pre- test (traditional teaching)	Male	30	18.4000	5.83450	-0.412	0.682
	Female	20	19.1000	5.96393		

*. The mean difference is significant at the 0.05 level.

Table (3) shows that there are no statistical significant differences at ($\alpha = 0.05$) level about the mean scores of the experimental group (3rd graders' grammar skills) in the pre-test due to the variable of gender . Significant value was (0.682) which is more than (0.05). That means no differences between males and females students in the pre-test.

Table (4)

Independent sample t test about students' scores in posttest due to gender

Grammar	Gender	N	Mean	Std. Deviation	t	Sig.*
Post- test (<i>Nano-learning technology</i>)	Male	30	22.6000	7.32779	-1.212	0.231
	Female	20	24.9500	5.65197		

*. The mean difference is significant at the 0.05 level.

Table (4) shows that there are no statistically significant differences at ($\alpha = 0.05$) level about the mean scores of the experimental group (3rd graders' grammar skills) in the post -test due to the variable of gender. Significant value was (0.231) which is more

than (0.05). That means no differences between males and females' students in the post-test and the effect of the strategy of Nano-learning technology impacted both males and females' students.

Interview findings and analysis

Interviews included five primary level English-speaking instructors with specialized expertise. Talks centered on the need of teaching grammar, assessment techniques, teaching methodologies, difficulties of grammar, the function of technology, and recommendations for curricular improvement. The results will be given in this portion along with relevant records and direct statements from the participants. Interview results should be in italics quoted by interviewee.

1. The need of teaching basic level grammar: Every participant underlined that strengthening pupils' language abilities depends on elementary level grammar instruction. " grammar is like a map that helps students navigate the language correctly," Mohammed said in a personal interview set for 2025. Mahmoud underlined in his personal interview 2025 that "teaching grammar at this age is not intended to make students experts in grammar, but rather to instill in them an innate sense of how to construct sentences and communicate correctly".

Conversely, Nour said that teaching grammar should be done practically and not as a collection of hard rules that must be memorized: "The goal is not to pile up grammar, but to make it a tool that students use when speaking and writing" (Nour, personal interview, 2025).

2. Approaches of evaluating pupils' grammar before beginning instruction
Every participant said they use many strategies to gauge pupils' degree before beginning grammar instruction. Apart from noticing pupils' usage of grammar during conversation and writing activities, Ahmed depends on "simple diagnostic tests that include completing sentences and correcting errors" (Ahmed, personal interview, 2025).

Regarding Laila, she said "short writing tasks such as describing one's family or writing sentences about hobbies help me assess students' level of understanding of grammar informally" (Laila, personal interview, 2025). Saying, "The " Correct the Sentence" game gives students the opportunity to identify errors in a fun way, which helps me assess their level without them feeling like they are formally tested," Nour said in a personal interview 2025.

3. Grammar Instruction Techniques : Although the participants used various grammar teaching approaches, they all agreed on the need of making instruction relevant to the life of the students and participatory. "Instead of presenting grammar as a set of abstract rules, I integrate it into everyday conversations and stories so that students understand how it works in a natural context," Mahmoud remarked in a personal interview slated for 2025 (Mahmoud).

Regarding Laila, she employs what she referred to as "grammar stations," in which students engage in short writing, sentence building using word cards, and sentence correction between several activities (Laila, personal interview, 2025).

Mohammed, on the other hand, emphasized the need of students working together and said, "When students explain grammar to each other, they reinforce their understanding in a very effective way" (personal interview, 2025).

4. Difficulties in Teaching Young Students Grammar: Among the most often mentioned difficulties the participants faced was keeping pupils engaged in grammar. "Students see grammar as something boring and difficult, so I try to present it in a creative and fun way," Nour said in a personal interview set for 2025 (Nour).

"Some students pick up grammar quickly, while others need more support, so I use additional exercises for students who are struggling and provide additional

challenges for advanced students," Laila said in a personal interview, 2025, pointing out another difficulty in which a uniform approach is difficult to apply.

5. The effect of technology on learning grammar: Every participant thought that the grammar learning process had been much enhanced by technology. "Digital apps and games let students receive immediate feedback, which helps them correct their mistakes immediately instead of waiting for correction later," Mohammed said in a (Mohammed, 2025). "When teaching conditional grammar, I used videos showing real conversations, which helped students understand how grammar is used in real-life situations," Laila said in reference to explanatory videos (personal interview, 2025).

Mahmoud said in his personal interview, 2025): "using technology makes grammar more interactive and engaging, as students can learn through competitions and games instead of traditional methods."

6. Ex comparison of conventional and creative approaches: Teachers concurs that creative approaches greatly raise student involvement and results. "When I used traditional methods such as lectures and paper exercises, students were not motivated, but when I used games and interactive activities, they became more engaged and remembered the rules for a longer period," Ahmed remarked in a personal interview set for 2025 (Ahmed).

"After using interactive games, I noticed that students were not only more engaged, but they also applied the rules better in their writing,". (Noor, personal interview for 2025).

7. Approaches of evaluating student development after use of instructional strategies
Every participant admitted they use many evaluation techniques. Mahmoud depends on "short tests combined with performance analysis in written assignments and class discussions" (personal interview, 2025).

Although Laila depends on "observing how students use grammar in their daily tasks rather than focusing only on formal tests" (personal interview, 2025).

The interviews demonstrate an agreement among instructors that grammar education should be practical, participatory, and technology-integrated to promote improved student comprehension. The results also indicate to the need for curriculum creation and continued teacher training to enhance teaching tactics.

Nano learning supports students' interaction by using educational videos and interactive games as well as short tests which deepen their educational process. It is more appropriate for this generation because it depends on technology coping with the technological age. Despite these benefits, the extra effort teachers exert makes it hard to implement it fully. Also, the lack of technological infrastructure is a great challenge in the implementation of nano learning (Ibrahim et al., 2024).

Chapter Four

Discussion and Recommendations

4.1 Introduction

This chapter examines the study's findings within the context of the theoretical framework and existing research. It elucidates the reasons and mechanisms behind the emergence of the results, connects them to Cognitive Load Theory and Constructivist Learning Theory, and underscores both the advantages and challenges associated with the implementation of nano-learning in grammar instruction.

4.2 Discussion of Findings

1. Improvement in Grammar Proficiency

Nano-Learning has demonstrated its ability to develop students' grammatical skills level since it decrease the educational load throughout the educational process (Sweller, 2010). The repetitive application of this strategy leads to having much information retained avoiding students' loss in their materials.

According to Pham & Nguyen (2023), well-structured grammar lessons can enable students to have organized thoughts in their heads making creative thinking a possible option. This eventually makes their proficiency higher and their use of language stronger.

2. Attention and Retention

It is illustrated that the improvements in students' grammar retention in English classes due to nano-learning methods can be because of short-term planning and regular sessions unlike traditional classes with inactive students due to the methods employed.

Mayer & Moreno's (2003) claim that knowledge arrangement into smaller parts develops memory retention. Furthermore supporting Serfaty & Serrano's (2022)

conclusions that spaced learning—revisiting content over intervals—promotes long-term retention is nano-learning's effective integration of For young pupils, learning is best enhanced by cognitive efficiency as well as ongoing exposure.

3. Teachers' Perceptions

Educators noted favorable views on the application of nano-learning in grammar education, emphasizing how its inclusion of interactive exercises, digital materials, and short learning activities promoted active student engagement. The adaptability of nano-learning, its student-centered approach, and its ability to meet various learner needs account for its efficacy. These findings support Constructivist Learning Theory (Vygotsky, 1978), which highlights the need of active participation, scaffolding, and student independence in knowledge creation. Furthermore, the results align with Chamorro-Atalaya & Flores-Velásquez (2024), who showed how nano-learning improves student independence and maintains participation especially in digital learning settings.

According to Alahmadi (2019), nano learning enables students to choose the educational content according to their needs and control the rythme of their learing process. This helps their skills' development in research, analysis and taking educational decisions as solving problems becomes quick and more practical. It also enhances the ease of students' comprehension focusing on one area of knowledge in each unit decresing forgetting infromation and retain informaiton in the long-term memory.

Concerning gender-based variations, the study found slight differences in grammatical performance between male and female students; these differences, nevertheless, were not statistically significant. Such differences could be the result of distinct individual learning preferences and variable engagement with online learning resources. This result accords with Nakata & Suzuki (2019), who found that learner characteristics—including interests and patterns of involvement—might affect spaced

learning's effectiveness. and nano-learning as well as fragmented pedagogical techniques.

4.3 Advantages and Disadvantages of Nano-Learning

Advantages:

- Offers a clear focus and enhances understanding of grammar principles.
- Develops foundational grammar competencies progressively.
- Aids learners in maintaining attention and alleviates cognitive overload.
- Flexible and adaptable, catering to multitasking digital learners.
- Fosters motivation and encourages regular participation.

Disadvantages:

- Learners might experience a sense of disconnection from real-world communication if grammar is consistently taught in small digital segments.
- There is a risk of the content becoming tedious or repetitive if utilized excessively.
- It may restrict learners' capacity to apply grammar knowledge in authentic speaking and writing scenarios.
- Dependence on technological resources, which may not be accessible in every context.

4.4 Recommendations

For Teachers:

- Interactive learning and gamification should be employed in classrooms as a part of nano-learning strategy.
- Digital platforms and mobile-friendly applications should be employed to test students' knowledge of grammar rules.

- The followed method in classrooms should be a mixture of nano-learning and communicative grammar to guarantee real-life application.

For School Administrators:

- Schools should train teachers on designing nano-learning materials.
- Digital platforms should be accessed for free to assure teachers benefit from them.
- Curriculum designers should have nano-learning strategies in mind whenever they design any curriculum.

For Future Researchers:

- More studies should:
- Elaborate on the long-term effects of nano-learning.
- Analyze the use of AI-driven tools and adaptive platforms to personalize nano-learning experiences.
- Investigate nano-learning applications in other language areas beyond grammar, such as writing and speaking.

4.5 Conclusion

This study demonstrated that learning using mini-tasks is an excellent way to assist 3rd graders in learning English grammar, hold their attention on important issues and retain them until later. This method eases their engagement in the classrooms which is eh teachers are encouraged to use a mixture of the interactive and nano-learning dividing large pieces of information to smaller ones which are easier to complete life (Al-Shehhi, 2022; Sweller, 2010).

Nano learning can be implemented effectively in different educational levels by providing a short educational content which can be comprehended in the classrooms. It can be merged with digital platforms in order to increase students' interaction. It

also motivates students to participate fully by reviewing what is learnt improving students' academic results (Aburizaizah & Albaiz, 2021).

Nano learning encourages social interaction among students by discussing short units directly and fast. It also encourages ideas and experiences' exchange in no time. Digital platforms enhance interaction and collective participation leading to cooperation and teamwork . Furthermore, it enables students to provide feedback for each other (Jo, 2022).

Still, nano learning covers complicated issues fully by giving the unit in the form of short mini-units. Some learners might find this information shallow and unorganized. However, it requires preparing the educational units with the help of technology unlike traditional learning styles. In order to implement it fully and effectively, the educational unit should be divided into short mini-units supported by videos and elaborative pictures encouraging interaction and practical implementation of each unit. Finally, presenting short revisions of each unit supports students' self-learning (Khan et al., 2023).

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Appendices
Appendix (A)
Grammar Exam

I'm :.....		دولة فلسطين
Date: \ \		وزارة التربية والتعليم
English Exam		مديرية التربية والتعليم – نابلس
Third grade		مدرسة الزهراء الأساسية

Grammar Exam

Question One

Write the missing words in the grammar table:

1-.....	you	got	a sore throat?
2-Does	he	Sick?
3-.....	she	a cut?
4-.....	you	dizzy?

Question Two

Answer the question with “has\have got” or “feel”:



1- What's the matter?

I



2-What's the matter?

.....

Question Three

Make a complete question then answer it:



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\ he

.....?

Yes,



shutterstock

.....?

No,

Wish u the best

T. Marah Rahhal

I'm :.....		دولة فلسطين
Date: \ \		وزارة التربية والتعليم
English Exam		مديرية التربية والتعليم – نابلس
Third grade		مدرسة الزهراء الأساسية

Grammar Exam

Question One

Put the following words in the correct order to make a question:

1-they\ Do \ sick \feel \ ?

2-a cut \ Has \ got \ he \?

Question Two

Complete the sentences with “has\have got” or “feel”

1-She ----- a cold.

2-They ----- dizzy.

3-I ----- a headache.

4-He ----- a cut on his finger.

Question Three

Match the question with its answer

1-Does he feel dizzy? Yes, she has.

2-Have they got a headache? No, he doesn't.

3-Has she got a flu? No, I don't.

4-Do you feel sick? Yes , they have.

Wish u the best
T. Marah Rahhal

Appendix (B)

Interview Questions

Introduction to the Interview

Thank you for joining this interview as part of a research project focused on examining the impact of different teaching methods on improving students' English language skills. The goal of this discussion is to gain valuable insights into your experiences and perspectives as an educator in this field. Please be assured that all the information you provide will remain strictly confidential, with no identifying details shared. Your participation is greatly valued, and we deeply appreciate the time you are dedicating to this study.

Demographic Section

- Name (optional): Ahmed
- Age: 30
- Years of teaching experience: 7
- Academic qualifications: Bachelor's Degree
- Subjects you teach: English Language

Interview Questions

1. In your opinion, how important is it to teach grammar to elementary school students?

Grammar is fundamental at this stage because it's the building block of language development. Without a strong understanding of grammar, students struggle to express themselves correctly in speaking and writing. Teaching grammar early ensures that students develop good habits from the beginning and avoid common mistakes later on. It's also essential because it improves their comprehension skills—when students understand how sentences work, they can understand texts better and become more confident communicators. In my experience, a solid grammar foundation in elementary school leads to better performance in middle and high school.
2. What methods do you use to assess students' English grammar proficiency before starting instruction?

I like to start with diagnostic tests to get a sense of where each student stands. These tests are simple and include activities like completing sentences, correcting errors, or identifying parts of speech. I also observe students informally during activities like storytelling or discussions to see how they apply grammar in real-time. Sometimes, I give them a short writing task, such as writing a paragraph about their favorite activity, to identify recurring mistakes. It's important to have a mix of formal and informal assessments because they give me a complete picture of the students' strengths and weaknesses.

3. Can you describe the strategies you typically apply when teaching grammar?

I try to move away from "chalk and talk" methods and focus on making grammar interactive. One strategy I use is teaching grammar through context, meaning I introduce grammar rules through stories or real-life examples. For example, when teaching verb tenses, I might ask students to describe what they did yesterday, what they are doing today, and what they plan to do tomorrow. This way, they're learning grammar while talking about their own experiences.

I also believe in repetition, but not in a boring way. I design games, quizzes, and group activities that reinforce the rules we've covered. For instance, a game like "grammar bingo" can help students memorize irregular verbs without feeling like it's a chore. I find that students learn best when they're having fun and actively engaging with the material.

4. Have you tried using innovative teaching methods, such as micro-learning or interactive learning?

Yes, I've used both.

If yes, what was your experience like?

With micro-learning, I break down complex grammar topics into smaller lessons. Instead of teaching all forms of the past tense in one go, I focus on one form at a time. For example, we might spend one day mastering the past simple before moving on to the past continuous. This approach prevents students from feeling overwhelmed and allows them to digest information at their own pace.

Interactive learning is another method I use frequently, especially through online tools and games. I've used digital quizzes where students get immediate feedback, and I've found that this instant response helps them correct mistakes faster. One time, I used a grammar app where students competed in teams to solve grammar challenges, and the excitement and teamwork made them much more engaged than they would have been with a worksheet.

5. What challenges do you face when teaching English grammar to elementary school students?

One of the biggest challenges is that many students view grammar as boring or difficult. They associate it with memorizing rules, which can make them lose interest quickly. To overcome this, I try to make lessons creative and relatable. I use examples from their daily lives or popular culture to show them that grammar isn't just about rules—it's about effective communication.

Another challenge is addressing different learning levels in the same classroom. Some students pick up grammar easily, while others need more support. I try to differentiate my instruction by giving struggling students extra practice while providing advanced activities for those who are ready for more.

6. How do you think integrating technology into grammar instruction affects students' understanding?

Technology has been a game-changer. Students today are naturally drawn to screens, so incorporating digital tools into grammar lessons keeps them interested. For example, I use grammar apps that turn exercises into games, and students often don't even realize they're learning because they're so focused on winning. Technology also allows for personalized learning—students can progress at their own pace, and I can track their individual progress through the app's analytics.

Another advantage is the immediate feedback that technology provides. If a student makes a mistake, they can correct it on the spot instead of waiting for me to grade their work later. This immediate reinforcement helps them internalize the correct form more effectively.

7. Have you noticed any significant differences in student engagement or outcomes when comparing traditional and innovative teaching approaches?

Absolutely. When I used traditional methods like lecturing and worksheets, many students were disengaged, and the retention rates weren't great. But when I switched to interactive methods, I noticed a significant increase in participation. Students are more likely to ask questions, take risks, and make mistakes—which is a good thing because mistakes are part of learning.

I also observed that students retained grammar rules better when they learned them through games or storytelling. They weren't just memorizing rules for a test; they were applying them in conversations and writing, which helped the knowledge stick.

8. How do you measure students' progress in grammar skills after implementing a particular teaching method?

I use a combination of methods to track progress. I give periodic quizzes to test specific grammar points, but I also look at their writing samples to see if they're applying what they've learned. For example, if we've been working on subject-verb agreement, I'll check their assignments to see if they're consistently using the correct forms.

I also rely on observation during classroom activities. If students are using grammar correctly in their speech during discussions or role-playing exercises, it's a sign that they're internalizing the rules. Feedback from peers is another valuable tool—I often have students work in pairs to review each other's work, which helps them learn from their mistakes.

9. What are your thoughts on offering additional training for teachers to enhance their teaching strategies?

I think it's essential. Teaching is constantly evolving, and what worked 10 years ago might not be effective today. Training allows teachers to stay up to date with new methods and technologies. For example, when I attended a workshop on integrating digital tools into language teaching, it completely changed the way I approach

grammar lessons. I now use apps, games, and online resources that I wouldn't have known about without that training.

Do you think it's necessary?

Yes, especially because students' needs are changing. Training not only benefits teachers but also improves student outcomes. When teachers are equipped with diverse strategies, they can reach more students and address different learning styles.

10. How do you believe the current curriculum could be improved to better support students in mastering grammar?

The current curriculum could benefit from more flexibility. Right now, it can feel rigid and overly focused on testing. I think we need more room for creativity and exploration. For example, instead of just teaching grammar rules and asking students to complete exercises, the curriculum should include project-based activities like writing short stories, creating dialogue scripts, or producing class newsletters.

I'd also suggest incorporating more digital resources and interactive materials. Many students learn better through hands-on activities and real-world applications. If the curriculum allowed for this type of learning, I believe students would not only master grammar but enjoy the process as well.

Introduction to the Interview

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Demographic Section

- Name (optional): Mahmoud
- Age: 40
- Years of teaching experience: 14
- Academic qualifications: Master's in English Language
- Subjects you teach: English Language

Interview Questions

1. In your opinion, how important is it to teach grammar to elementary school students?

Teaching grammar to young learners is essential, not because they need to become grammar experts at this stage, but because they need to acquire a sense of how language functions and how sentences are constructed. This early exposure is crucial to avoid developing bad habits that become difficult to correct later. When grammar is taught effectively, students gain confidence in their ability to communicate correctly, both in writing and speaking. It's not just about teaching rules; it's about helping them develop intuition for correct usage, which will benefit them across all subjects that involve language.

Moreover, grammar at this level should be presented as part of natural language learning. Students often pick up grammar unconsciously through reading, writing, and listening activities, so it's important to create opportunities for them to encounter and use correct grammar frequently.

2. What methods do you use to assess students' English grammar proficiency before starting instruction?

I adopt a combination of formal and informal methods to assess grammar proficiency. Initially, I give students diagnostic exercises covering fundamental topics like subject-verb agreement, verb tenses, and sentence structure. These exercises help identify common errors and areas where individual students may need extra support.

However, formal testing isn't always enough. I also observe how students naturally use language in classroom interactions, during discussions, or when writing short essays. Sometimes, their spoken responses reveal errors that don't always show up in written tests. By combining both observation and testing, I can create a more comprehensive profile of their strengths and weaknesses.

Another technique I use is self-reflection tasks, where students write about their understanding of grammar and any difficulties they face. This allows me to pinpoint misconceptions that need clarification.

3. Can you describe the strategies you typically apply when teaching grammar?

My teaching approach focuses on contextual learning. Rather than presenting grammar as a set of abstract rules, I introduce concepts within meaningful contexts such as stories, dialogues, or real-life situations. For instance, when teaching the present continuous tense, I might have students describe what's happening around them or discuss an event as it unfolds. This way, grammar becomes functional and relatable.

I also emphasize the importance of practice and repetition, but not in a monotonous way. I design activities like sentence-building games, role-playing, and peer correction exercises. By working collaboratively, students learn not only from their own mistakes but also from those of their peers. This peer interaction often leads to greater retention.

Another key strategy is scaffolding. I start with simple sentences and gradually introduce more complex structures, ensuring that students build their understanding step by step. Regular review sessions help reinforce previous lessons while integrating new material.

4. Have you tried using innovative teaching methods, such as micro-learning or interactive learning?

Yes, I frequently incorporate both micro-learning and interactive teaching methods into my grammar lessons.

- **If yes, what was your experience like?**

Micro-learning works well when students need to absorb specific grammar points without feeling overwhelmed. For example, instead of introducing multiple verb tenses in one lesson, I break them down into smaller units, each focusing on a single tense. This allows students to master one concept before moving on to the next.

Interactive learning is equally important in keeping students engaged. I often use digital tools, such as online quizzes and interactive grammar games, which provide immediate feedback. One particularly effective method I've used is collaborative sentence construction, where students work in groups to build grammatically correct sentences based on given prompts. This not only reinforces grammar but also fosters teamwork and critical thinking.

I believe that combining these methods creates a dynamic learning environment where students feel motivated to participate actively.

5. What challenges do you face when teaching English grammar to elementary school students?

One major challenge is overcoming students' perception that grammar is boring or difficult. Many students associate grammar with memorization, which can be discouraging. To address this, I focus on making grammar lessons engaging and relevant. I show students how grammar is used in everyday conversations, books, and media to highlight its importance.

Another challenge is the diversity of learning levels within a single classroom. Some students grasp grammar concepts quickly, while others require more time and individualized attention. To bridge this gap, I often use differentiated instruction, providing additional exercises for advanced students and extra support for those who need it. Frequent review sessions also help reinforce concepts for slower learners without holding back the rest of the class.

6. How do you think integrating technology into grammar instruction affects students' understanding?

Integrating technology has made a significant difference in how students perceive and understand grammar. Digital platforms provide interactive exercises that keep students engaged while offering immediate feedback. This immediate correction is critical because it prevents students from internalizing incorrect patterns.

I also use multimedia resources such as video lessons and grammar-based animations, which cater to different learning styles. For visual learners, seeing grammatical concepts presented through diagrams or animated explanations helps them grasp the material more easily.

Additionally, technology allows for personalized learning. Students can work at their own pace, revisiting challenging topics as needed. This flexibility is particularly beneficial in classrooms with diverse learning needs.

7. Have you noticed any significant differences in student engagement or outcomes when comparing traditional and innovative teaching approaches?

Yes, there is a noticeable difference. Traditional methods, such as lectures and worksheets, often result in passive learning where students memorize rules but struggle to apply them in real-life contexts. On the other hand, innovative approaches that incorporate games, discussions, and interactive digital tools make learning more active and enjoyable.

When students are engaged through interactive activities, they participate more, ask questions, and experiment with the language without the fear of making mistakes. As a result, their understanding of grammar improves, and they are more confident using it in writing and speaking. I've also noticed that students retain grammar concepts longer when they learn them through application rather than rote memorization.

8. How do you measure students' progress in grammar skills after implementing a particular teaching method?

I use a variety of assessment tools to measure progress. Quizzes and tests provide measurable results, but I place equal importance on their performance in practical tasks like writing assignments, class discussions, and presentations. If students are

consistently using grammar correctly in their spoken and written work, I know that the method is effective.

Additionally, I encourage students to self-assess their progress. I ask them to reflect on their learning and identify areas where they feel confident or need improvement. This process not only helps me understand their progress but also fosters self-awareness and responsibility for their learning.

9. What are your thoughts on offering additional training for teachers to enhance their teaching strategies?

I believe ongoing professional development is essential. Language teaching is constantly evolving, and teachers need to stay updated with the latest research and tools. Training sessions that focus on practical strategies—such as integrating technology or using project-based learning—are especially valuable.

Do you think it's necessary?

Yes, absolutely. Even experienced teachers benefit from exposure to new ideas and techniques. Training provides opportunities for collaboration and knowledge sharing, which can lead to more effective teaching practices and better learning outcomes for students.

10. How do you believe the current curriculum could be improved to better support students in mastering grammar?

The curriculum should focus less on memorization and more on application. Students should have opportunities to practice grammar through meaningful activities like role-plays, creative writing projects, and real-world simulations. Incorporating digital tools and multimedia resources would also enhance engagement and understanding.

Another area for improvement is flexibility. The curriculum should allow teachers to adapt lessons based on their students' specific needs rather than following a rigid structure. By making grammar instruction more dynamic and interactive, we can help students develop a deeper and more practical understanding of the language.

Introduction to the Interview

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Demographic Section

- **Name (optional): Mohammed**
- **Age: 35**
- **Years of teaching experience: 10**
- **Academic qualifications: Master's in English Language**
- **Subjects you teach: English Language**

Interview Questions

1. In your opinion, how important is it to teach grammar to elementary school students?

Teaching grammar to young learners is crucial, but not just for the sake of learning grammar rules. It's about helping them understand how to express themselves clearly and effectively. At this age, their language development is still flexible, and introducing them to correct sentence structures early makes a big difference in their ability to use English fluently later on. Grammar is like a map—they need to know the path before they can confidently navigate the language.

2. What methods do you use to assess students' English grammar proficiency before starting instruction?

I prefer using a blend of diagnostic tools and practical observation. I start with a simple written test that includes exercises on sentence formation, verb usage, and common grammar errors. I also observe how students speak and interact in class

because oral communication often reveals gaps that writing might not show. Additionally, I encourage students to complete short reflective tasks like writing a paragraph about their favorite activity. This gives me a clear picture of their strengths and weaknesses.

3. Can you describe the strategies you typically apply when teaching grammar?

I focus on making grammar meaningful and relevant. One strategy I frequently use is integrating grammar into storytelling or creative writing activities. For example, I ask students to write a story using a specific verb tense, which helps them practice grammar in context rather than through isolated exercises.

I also use collaborative group work where students correct sentences together, discuss errors, and explain why certain rules apply. I've found that when students explain grammar to their peers, they reinforce their own understanding. Another important strategy is scaffolding—starting with simple concepts and gradually introducing more complex ones.

4. Have you tried using innovative teaching methods, such as micro-learning or interactive learning? Yes, and I find them incredibly effective.
 - o **If yes, what was your experience like?**

I've used micro-learning to break down large topics into manageable parts. For example, instead of teaching all conditional forms in one lesson, I focus on one type (like zero conditionals) and let students practice it thoroughly before moving on to the next.

Interactive learning is equally important in my teaching. I use online platforms where students can participate in quizzes, games, and collaborative projects. One of the best experiences I had was when I used an online grammar escape room game. The students were so engaged that they didn't realize they were practicing grammar.

5. What challenges do you face when teaching English grammar to elementary school students?

The biggest challenge is making grammar enjoyable for students. Many of them see it as a set of rigid rules, and they get frustrated when they make mistakes. To overcome this, I focus on positive reinforcement and make sure that students know

mistakes are part of learning. Another challenge is dealing with mixed-ability groups. Some students grasp grammar concepts quickly, while others struggle, which can create a gap in the classroom. To address this, I use differentiated instruction, providing extra support to those who need it while offering enrichment activities for advanced learners.

6. How do you think integrating technology into grammar instruction affects students' understanding?

Technology has completely transformed the way grammar is taught. It allows for interactive learning that engages students far more than traditional methods. Apps and games make grammar fun and interactive, and students benefit from immediate feedback. One tool I use frequently is an online quiz platform that shows students their mistakes and explains the correct answer on the spot.

Beyond engagement, technology also provides personalized learning. Students can work at their own pace, revisiting areas they find difficult while progressing quickly through topics they've mastered. I've noticed significant improvement in students' grammar when they have access to these tools.

7. Have you noticed any significant differences in student engagement or outcomes when comparing traditional and innovative teaching approaches?

Yes, the difference is clear. Traditional methods, like lecturing or giving students grammar worksheets, often lead to passive learning. Students may complete the exercises, but they don't retain the knowledge or understand how to apply it. With innovative approaches, such as interactive games, group activities, or project-based learning, students are far more engaged. They actively participate, ask questions, and even enjoy learning grammar. I've also noticed better long-term retention of grammar rules when students learn them through practical application.

8. How do you measure students' progress in grammar skills after implementing a particular teaching method?

I use multiple assessment methods to get a well-rounded view of their progress. I start with short quizzes or tests after each lesson to check immediate understanding. Writing assignments are another key tool—I assess how accurately students apply the grammar rules in their essays, stories, or journal entries.

In addition to formal assessments, I rely on classroom observation. When students participate in discussions or group activities, I take note of how they construct sentences and whether they use grammar correctly. I also encourage self-assessment and peer reviews, which help students reflect on their learning and recognize areas for improvement.

9. What are your thoughts on offering additional training for teachers to enhance their teaching strategies?

I believe professional development is essential for teachers. Grammar teaching has evolved, and teachers need to stay updated with the latest strategies and tools to be effective. Training sessions introduce us to new ideas and give us opportunities to learn from other teachers' experiences.

Do you think it's necessary?

Yes, absolutely. Without ongoing training, teachers may fall into outdated practices that don't engage students effectively. For example, I once attended a workshop on using gamification in the classroom, and it completely changed the way I approach grammar lessons. The students responded positively to the new methods, and their engagement increased dramatically.

10. How do you believe the current curriculum could be improved to better support students in mastering grammar?

The curriculum could benefit from being more flexible and focused on practical application. Instead of relying heavily on traditional exercises and tests, it should include activities that allow students to use grammar in meaningful contexts. For example, integrating grammar into creative writing projects, role-play exercises, or collaborative storytelling would give students real-world practice.

I also believe the curriculum should incorporate more technology-based resources, such as grammar apps and online platforms, to cater to different learning styles. Giving teachers more freedom to customize lessons based on their students' needs would also lead to better outcomes.

Introduction to the Interview

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Demographic Section

- **Name (optional): Noor**
- **Age: 28**
- **Years of teaching experience: 4**
- **Academic qualifications: Bachelor's in English Language**
- **Subjects you teach: English Language**

Interview Questions

1. In your opinion, how important is it to teach grammar to elementary school students?

I believe that teaching grammar to elementary students is very important because it builds the foundation for their ability to communicate effectively in English. Without understanding basic grammar, students often struggle with writing, reading comprehension, and speaking as they move forward in their education. However, teaching grammar at this level shouldn't be overwhelming. The goal is not to load them with complex rules but to help them naturally use correct sentence structures in their daily language tasks.

In my experience, grammar should be introduced as something functional and practical, not as a long list of rules they must memorize. When students understand how grammar helps them write a story, describe their day, or answer questions in class, they start seeing it as something useful, not scary. At this stage, the key is to build their confidence with simple, clear explanations and plenty of opportunities to apply what they learn.

2. What methods do you use to assess students' English grammar proficiency before starting instruction?

When assessing students' grammar proficiency, I like to use simple, low-pressure activities to make sure they feel comfortable. I avoid lengthy, formal tests because younger students can find them intimidating. Instead, I might ask them to write a short paragraph about their weekend or describe their favorite animal in a few sentences. This type of task reveals whether they understand basic grammar concepts like verb usage, subject-verb agreement, and sentence structure.

I also use games as diagnostic tools. One game I use is "Correct the Sentence," where students spot and fix errors. This allows me to see their understanding of grammar without them feeling like they're being evaluated. Additionally, during classroom discussions, I observe how they form sentences when answering questions. These methods give me a clear picture of their grammar level in both written and spoken contexts.

3. Can you describe the strategies you typically apply when teaching grammar?
4. Have you tried using innovative teaching methods, such as micro-learning or interactive learning? Yes, I've experimented with both micro-learning and interactive learning, and I've found them to be very effective.

If yes, what was your experience like?

Micro-learning works well when students struggle with large grammar topics because it allows me to break them down into smaller, easier-to-understand lessons. For example, instead of teaching all verb tenses in one session, I focus on one tense, like the simple past, and let students practice it thoroughly before moving on to the next.

Interactive learning is also a regular part of my teaching. I use grammar games, group activities, and digital tools like online quizzes or interactive exercises. One activity that worked especially well involved students working in teams to correct sentences on the board in a race against time. They loved the competitive element, and it helped them quickly review and remember common grammar rules.

5. What challenges do you face when teaching English grammar to elementary school students?

One of the main challenges I face is keeping students engaged. Grammar, if taught in a traditional, rule-based way, can seem boring or difficult for young learners. Many students feel frustrated when they make mistakes, which can cause them to lose confidence. To address this, I focus on creating a classroom environment where mistakes are welcomed as part of the learning process. I praise students for trying and encourage them to learn from their errors.

Another challenge is catering to students with different learning speeds. Some students grasp grammar concepts quickly, while others need more time and support. I manage this by offering extra practice for students who struggle and giving more advanced tasks to those who understand the material easily. Group activities also help because students can learn from each other.

6. How do you think integrating technology into grammar instruction affects students' understanding?

Technology has made grammar more engaging and accessible for students. One major advantage is that digital tools provide instant feedback. I use online grammar exercises and games that immediately tell students whether their answers are correct and explain their mistakes. This real-time correction helps them learn faster and avoid repeating the same errors.

I also use videos and interactive animations to explain grammar topics. For example, I once used an animated video to teach the difference between "there," "their," and "they're," and students responded very well to it. The visuals helped them remember the rule better than a traditional explanation would have. Overall, technology adds variety to my lessons and keeps students excited about learning.

7. Have you noticed any significant differences in student engagement or outcomes when comparing traditional and innovative teaching approaches?

Yes, there's a big difference. When I use traditional methods like lectures or worksheets, students often lose interest quickly. They complete the exercises because they have to, but they don't always remember the rules afterward. On the other hand, when I use games, interactive activities, or projects, students are much more engaged. They participate actively and enjoy the process of discovering grammar on their own.

I've also noticed that students perform better in tests and assignments after interactive lessons because they've had multiple opportunities to practice and apply the rules. They're more confident and less likely to feel stressed during assessments.

8. How do you measure students' progress in grammar skills after implementing a particular teaching method?

I measure progress using a combination of quizzes, writing assignments, and classroom observations. After introducing a grammar topic, I give students short quizzes to see if they've understood the basic rule. I also ask them to apply the rule in a paragraph or story. This helps me see whether they can use grammar correctly in context, not just in isolated exercises.

Additionally, I pay close attention to their participation during class discussions and group activities. If they can explain why a sentence is correct or incorrect, I know they've mastered the concept. Peer feedback is another method I use, where students review each other's work and provide suggestions for improvement.

9. What are your thoughts on offering additional training for teachers to enhance their teaching strategies?

I believe additional training is very important, especially for young teachers like me. There's always something new to learn, whether it's a creative activity or a new digital tool. Training workshops help me improve my teaching and stay updated on effective methods. I've attended workshops on using technology in language teaching, and they've completely changed the way I teach grammar.

Do you think it's necessary?

Yes, it's absolutely necessary. Training helps teachers adapt to students' changing needs and introduces innovative strategies that make learning more effective and enjoyable.

10. How do you believe the current curriculum could be improved to better support students in mastering grammar?

I think the curriculum could include more interactive and project-based activities. Right now, there's too much emphasis on traditional exercises and tests, which can be repetitive and boring for students. If the curriculum encouraged students to

practice grammar through writing short stories, creating presentations, or role-playing real-life situations, they would learn more effectively.

Also, more flexibility would help. Teachers should have the freedom to adapt lessons based on their students' needs rather than strictly following a fixed structure. Integrating digital resources and interactive tools as part of the curriculum would also make grammar learning more engaging.

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Demographic Section

- **Name (optional): Layla**
- **Age: 33**
- **Years of teaching experience: 8**
- **Academic qualifications: Master's in English Language**
- **Subjects you teach: English Language**

Interview Questions

1. In your opinion, how important is it to teach grammar to elementary school students?

Grammar is essential for elementary students because it lays the groundwork for their future success in using English fluently and correctly. At this stage, they are developing their language habits, and teaching them grammar early prevents common mistakes from becoming permanent. However, I believe grammar should not be taught as isolated rules. Instead, it should be embedded into activities that feel natural, like reading, storytelling, or even classroom discussions.

When students learn grammar through meaningful activities, they understand how it works in real communication. It's not just about teaching them the difference between tenses—it's about helping them form proper sentences and express themselves confidently. When students see that grammar helps them write stories or explain their ideas better, they become more eager to learn.

2. What methods do you use to assess students' English grammar proficiency before starting instruction?

Before diving into formal lessons, I always assess their level using a combination of methods. I typically start with short writing tasks, such as asking students to describe their family or write a few sentences about their favorite hobby. This tells me how well they understand basic sentence structure and common grammar forms like past and present tense.

I also observe them during informal speaking activities. Sometimes, when students speak, they reveal more about their grammar level than they do in writing. For instance, I listen for errors in subject-verb agreement or the use of articles. Lastly, I give them short grammar quizzes, but I try to keep them fun and interactive to reduce any stress. My goal is to understand their starting point without making them feel tested.

3. Can you describe the strategies you typically apply when teaching grammar?

My main strategy is to make grammar as practical and interactive as possible. I like to teach grammar within the context of real situations. For example, if we are learning about the future tense, I might start by asking students to describe their plans for the weekend. This way, they immediately see how grammar fits into their daily communication.

I also use a lot of hands-on activities. One of my favorite techniques is using "grammar stations," where students rotate between different activities in small groups. One station might focus on sentence correction, another on building sentences using word cards, and another on short writing tasks. This keeps them active and engaged. I also rely on peer work, where students correct each other's sentences. It's amazing how much they can learn by explaining grammar to their classmates.

4. Have you tried using innovative teaching methods, such as micro-learning or interactive learning?

Yes, I have explored both, and they've made a huge difference. Micro-learning is especially useful for grammar because students can feel overwhelmed when given too much information at once.

If yes, what was your experience like?

I break down lessons into smaller, more manageable sections. For example, instead of teaching all forms of the past tense in one lesson, I'll focus on just regular past tense verbs first. Once they're comfortable, we move on to irregular verbs and then past continuous.

Interactive learning is something I always incorporate. I often use apps and games to make learning more fun. There's one game where students race to correct sentences on the board, and they love it. I also use digital platforms for interactive quizzes, which give them immediate feedback on their performance. It makes learning feel less like a task and more like a game.

5. What challenges do you face when teaching English grammar to elementary school students?

One major challenge is keeping students interested. Grammar, to many students, can feel boring or too difficult if it's taught in a traditional, textbook-based way. I've had students tell me, "Grammar is too hard," and that's when I know I need to change the approach. To tackle this, I design activities that don't feel like traditional grammar lessons. I add games, competitions, or real-life scenarios to make grammar enjoyable.

Another challenge is the difference in learning speeds. Some students grasp grammar quickly, while others need extra time. To deal with this, I provide additional practice and offer personalized feedback. For faster learners, I give extension activities that challenge them to use grammar creatively, such as writing short stories or dialogues.

6. How do you think integrating technology into grammar instruction affects students' understanding?

Technology has been a game-changer in my classroom. Many students are naturally drawn to using tablets or computers, and integrating technology into grammar instruction has made them more excited to learn. I use online platforms where students can complete grammar exercises and receive immediate feedback. This instant correction is crucial because it helps students fix their mistakes right away instead of waiting for me to review their work.

I also use videos and interactive presentations to explain difficult grammar topics. For example, when teaching conditionals, I show video examples of real

conversations and pause to discuss how the grammar works. Technology makes it possible to teach grammar in a way that is visual, interactive, and tailored to individual learning needs.

7. Have you noticed any significant differences in student engagement or outcomes when comparing traditional and innovative teaching approaches?

Yes, the difference is very noticeable. When I first started teaching, I used more traditional methods like worksheets and lectures. While these methods had some effect, students were often disengaged, and many forgot the rules shortly after the lesson. But when I shifted to using games, collaborative tasks, and digital tools, their engagement skyrocketed.

Students who used to be shy about grammar now participate actively in class, and they remember the rules much better because they've practiced them in different ways. For example, after an interactive lesson on prepositions where students created their own short stories using visual prompts, I saw noticeable improvements in their writing assignments. They weren't just memorizing—they were applying what they had learned.

8. How do you measure students' progress in grammar skills after implementing a particular teaching method?

I track progress through various forms of assessment, both formal and informal. I give students quizzes and short tests to see how well they've retained specific grammar rules. However, I don't rely solely on tests. I also pay attention to how they apply grammar during writing assignments, group discussions, and presentations.

For example, if we've recently covered possessive pronouns, I'll observe how they use them in their written paragraphs or when speaking in class. I also value peer reviews, where students check each other's work and give feedback. This not only helps them spot errors but reinforces their understanding by explaining the rules to their classmates.

9. What are your thoughts on offering additional training for teachers to enhance their teaching strategies?

I believe continuous training is essential. Even after 8 years of teaching, I'm still learning new strategies that improve my classroom experience. Training helps

teachers stay up-to-date with new techniques and tools that make lessons more effective. For example, a workshop I attended on using storytelling to teach grammar completely changed how I approach certain lessons. Now, instead of starting with rules, I start with stories, and students enjoy it much more.

Do you think it's necessary?

Yes, it's absolutely necessary. The way students learn today is different from how they learned 10 years ago. With new technologies and changing student needs, teachers must be adaptable. Training helps us grow and improve our teaching methods.

10. How do you believe the current curriculum could be improved to better support students in mastering grammar?

The current curriculum could be improved by incorporating more project-based and creative activities. Instead of focusing so much on traditional exercises, students should be encouraged to apply grammar through real-world tasks. For example, they could write stories, create dialogues, or even make presentations using specific grammar points.

I also think the curriculum should be more flexible. Teachers should have the freedom to adjust lessons based on their students' progress and needs. Including more digital resources and interactive lessons would also help students engage with grammar in a meaningful way.



جامعة النجاح الوطنية
كلية الدراسات العليا

أثر تقنيات التعلم النانوي في إتقان قواعد اللغة الإنجليزية لدى
طلاب الصف الثالث: دراسة في مدرسة الزهراء الخاصة

إعداد

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قدمت هذه الرسالة استكمالاً لمتطلبات درجة الماجستير في أساليب تدريس اللغة الإنجليزية في كلية الدراسات العليا في جامعة النجاح الوطنية في نابلس، فلسطين.

2025

أثر تقنيات التعلم النانوي في إتقان قواعد اللغة الإنجليزية لدى طلاب الصف الثالث:

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الملخص

تبحث هذه الدراسة في تأثير التعلم النانوي على قدرة طلاب الصف الثالث على تعلم القواعد النحوية للغة الإنجليزية والاحتفاظ بها. يُعد التعلم النانوي نهجًا تعليميًا حديثًا يُقدم دروسًا قصيرة ومركزة تتناسب مع القدرات الإدراكية ومدى انتباه الطلاب. اعتمدت الدراسة منهجية بحثية مختلطة تضمنت اختبارات قبلية وبعديّة لعينة مكونة من 50 طالبًا، بالإضافة إلى مقابلات منظمة مع خمسة معلمين للغة الإنجليزية في مدرسة الزهراء الخاصة. كشفت التحليلات الإحصائية باستخدام برنامج SPSS عن تحسن ملحوظ في إتقان القواعد النحوية بعد تطبيق التعلم النانوي، حيث أظهرت نتائج الاختبار البعدي تقدمًا كبيرًا. أكد المعلمون على فوائد دمج الأدوات الرقمية، والمحتوى التفاعلي، وعناصر الألعاب في تعزيز تفاعل الطلاب وزيادة قدرتهم على الاحتفاظ بالمعلومات. تشير النتائج إلى أن التعلم النانوي يساهم في تقليل الحمل الإدراكي، وتحسين مدى انتباه الطلاب، وتوفير تجربة تعليمية أكثر تفاعلية وفعالية. ومع ذلك، تظل بعض التحديات مثل محدودية الوصول إلى الأدوات الرقمية ومقاومة الأساليب التعليمية الجديدة قائمة. توصلت الدراسة إلى أن التعلم النانوي يمثل نهجًا واعدًا وقابلًا للتكيف في تعليم القواعد النحوية، وأوصت بمزيد من البحث حول آثاره طويلة المدى وإمكانية تطبيقه على نطاق أوسع في البيئات التعليمية المتنوعة.

الكلمات المفتاحية: تقنيات التعلم النانوي؛ قواعد اللغة الإنجليزية؛ مدرسة الزهراء الخاصة