



The Effect of Overlapping Waves Theory on ESP Vocational School Female Students' Achievement in Spelling and Vocabulary

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Abstract

Teaching and learning spelling and vocabulary become indispensable in most fields of study for both teachers and learners, especially who want to study English for Specific Purposes (ESP) and considered as one of many challenges and difficulties faced by vocational school students. The current study aims to find out The Effectiveness of Overlapping Waves Theory in Spelling and Vocabulary Achievement for vocational school students. In order to attain the purposes of this research and validate its theories, a sample of sixty-two student have been randomly chosen from Iraqi fifth grade at vocational school for girls for the academic year (2024-2025). The two groups are assigned randomly into group (A) experimental group that consists of (25) students who have been taught according to Overlapping Waves Theory, and group (B) represent control group which also consists of (25) students who have been taught according to the conventional method, and 12 students for pilot study. Both groups have been equalized in some variables. The researcher used achievement posttest; the data was gathered from the posttest findings have been statistically analyzed. The results are indicated that vocabulary achievement test for experimental group who were taught by using Overlapping Waves Theory, are higher and better than the control group, who taught using the conventional methods. Whereas with spelling according to the results, there is no effect of the theory on students' achievement. Appropriate recommendations and ideas for further research are offered in light of the study's results and conclusions.

Keywords: Overlapping Waves Theory. Spelling, Vocabulary, Vocational School Students



فاعلية نظرية الأمواج المتداخلة في التحصيل عند طالبات المدارس المهنية الدارسات مادة اللغة الانجليزية لأغراض خاصة في التهجئة والمفردات

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المستخلص:

أصبح تعليم وتعلم التهجئة والمفردات أمراً لا غنى عنه في معظم مجالات الدراسة لكل من المعلمين والمتعلمين، خاصة أولئك الذين يهدفون إلى تعلم اللغة الإنجليزية لأغراض خاصة (ESP) ويعتبرون من بين العديد من التحديات والصعوبات التي يواجهها طلاب المدارس المهنية. تهدف الدراسة الحالية إلى معرفة فعالية نظرية الأمواج المتداخلة في تحقيق التهجئة والمفردات لطلاب المدارس المهنية. لتحقيق أهداف هذه الدراسة والتحقق من فرضياتها، تم اختيار عينة من (٦٢) طالبة بشكل عشوائي من الصف الخامس الإعدادي في الإعدادية المهنية للبنات للعام الدراسي (٢٠٢٤-٢٠٢٥). تم توزيع المجموعتين بشكل عشوائي إلى المجموعة (أ) وهي المجموعة التجريبية التي تتكون من (٢٥) طالبة تم تدريسهن وفقاً لنظرية الامواج المتداخلة، والمجموعة (ب) التي تمثل المجموعة الضابطة والتي تتكون أيضاً من (٢٥) طالبة تم تدريسهن وفقاً للطريقة التقليدية، و(١٢) طالبة للعينة الاستطلاعية. تمت موازنة كلا المجموعتين في بعض المتغيرات. استخدم الباحث الاختبار التحصيلي كأداة للبحث وتم جمع البيانات من نتائج الاختبار النهائي وتم تحليلها إحصائياً. تشير النتائج إلى أن اختبار إنجاز المفردات للمجموعة التجريبية التي تم تعليمها باستخدام نظرية الامواج المتداخلة، أعلى وأفضل من المجموعة الضابطة التي تم تعليمها باستخدام الطرق التقليدية. بينما فيما يتعلق بالتهجئة وفقاً للنتائج، لا يوجد تأثير للنظرية على إنجاز الطلاب. استناداً إلى النتائج والاستنتاجات التي توصلت إليها هذه الدراسة، تم تقديم التوصيات والاقتراحات المناسبة للدراسات المستقبلية.

الكلمات المفتاحية: نظرية الامواج المتداخلة، التهجئة، المفردات، المدارس المهنية

1. Introduction

English is widely recognized as the international language of science, business and technology. It is estimated that about 1.5 billion people worldwide speak English, making it the global language. This has made it increasingly essential for people to learn English as a second/ foreign language or English for Specific Purposes (ESP) tackles the requirements of adult learners who must acquire a foreign language for utilization in their specialized careers, encompassing academic learning, science, technology, medical, and leisure. Therefore, English for Specific Purposes requires special courses and strategies focusing on ESP learners' needs to utilize the English they need in their own professional fields (Hutchinson & Waters, 1996). However, Teaching English for specific purposes, finding proper materials to design a course, conducting the needs analysis and familiarity with the subject knowledge might be challenging for teachers. Vocational school in Iraq is one among many around the world where there are various fields to be studied like Trade, Applied Arts and Electricity, so it requires special knowledge that even the English native speakers' teachers are not familiar with (Far, 2008). Poor language proficiency could hamper the advancement of their professional courses, which is the main challenge faced by students in vocational schools. Achievement scores of students in vocational schools are substantially lower than those of students in academic ones. Students struggle to organize and formulate ideas and turn them into text that is easy to understand. Their lack of proficiency in vocabulary, word order, proper spelling, and paragraph development also makes them less interested in writing classes. (Musyafa'ah, 2016). Moreover, Spelling is not a new problem for Iraqi EFL students. It is a problem even for university students years ago (Saalh, 2003). Therefore, new strategies and methods of teaching have emerged, which have shifted the educational process from the subject of study and dependence on the teacher to an educational process that concerns the student, who is a center of organized activities that seeks to achieve the objectives of the educational process. For a better understanding of these challenges, the researcher conducts scientific research to enhance students' achievement by applying modern strategies that may help to reduce these challenges and difficulties. The current study intends to experiment with the Overlapping Waves Theory to present strategies for teaching spelling and vocabulary. Thus, Siegler's overlapping wave theory is considered basic for modern and effective strategies in the educational and pedagogical processes. These strategies may help students to acquire skills and knowledge and become more active and energetic students (Siegler, 1996). Since the language that is used in Iraqi textbooks for English is a foreign language (Saalh & Ismaeel, 2022), these textbooks,

especially for vocational schools, need to be enriched with different learning strategies.

Aim: this study aims to find out the effect of overlapping waves theory on ESP vocational school students' achievement in spelling and vocabulary

Value of the study: the study is anticipated to be beneficial to:

1. Experts, educators, and researchers who are engaged in or interested in researching new methods of instruction or tactics.
2. Teachers and specialists interested in
3. Teachers to overcome the challenges faced in vocational schools while teaching English.

Limits:

1. This study is restricted to fifth-grade secondary students at the Al-Diwanyiah Governorate's Vocational School for Girls' Applied Arts department.
2. The academic year 2025-2024.

Hypothesis of The Study: there is no statistically significant difference at 0.05 between the mean score of the experimental group taught according to the overlapping waves theory and the mean score of the control group taught according to the prescribed method in their spelling and vocabulary achievement post-test.

2. Theoretical Framework

2.1 Overlapping Waves Theory

Different theories have been developed to explain individual's development, beginning with a description of successive stages in development by Piaget who described the developmental stages as necessary behaviors that an individual should display in a given order, he proposed four sequential stages of cognitive development, each marked by distinct thinking patterns, No agreement has been reached, however, concerning the transitional period during which individuals move from one understanding to another (Lawson, Baron, & Siegel, 1974). Additionally, the experiential learning theory stipulates that the teacher must utilize various strategies to initiate the process of generating ideas and establishing a knowledge base according to the learners' needs and skills. (Saalh, 2014). In some passages, individuals are described as vacillating among different answers and logic during the transitional period; individuals use different strategies to solve different problems on a certain occasion; also, they often use different strategies to solve the same problem on two occasions close in time; and they sometimes

use multiple strategies on a single problem. This variability has important consequences for cognitive development. Individuals who know and use varied strategies can use them more precisely to the demands of different problems and to their own strengths and weaknesses than those who have fewer strategies (Siegler, 1994). The waves metaphor for cognitive development, or Siegler's Overlapping Waves Theory, concentrating on focusing on a single method, Siegler was interested in the quantity of strategies individuals may employ at every age. Siegler, who noticed variability from an evolutionary viewpoint based on Darwinian principles, sought that the development of individuals be properly shown rather than advocating for the abandoning of previous studies. The Overlapping Waves Theory (Siegler, 2005) is based on three assumptions: (a) Variability; (b) these different ways of thinking compete with each other for a longer period of time, not just during brief transitions; and (c) cognitive growth involves both the introduction of more sophisticated ways of thinking and gradual changes in the frequency of distinct ways of thinking.

According to OWT (Siegler & Opfer 2003), learners' growth is connected to both cognitive success and failure, culminating in adaptable change. When faced with challenges, students come up with a variety of tactics and assess the ideas' efficacy by progressively going through trial and error. They develop preferences for the strategic routes that work better or are more suitable as they gain expertise in resolving similar and distinct challenges. In this way, both regular and less frequent techniques continue to exist. Different ways of thinking, different ways of processing information, and the effect of experience rather than age are all taken into account by this evolution in developmental theory (Mutar, AL_khuzaie, & Mohammed, 2023).

2.1.1 The Educational Implications of OWT

Learning encompasses both the ability to retain crucial knowledge for later retrieval and the ability to comprehend or grasp a concept, a principle, or the current job. Furthermore, learning something successfully has the power to alter a person to varied degrees. One of the most up-to-date and successful ideas in the field of education and pedagogy is the Overlapping Waves hypothesis. The goal of this kind of learning is to assist students in gaining knowledge and skills. This educational approach gives students a vital role by increasing their level of activity and energy because it teaches them the fundamental idea that prior knowledge is a prerequisite for new learning.

Thus, this strategy focuses on the students' current cognitive structures, which can have a direct impact on the learning process, show up in the capacity of learners to perform effectively, and facilitate the clear presentation of scientific material. Consequently, this enhances the student's cognitive accomplishment by strengthening his mental faculties and

capabilities. Recent research has demonstrated that the Overlapping Waves theory's underlying presumptions apply to English spelling and reading. It should be emphasized that these investigations found a direct recall of information for reading and writing abilities in addition to markers for diversity, adaptive choice, and progressive change in the approach utilization (Siegler & Booth, 2005).

This idea is very near the zone of proximal development and scaffolding that is utilized in providing the student-teachers with different strategies for teaching, and the student-teachers select the most suitable one according to their teaching style (Alsaadi & Mahdi, 2013).

2.2 Spelling

Combining alphabetic letters to create a written word is known as spelling. Correct writing is a linguistic procedure that involves arranging the required letters in a readable, often regular sequence. Another definition of spelling is the traditional method of writing words using an alphabetical writing system. Stockwell and Trask (2007). It is also considered as a combination of alphabetic letters to form a written word. It is a linguistic process of correct writing with the necessary letters present in a comprehensible, usually standardized order (Trask & Stockwell, 2007). Accurate pronunciations may be used for obtaining the right spellings, and student will eventually learn to adjust for mispronunciations. The aim of word pronunciation is not to lessen their natural accent, but to aid in spelling and word knowledge development. Contrary to research on second language acquisition, some beginners could have a "quiet period" during which they listen, mentally practicing the language without attempting to produce it. This "quiet period" might last anywhere from a few weeks to several months for individuals, while it can last for many months for others. Students can help one another comprehend class requirements and word meanings when they are working with linguistic partners.

The purpose of spelling, according to Treiman and Bourassa (2000), is to teach students how to spell words correctly, utilize terms they encounter often in daily life accurately, and develop study habits that will enable them to pick up new words as needed. As the learning process is affected by the learner's purpose, teachers should avoid allowing learners to entertain the intention just to retain it temporarily. Not only permanent retention but the ability to reproduce spontaneously and automatically written discourse should be the purpose of the learner. It is clear that there is a check to the even flow of thought in writing when one has to think how to spell, for then the attention is drawn from the thought to the mechanism of expression.

2.2.1 EFL/ ESL Students' Challenges with Spelling

Writing is a vital component of communication and a way to demonstrate one's comprehension of a subject. A thorough command of the language is

crucial for both writing and spelling as these abilities support one another. Emerging technology is at the center of the swiftly changing global landscape, and textual communication is crucial to it. Cook and Bassetti (2005) demonstrated that the phrase "writing system" has two different meanings: one that alludes to broad writing concepts and the other that refers to particular languages. They add that different writing systems may be identified by the kinds of units they use, such as phonemes, consonants, syllables, or morphemes. As a result, writing tends to be a more challenging talent than other competencies. Bukta (2014) asserted that writing skills are not inherent. individuals must develop their cognitive abilities to a certain extent before they can learn to write, as contrast to speaking and listening. It implied that writing well requires a variety of abilities. In general, everybody with ordinary understanding can learn to speak; however, writing requires simultaneous use of comprehension and basic literacy abilities, making writing slightly harder than speaking. Students who write are better prepared for an interconnected world where they must write in a variety of genres and for a variety of objectives (Burns & Siegel, 2018).

2.2.2 Spelling and (OWT)

Consequently, for all the above, there is a need for new strategies to help students to cope with spelling difficulties. It's feasible that overlapping waves offer a more precise illustration of the range of spelling techniques people employ (Siegler, 2007). Different tactics with various rates of application develop throughout time. whereas one tactic could be more popular at a particular moment, there are further options as well. From the start, people spell words using all the information that is obtainable. What could seem to define a certain stage is really a majority of either strategies employment rather than the use of one strategy in absolute terms. A study by Grabner-Hagen (2004) noted that students used different types of spelling learning strategies across different levels of education, which were categorized as follows: retrieval, mnemonic technique, syllabification, visual verification, rule application, analogy, visual memory, and synonym writing. Three fundamental presumptions of the overlapping waves theory of spelling were put out by Rittle-Johnson and Siegler (1999). The first is that different strategies are used. The use of a variety of tactics at a certain point in time is represented by the perspective of variability. students may employ many types of strategies, for example. To spell a word, they could combine visual checking techniques with rule use. The second premise is adaptive choice, which means that they employ their own repertoire of options based on the degree of word difficulty in order to accurately spell words. students may employ the best tactics and become less reliant on others when they have gained greater competence. In essence. Students can use hearing out words to spell them, and if the word is hard to remember,

they might employ a different technique to help them retain the challenging portions. Hence, rather of only simply sounding out to learn that specific word, the person employs syllabification techniques. As a result, different students may employ different methods in the classroom. Therefore, examining how young students utilize many techniques at the same time helps teachers focus less on improving their spelling skills. Four methods can be used to induce the alterations, according to Rittle-Johnson & Siegler (1999). When a new and more sophisticated plan is implemented, things change. They also happen when more sophisticated techniques are used, or when strategies are implemented well and there are more flexible options. This may be demonstrated by pointing out how someone employs syllabification. In the meanwhile, a teacher implements a novel teaching method, such as visual verification. When learning a word's spelling, the learner makes use of visual verification and syllabification. Change results from the replacement of the unsuccessful approach with the most effective one. Even if people employ a variety of spelling techniques, choose the best one and alter their approach, Similarly, adults follow the same process and employ various strategies (Rittle-Johnson & Siegler, 1999).

2.3 Vocabulary

Most language teachers believe that the most crucial component of any language training is vocabulary (McCarthy, 1990). No matter how effectively individuals learn grammar or how well they understand L2 sounds, communication cannot occur in any meaningful way without words that can convey a wide range of meanings. Despite this, vocabulary seems to be the least organized and well-supported of all the components of learning a foreign language. Hence, it is crucial to examine the current understanding of a language like English's vocabulary and consider how it has been used in language instruction. Vocabulary is a fundamental tool for all learners to communicate and acquire knowledge. Words enable one to think since they are the basis of understanding other people. The four fundamental English language skills—speaking, listening, reading, and writing—are connected to vocabulary. The skill of vocabulary enhances language use conversely. Language use leads to an increase in vocabulary knowledge. The importance of vocabulary is demonstrated daily in and out of campuses. In the classroom, Students' vocabulary is the most sufficient. Researchers like Laufer and Nation (1999) came to the conclusion that vocabulary development is essential for fluent usage of foreign languages and is an essential component in the creation of comprehensive written and spoken texts. In accordance to some studies, second-language readers assign a high value on vocabulary knowledge, and the biggest challenge they face is a lack of it. In production, language learners need a vocabulary bank from which they may select words to convey a notion or concept they like to

convey. As a result, students rely on their bilingual dictionary as a fundamental tool for interaction and spend a lot of time learning lists of terms.

2.3.1 EFL/ ESL Students' Challenges with Vocabulary

English learners need extensive and diverse vocabularies to progress in the language, especially when developing their ability to use English in specialized contexts. For young students, early vocabulary acquisition is essential. The vast majority of students pick up oral vocabulary through shared storybook readings, peer interactions, and chats with their parents. Vocabulary knowledge has been found to support important literacy abilities such as decoding, morphological awareness, and letter-sound understanding (Brown & D.H., 2001). Lack of L2 vocabulary might impede the development of foundational skills and text comprehension in the target language whereas learning a second language (L2). To bridge vocabulary gaps between students, especially L2 learners, and those in starting programs, research has shown that students need to be exposed to vocabulary terms repeatedly, get specific teaching on learning processes, and have enough time to practice new words. Vocabulary education must thus be a fundamental part of all language programs (Nation, 2000). Many variables can cause vocational school students to have difficulties when acquiring vocabulary. Vocabulary encompasses meaning, appropriate use, pronunciation, spelling, and connotation. Studies indicated that learning words that are hard to pronounce also makes them harder to learn. Students who speak languages with high spelling systems may encounter difficulties spelling numerous English words. Where pronunciation is concerned, specific spelling patterns may also lead to misunderstandings (Thornbury, 2002). Meaning encompasses the relationship between form and meaning, or, to put it, another form, the idea and the things it referred to, and the connections individuals have when they see or hear a particular word or phrase. Spelling and vocabulary are interconnected skills, and there is a need to support the contribution and importance of word spelling for vocabulary learning and instruction. This research reveals how written words are stored in memory, how they influence speech, and how spelling exerts a powerful influence on vocabulary. Therefore, teaching vocabulary more effectively reveals that little is said about the spelling of words.

2.3.2 Vocabulary and (OWT)

In Overlapping Waves Theory, Siegler, R. S. (2005) argued that students usually use many approaches and modes of thinking rather than just one while tackling an issue. These many approaches and modes of thought coexist for extended periods of time, not just during brief times of change. Students' relative dependence on contemporary tactics and ways of thinking

changes as a result of experience, which also sparks the development of more sophisticated methods. Rittle-Johnson & Siegler (1999) and Siegler (1996) introduced three fundamental overlapping waves theory presumptions about language. The first is that various techniques are used. Using a variety of strategies at a certain point in time is represented by the variability perspective. Students could, for example, start out using heuristic techniques. They could mentally repeat or visualize the uttered words by breaking them up into smaller parts. The adaptive choice assumption is the second one. which means that, depending on the word difficulty, individuals employ tactics from their own repertoire. They could switch to more algorithmic tactics as they have more experience, such as using web resources to increase their word bank or methodical vocabulary study procedures. Slow change is the third premise. Rittle-Johnson & Siegler (1999) assert that there are several approaches to create change. When a new and more sophisticated plan is implemented, things change. They also happen when more sophisticated tactics are used, when plans are implemented successfully, or when there are more flexible options available.

2.4 Related Works

This section presents the most relevant studies to the present one. A study conducted by Kwong & Varnhagen (2005) sought to investigate the development of both adults and children from their first efforts at spelling non-words to their subsequent direct memory recollection of the spellings through activating the overlapping wave model. For this study, Participants were 34 introductory psychology students, 32 of whom were female and 2 of whom were male; 11 Grade 1 children, 7 of whom were girls and 4 of whom were boys, with an average age of 6 years 10 months. The researcher used an instrument called the Wide Range Achievement Test-3 (WRAT-3; Wilkinson, 1993). The findings revealed that participants submitted retrospective strategy reports after each spelling. Half of those involved continued to use backup tactics that worked well for them, while the other half gradually transitioned from spelling terms with laborious backup procedures to quick retrieval. The overlapping waves model's applicability to non-algorithmic domains is supported by this study. It also shows how youngsters and adults acquire new words in identical manners.

Another study by Baleghizadeh and Dargahi (2011) sought to determine how frequently students in the elementary levels of English learning employed spelling strategies based on the Overlapping Waves Theory. likewise, it contrasted how these tactics were used by ordinary and proficient spellers with those of fragile spellers. The data was obtained by simple dictations and spelling tests. In this study, the researchers used purposeful sampling to select 32 Iranian students who are just beginning to learn how to spell at the Iran Language Institute (ILI). The study's findings

demonstrated that the most common approach employed by the participants was retrieval, which was followed by sounding out an analogy.

Al-Bulushi and Al-Humaidi's (2016) study's main goal was to look at the Overlapping Waves Theory spelling techniques employed by EFL students in Oman. Its main goal is to determine how frequently the tactics are used across classes and how they differ between the two grades. A questionnaire is the tool the researchers use to gather data. Since they reflect the departure level of Oman's school cycles, 757 students in grades four and ten made up the study sample. The findings showed that there were statistically significant variations in the methods' use in relation to grades.

3. The Analytical Part

3.1 Research Design

This research was an experimental quantitative nature in the two equal groups' manner for the research's nature and appropriateness.

3.2 Population and Sampling

The population of the current study is Vocational School for Girls / Applied Arts department in Middle Euphrates Governorates; 62 participants from the fifth secondary school students / Vocational School for Girls / Applied Arts department in Al-Diwanyiah Governorate were used as a sample in the study.

3.3 Instrument

In order to find out the results of the experiment, spelling and vocabulary, an achievement test is constructed in light of the 5th secondary school students / Applied Arts /book2, to be suitable to their level and interest.

3.4 Test Validity

In the current study, three types of validity were used: face, content, and construct validity.

3.4.1 Content Validity

Basic content analysis of the test and syllabus of the textbook 'English for School of Applied Arts, Book 2 for the 5th vocational stage. The purpose of the Student Book (SB) is to assess students. proficiency in vocabulary and spelling. Since the test is designed based on a table of specifications that has previously been created following a thorough content analysis of the material presented in the experiment, including the weights assigned for content items, its content validity is declared.

3.4.2 Face Validity

A committee consisting of sixteen experts in English teaching methodologies is asked to evaluate the current study and offer their opinions on the suitability and sufficiency of each measure's items. The experts

expressed their agreement that the test's items were adequate.

3.4.3 Pilot Study

A sample of (12) students is randomly chosen from the same vocational school for girls to carry out a pilot administration of the instruments. The pilot sample needs forty-five minutes to complete the spelling and vocabulary accomplishment exam. The results of this application demonstrate that the contents of the tests are acceptable and useful , and there is no ambiguity in it.

3.4.4 Construct Validity

The other type of validity dealt with in the current study is content validity. Discrimination power has been used to achieve the construct validity of the instruments.

3.4.4.1 Items Analyses

The process of test item analysis means checking responses constructed by all students for each item included in the test (Lee,2006). The following statistical analyses are conducted by the researcher based on the determination of the discrimination item index

3.4.4.2 Discrimination Power

The results of the current study indicate that the test item DL ranges from (0.2) - to (0.7), which is quite satisfactory, and the test item DP ranges from (0.3) to (1), which is acceptable. Table (3.15) shows the level of Discrimination and Difficulty of test items.

Table (1)

Item Discrimination and Difficulty of Spelling and Vocabulary Achievement posttest

| Qs | Items | Higher | Lower | Discrimination | Difficulty |
|----|-------|--------|-------|----------------|------------|
| Q1 | 1 | 28 | 6 | 0.43 | 0.44 |
| | 2 | 24 | 6 | 0.36 | 0.3 |
| | 3 | 28 | 2 | 0.52 | 0.3 |
| | 4 | 28 | 4 | 0.48 | 0.32 |
| | 5 | 28 | 6 | 0.44 | 0.34 |
| | 6 | 30 | 4 | 0.52 | 0.34 |
| Q2 | 1 | 26 | 10 | 0.32 | 0.36 |
| | 2 | 16 | 9 | 0.28 | 0.5 |
| | 3 | 19 | 10 | 0.36 | 0.58 |
| | 4 | 14 | 6 | 0.32 | 0.4 |
| | 5 | 18 | 10 | 0.32 | 0.56 |

| | | | | | |
|----|---|----|----|------|------|
| Q3 | 1 | 20 | 15 | 0.2 | 0.7 |
| | 2 | 13 | 5 | 0.32 | 0.36 |
| | 3 | 15 | 8 | 0.28 | 0.46 |
| | 4 | 13 | 6 | 0.28 | 0.38 |
| | 5 | 22 | 12 | 0.24 | 0.68 |
| Q4 | 1 | 20 | 12 | 0.32 | 0.64 |
| | 2 | 15 | 7 | 0.32 | 0.42 |
| | 3 | 19 | 12 | 0.28 | 0.62 |
| | 4 | 17 | 12 | 0.2 | 0.64 |
| | 5 | 19 | 14 | 0.2 | 0.66 |
| Q5 | 1 | 28 | 8 | 0.4 | 0.36 |
| | 2 | 31 | 4 | 0.54 | 0.35 |
| | 3 | 22 | 8 | 0.28 | 0.3 |
| | 4 | 23 | 8 | 0.3 | 0.31 |
| | 5 | 25 | 6 | 0.38 | 0.31 |
| Q6 | 1 | 25 | 11 | 0.56 | 0.36 |
| | | | | | |
| | 2 | 37 | 20 | 0.34 | 0.57 |
| | 3 | 29 | 18 | 0.22 | 0.47 |
| | 4 | 31 | 10 | 0.42 | 0.41 |
| | 5 | 20 | 10 | 0.2 | 0.3 |
| Q7 | 1 | 30 | 18 | 0.24 | 0.48 |
| | 2 | 19 | 10 | 0.18 | 0.29 |
| | 3 | 20 | 10 | 0.2 | 0.3 |
| | 4 | 21 | 12 | 0.18 | 0.33 |
| | 5 | 20 | 9 | 0.22 | 0.29 |

3.4.4.3 Distractors Efficiency

The table below shows how well the diversions worked in the multiple-choice responses to the test's questions. The data obtained indicate that no distractor is removed or replaced.

Table (2)

The Distractor Efficiency of the Multiple-Choice Items

| Items | Alternatives | High | Low | Effectiveness | High | Low | Effectiveness |
|-------|--------------|------|-----|---------------|------|-----|---------------|
| | | | | | | | |

| | | | | | | | |
|---|---|---------|---------|---------|---------|---------|---------|
| 1 | a | 1 | 2 | -0.96 | correct | correct | correct |
| | b | 0 | 1 | -0.02 | 2 | 6 | -0.08 |
| | c | correct | Correct | | 1 | 4 | -0.06 |
| | d | 0 | 2 | -0.04 | 2 | 3 | -0.02 |
| 2 | a | 5 | 9 | -4.82 | 4 | 8 | -0.08 |
| | b | 3 | 6 | -2.88 | 3 | 5 | -0.04 |
| | c | correct | Correct | | correct | correct | correct |
| | d | 3 | 5 | -2.9 | 2 | 4 | -0.04 |
| 3 | a | correct | Correct | | 4 | 5 | -0.02 |
| | b | 2 | 8 | -1.84 | 2 | 3 | -0.06 |
| | c | 3 | 5 | -2.9 | 2 | 5 | -0.06 |
| | d | 2 | 4 | -1.92 | correct | correct | correct |
| 4 | a | 4 | 8 | -3.84 | 2 | 5 | -0.06 |
| | b | correct | correct | | 2 | 4 | -0.04 |
| | c | 3 | 7 | -2.86 | 3 | 5 | -0.06 |
| | d | 3 | 6 | -2.88 | correct | correct | correct |
| 5 | a | correct | correct | correct | correct | correct | correct |
| | b | 2 | 6 | -1.88 | 2 | 4 | -0.04 |
| | c | 0 | 3 | -0.06 | 2 | 4 | -0.04 |
| | d | 1 | 2 | -0.96 | 1 | 4 | -0.02 |

3.5 Test Reliability

The Alpha-Cronbach Formula is a process used to evaluate the correlation of each item. To check the instrument's reliability, the researcher used the statistical program SPSS. According to Cronbach's Alpha, the internal consistency of the instrument is (0.69), which is reliable.

3.6 Scoring Scheme

The posttest of the current study consists of seven questions. The total mark of the written test is (59). See table (4)

Table 3
Scoring of Post-test

| No.of Q. | Whole Mark. | No. of items | Marks | | |
|----------|-------------|--------------|---------------|-------------------------|-----------------|
| | | | | | |
| Q1 | 12 | 6 | 2 for correct | 1 for partially correct | 0 incorrect |
| Q2 | 5 | 5 | 1 for correct | - | 0 for incorrect |
| Q3 | 5 | 5 | 1 for correct | - | 0 for incorrect |
| Q4 | 5 | 5 | 1 for correct | - | 0 for incorrect |

| | | | | | |
|----|----|---|---------------|-----------------------|-----------------|
| Q5 | 10 | 5 | 2 for correct | | 0 for incorrect |
| Q6 | 12 | 6 | 2 for correct | 1 for partial correct | 0 incorrect |
| Q7 | 10 | 5 | 2 for correct | 1 for partial correct | 0 for incorrect |

3.7 Statistical Means

1- T-Test Formula: It is used to judge the equivalence of the two groups in some variables and determine whether there are any notable variations between the two groups' dependent and independent variables.

2- Chi- square Formula: It has been applied to equalize several variables between the two experiment groups.

3 - Difficulty Level Formula: It is used to determine the Difficulty level of the items of the achievement test.

4-Item Discrimination Power Formula: It is used to estimate the discrimination level of the items of the achievement test.

5. Alpha-Cronbach Formula: It is used to calculate the reliability coefficient of the instruments.

4. Results

To achieve the study aim, "Find out the effectiveness of overlapping waves theory on ESP vocational school students' achievement in spelling and vocabulary", the following two null hypotheses are tested:

In their spelling achievement post-test, the experimental group, which was taught using the overlapping waves theory, had mean scores that were not statistically distinct from the control group, which was taught using the recommended method, according to the first null hypothesis. The null hypothesis is supported by the computed t-value (0.352), which is less than the critical one (2), the degree of freedom (48), the level of significance (0.726), and the mean score of the experimental group (0.24) with a standard deviation (2.10713) and the control group (0.04) with a standard deviation (1.90351); as shown in table 4.

Table (4)

Two independent samples T-test for spelling achievement posttest

| | Group. | Mean | Std. Deviation | Compute d t | Critical t | df | Sig. 0.05 |
|---------------|--------|------|----------------|-------------|------------|----|-----------|
| Ach. spelling | Exp. | 0.24 | 2.10713 | 0.352 | 2 | 48 | 0.726 |
| | Con. | 0.04 | 1.90351 | | | | |

In their vocabulary achievement post-test, the experimental group's mean scores taught using the overlapping waves theory and the control group's mean scores taught using the recommended method weren't different significantly in statistical terms at the significance level (0.05), according to the second null hypothesis. This null hypothesis is rejected since the experimental group's mean score was (12.20) with a standard deviation of (2.121), whereas the control group's mean score was (9.60) with a standard deviation of (3.464), the critical value (2) is lower than the computed t-value (3.200), the level of significance is (0.002) which is lower than (0.05) and degree of freedom (48). as shown in table 5.

Table (5)

Two independent samples T-test for vocabulary achievement posttest

| | Groups | Mean | Std. Deviation | Computed t | Critical t | df | Sig. |
|-----------------|--------|-------|----------------|------------|------------|----|-------|
| | | | | | | | 0.05 |
| Ach. vocabulary | Exp. | 12.20 | 2.121 | 3.200 | 2 | 48 | 0.002 |
| | Con. | 9.60 | 3.464 | | | | |

5. Conclusion

In relation to the first aim, the following are the main conclusions made from the collected results: Vocational school female students have a real problem with spelling and need a long time to cope with it since it a big obstacle faced by Students in general and specifically for those in vocational schools and this clear from the results of the experiment which indicates there are no statically significant differences in mean scores between the two groups in their spelling achievement posttest, this means there is a need for strong and continuous effort to help students to improve their level. In relation to vocabulary, students improve their level of vocabulary using OWT strategies in solving their problems, and this is clear from the results, which indicated that the mean scores of the experiential group are higher and better than the control one in achievement post-test.

6. Recommendations of the Study

In the light of the conclusions drawn, a number of recommendations are forwarded:

1. More focus on teaching spelling inside the classroom within other skills like reading and speaking, not only with writing, since spelling is a real obstacle faced by almost all students in vocational school students.
2. Give students more time to improve their learning by increasing the number of strategies to solve their problems inside the classroom.

7. Suggestions of the Study

In the light of the findings of the study, further studies need to be undertaken as follows:

1. A study recommends increasing the number of English lessons to 4 lessons per week to give students more time to improve their English levels.
2. A study is recommended to search the impact of the OWT on learners' four language skills in different vocational stages.

References

- Al-Bulushi, M., & Al-Humaidi, S. (2016). Spelling strategies of efl students. *Research Papers in Language Teaching and Learning*, 7(1), 169.
- Alsaadi, S. & Mahdi, S. (2013). The effect of a mediator on scaffolding EFL student-teachers teaching competencies, self-efficacy and self-awareness. *Journal of the College of Education for Women*, 24(4),1272-1295.
- Baleghizadeh, S., & Dargahi, Z. (2011). *The use of different spelling strategies among EFL young learners*.
- Brwon, D.H. (2001). *Teaching by principles*. New York, America: Longman, White Plain.
- Bukta, K. (2014). *Rating EFL Written Performance*. Walter de Gruyter GmbH. <https://search.ebscohost.com/login.aspx?direct=true&db=nlebk&AN=1805277&site=eds-live>.
- Burns, A., & Siegel, J. (2018). Teaching the four language skills: Themes and issues. *International perspectives on teaching the four skills in ELT: Listening, speaking, reading, writing*, 1–17.
- Cook, V., & Bassetti, B. (2005). *Second Language Writing Systems*. Multilingual Matters Ltd.
- Far, M. M. (2008). On the relationship between ESP & EGP: A general perspective. *English for Specific Purposes World*, 7(1), 1-11.
- Grabner-Hagen, M. (2004). *Exploring differences in spelling strategies used*

- by children (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (Accession Order No. 3148232).
https://www.researchgate.net/publication/344891505_Self-assessment_of_Word_Spelling_and_Pronunciation_of_College_Students
- Hutchinson and Waters (1996). *English for Specific Purpose: A learning Centered Approach*, New York: Cambridge University Press, 19.
- Kwong, T. E., & Varnhagen, C. K. (2005). Strategy development and learning to spell new words: generalization of a process. *Developmental Psychology*, 41(1), 148
- Laufer, B. & P. Nation. (1999). A vocabulary size test of controlled productive ability. *Language Testing*, 16, 33-51
- Lawson, G., Baron, J., & Siegel, L. (1974). The role of number and length cues in children's quantitative judgments. *Child Development*, 731-736.
- Lee, S. J. (2006). An analysis of the validity of the computerized dictation test and its scoring method. *Multimedia Assisted Language Learning*.
- McCarthy, M. (1990). *Vocabulary*. Oxford University Press
- Musyafa'ah, L. (2016). *Increasing students' ability in dictation by using spelling bee games in learning menu (A Classroom Action Research at the 10th Grade Students of Vocational High School Islamic Centre Baiturrahman Semarang in the Academic Year of 2015/2016)* (Doctoral dissertation, static Islamic university).
- Mutar, D. T., AL_khuzaie, A. H. O., & Mohammed, M. A. U. R. (2023).
- Nation, I. (2000). *Learning vocabulary in another language*. Cambridge, UK: Cambridge University press
- Rittle-Johnson, B., & Siegler, R. S. (1999). Learning to spell: Variability, choice, and change in children's strategy use. *Child development*, 70(2), 332-348, school students. *Int J Eval & Res Educ*, 12(1), 357-368.
- Saalh, S. M. (2003). *Self-assessment of Word Spelling and Pronunciation of College Students*. [Thesis] University of Baghdad- College of Education for Women.
- Saalh, S. M., & Esmael, D. H. (2022). EFL Student- Teachers' Perception in the Culture of Thinking. *Journal of the College of Education for Women*, 33(2), 1–12. <https://doi.org/10.36231/coedw.v33i2.1584>
- Saalh, S. M. (2014). The effect of combining video lectures and Kolb experiential learning on EFL student-teachers' ability to teach communicative course book and their teaching competencies. *Journal of the College of Education for Women*, 25(4), 1139–1156.
- Siegler, R. S. (1994). Cognitive variability: A key to understanding cognitive development. *Current directions in psychological science*, 3(1), 1-
- Siegler, R. S. (1996). *Emerging minds: The process of change in children's thinking* (p. 771). Oxford University Press.

- Siegler, R. S. (2005). Children's learning. *American Psychologist*, 60(8),
- Siegler, R. S. (2007). Cognitive variability. *Developmental science*, 10(1), 104-109.
- Siegler, R. S., & Booth, J. L. (2005). *Development of numerical*.
- Siegler, R. S., & Opfer, J. E. (2003). The development of numerical estimation: Evidence for multiple representations of numerical quantity. *Psychological science*, 14(3), 237-250.
- Thornbury, S. (2002). *How to teach vocabulary*. UK, Harlow: London, Longman.
- Trask, R. L., & Stockwell, P. (2007). *Language and linguistics: The key concepts*. Routledge.
- Treiman, R., & Bourassa, D. C. (2000). The development of spelling skill. *Topics in language disorders*, 20 (3), 1–18.