

فاعلية استراتيجية PDEODE على تطوير التفكير التحليلي لطلبة اللغة الإنجليزية لغة أجنبية
في مادة الاختبارات

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الكلمات المفتاحية: استراتيجية PDEODE التفكير التحليلي، الاختبارات، متعلمي اللغة
الإنجليزية كلغة أجنبية.

كيفية اقتباس البحث

اللبان ، أمير سلمان حسين، فاعلية استراتيجية PDEODE على تطوير التفكير التحليلي لطلبة
اللغة الإنجليزية لغة أجنبية في مادة الاختبارات، مجلة مركز بابل للدراسات الانسانية، تموز
2025، المجلد: 15، العدد: 4 .

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The Effectiveness of PDEODE Strategy on Improving Iraqi EFL University Students' Analytical Thinking in Testing Course

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Keywords : PDEODE, Analytical thinking, Testing, EFL learners.

How To Cite This Article

Al-Labban, Ameer Salman Hussein , The Effectiveness of PDEODE Strategy on Improving Iraqi EFL University Students' Analytical Thinking in Testing Course, Journal Of Babylon Center For Humanities Studies, July 2025, Volume:15, Issue 4.



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المستخلص:

إن التفكير التحليلي هو عملية معرفية تفكك الموقف إلى مكوناته وتعيد تنظيمها، مما يتيح للشخص رؤية الأحداث من منظور جديد والتعرف على الترابطات بين البنى المعرفية. إن طلبة الجامعات يجب أن يمتلكوا قدرات التفكير التحليلي للتعامل بفعالية مع الأنشطة والموارد المتنوعة، وتعزيز اكتساب المعرفة المستقلة والإبداع. ومن بين هذه المواد هي مادة الاختبارات حيث تعد أحد المواد التي تتطلب تطوير تقنيات متنوعة لإنتاج مثل هذا النوع من التفكير من أجل توليد أشياء فعالة وقيمة لغرض اختبار أجزاء مختلفة من اللغة. ومن هذه الاستراتيجيات الفعالة استراتيجية PDEODE (توقع - ناقش - فسر - لاحظ - ناقش - فسر) والتي تركز على مفاهيم ومبادئ التعلم البنائي. وتهدف الدراسة الحالية إلى معرفة فاعلية استراتيجية PDEODE في تحسين التفكير التحليلي لدى طلبة الجامعات العراقية الذين يدرسون اللغة الانجليزية كلغة أجنبية في مقرر الاختبار. ويفترض هذا البحث عدم وجود فروق ذات دلالة إحصائية بين نتائج المجموعة التجريبية التي تم تدريسها باستخدام استراتيجية PDEODE والمجموعة الضابطة التي

تم تدريسها بالطرق التقليدية. تم اختيار عينة مكونة من (65) طالب وطالبة من المرحلة الرابعة بقسم اللغة الانجليزية خلال الفصل الدراسي الأول للعام الدراسي 2023-2024م، وقد تم تقسيم العينة إلى مجموعتين، (33) طالب وطالبة للمجموعة التجريبية و(32) طالب وطالبة للمجموعة الضابطة، وتشير نتائج الاختبار القبلي والبعدي إلى أن استراتيجية PDEODE تعمل على تعزيز المهارات التحليلية لدى الطلبة بشكل ملحوظ.

Abstract

Analytical thinking is a cognitive process that deconstructs a situation into its components and reorganizes them, enabling the person to see events from a novel perspective and recognize the interconnections among cognitive structures. University students must possess analytical thinking abilities to effectively engage with diverse activities and resources, fostering independent knowledge acquisition and creativity. Among these materials, testing is one that necessitates the development of techniques for producing such a sort of thinking in order to generate things that are both effective and valuable for testing various parts of language. One of these effective strategies is the PDEODE (Predict-Discuss-Explain-Observe-Discuss-Explain) strategy, which is founded on the concepts and principles of constructivist learning. The current study aims to find out the effectiveness of PDEODE strategy on improving Iraqi EFL university students' analytical thinking in testing course. This research hypothesizes that there will be no statistically significant difference between the findings of the experimental group, instructed using the PDEODE strategy, and the control group, instructed by conventional methods. A sample of (65) students has been selected from the fourth stage of the Department of English during the first semester of the academic year 2023-2024. The sample has been divided into two groups, (33) students for the experimental group and (32) for the control group. The findings of the pre and post-test indicate that the PDEODE strategy significantly enhances students' analytical skills.

1. Introduction

1.1 The Problem and Significance of the Study

Analytical thinking entails using a systematic methodology to make judgments or resolve problems. Analytical thinkers enhance their comprehension and reach logical conclusions by deconstructing information into components. Upon identifying a problem, analytical thinkers often collect further information, formulate potential solutions, evaluate them, and choose the most effective option. Analytical competence refers to pupils' capacity to recognize and analyze complicated issues and concepts in order to arrive at a solution.



Analytical skills facilitate the inquiry of pertinent information, the examination of data, the identification of primary problems, the evaluation of potential solutions, and the selection of the optimal resolution. The phrase "Thinking Analytically" refers to a student's ability to contemplate and evaluate existing options, followed by a clear comprehension before proceeding to articulate their findings (Amer, 2005).

Analytical thinking is an important skill for students to have because it helps them see things clearly, solve problems creatively, and come up with new ideas by breaking out of their comfort zones and thinking outside the box. Educators are starting to take notice of this skill because of its impact on individuals and society. Students require time to think about, recognize, and comprehend these factors in order to alter their behavioral patterns (Jaber, 2008).

The instruction that imparts knowledge to students requires suitable pedagogical strategies to elucidate and convey the content effectively. Teaching diverges significantly from thinking and innovation, as it transforms students into passive recipients of information and instructions, inhibiting their engagement in discussion, dialogue, critique, analysis, and conclusion. Consequently, students lack the spirit of inquiry and critical thinking, including analytical reasoning. The aforementioned obstacles compelled researchers to select strategies and methodologies for enhancing students' abilities in grasping grammatical concepts, fostering analytical thinking, addressing the decline of human knowledge, and attempting to resolve the issue by emphasizing student engagement (Hussein and Fayyadh, 2019).

Among these effective strategies is the PDEODE strategy, that is founded on constructivist learning concepts and principles. This teaching strategy is characterized by a collection of instructional methods that promote an interactive classroom environment via dialogue and the articulation of varied perspectives. Furthermore, it helps learners in comprehending everyday scenarios (Costu, 2008).

Regarding the aforementioned facts, the problem of this study is to find an answer for the following question: "What is the impact of PDEODE strategy on the development of analytical thinking of Iraqi EFL university students in testing course?"

1.2 Aim

The current study aims at finding the effectiveness of PDEODE strategy on improving the analytical thinking of the Iraqi EFL university students in testing course.

1.3 Limits of the Study

The current study was limited to the fourth stage students (morning study) in testing course at the University of Babylon – College of Basic Education – Department of English – throughout the second semester in the academic year 2023-2024.

1.4 Hypotheses of the Study

According to the nature of the current study, it is hypothesized that:

1. "There is no statistically significant difference at the level of (0.05) between the mean score of the results of the pre-test for both experimental group (who are taught via PDEODE strategy) and control group (who are taught according to the traditional method)."
2. "There is no statistically significant difference at the level of (0.05) between the mean score of the post-test result for both experimental group (who are taught via PDEODE strategy) and control group (who are taught according to the traditional method)."
3. "There is no statistically significant difference at the level of (0.05) between the mean score of the results of the pre and post-test for experimental group to measure the effectiveness of PDEODE strategy on Iraqi EFL learners' analytical thinking improvement."

1.5 Procedures of the Study

The following procedures have been followed by the researcher to conduct the current study successfully:

1. Reviewing relevant literature and earlier studies on the topic.
2. Selecting the study sample from the overall population.
3. Dividing the whole sample into two groups: experimental and control to start the experiment.
4. Conducting a pre-test for both groups to evaluate their current expertise in analysis and interpretation using analytical thinking.
5. Initiating the experiment by employing the PDEODE strategy for the experimental group, while utilizing conventional method (Discussion) with the control group.
6. Conducting the post-test for both groups to evaluate their performance after a certain period.
7. Performing a statistical analysis of the data in order to get the findings.

1.6 Definitions of Basic Terms

1.6.1 Effectiveness

Peter (2006) defines the effectiveness as "the ability to exhibit the expected results or intended outcomes that are distinctly evident in the outputs. An action is regarded as "effective" if it achieves the expected results or yields a successful conclusion."



Operational Definition

In the present study, "effectiveness" denotes the influence of the PDEODE strategy on improving the analytical thinking skills of Iraqi EFL university students in a testing course.

1.6.2 PDEODE Strategy

PDEODE is an instructional strategy of six phases that underscores the significance of students' active participation in the process of learning, enabling them to explore and structure their personal knowledge. This strategy of learning will include students in logical and analytical reasoning grounded on quantities and assumptions (Diplaya and Corebima, 2016).

Operational Definition

It is a teaching strategy that the researcher employs to evaluate its efficacy on the academic performance of undergraduate students in the testing course.

1.6.3 Analytical Thinking

Analytical thinking is the capacity to address complex problems by assessing and organizing collected knowledge. Analytical thinkers may identify patterns within datasets that often result in innovative solutions (Elder and Paul, 2007).

Operational Definition

It refers to the students' cognitive processes and rationale in formulating various test formats based on the PDEODE strategy.

1.6.4 Testing

A test denotes an instrument, approach, or methodology used to assess learners' knowledge or their capacity to do a certain activity. In this context, testing may be seen as a method of evaluation. This means giving a learner a series of questions or activities to assess performance, often quantified by a score. The score aims to provide information on the individual assessed (Al-Juboury, 2014).

Operational Definition

The testing course in this study denotes a collection of lectures collected by the researcher, aligned with the curricula of the Ministry of Higher Education and Scientific Research, intended for fourth-grade students in the Department of English at the College of Basic Education.

2. Theoretical Background

2.1 PDEODE Strategy

Ibrahim (2016) defines the PDEODE strategy as an interactive teaching strategy rooted on constructivist theory, including six steps, i.e., prediction, discussion, interpretation, observation, discussion, and interpretation. This strategy fosters an atmosphere conducive to group



discussions, issue judgment, interpretation, and solution formulation. It seeks to enhance the learner's awareness of his cognition and to position him as an observer of his own ideas.

The strategy integrates both group and individual instruction, and the sixth-dimensional teaching strategy is grounded on the principles of constructivist learning theory, progressing through six sequential levels (Wadi and Sharaf, 2022). The six-dimensional strategy clearly provides students with multiple chances to consider a wide range of alternative solutions to a single issue. This educational method challenges students to continually reassess and adjust their cognitive frameworks. It enables the synthesis of new experiences with existing ones, creating authentic and significant connections essential for the development of investigative cognitive abilities. In addition to all of these advantages, the strategy enables students to independently get information via thorough investigation, inquiry, and discovery. This is accomplished by emphasizing the central role of students in the educational process (Al-Kreimeen, 2024).

The PDEODE strategy for learning emphasizes the importance of students actively engaging in the process of learning, whereby they uncover and formulate their personal knowledge. This learning strategy will engage students in logical and theoretical thinking based upon proportions and hypotheses. They may also make choices depending on the findings reached. Simultaneously, educators assume the roles of motivators and facilitators for students throughout learning activities. Educators instruct, lead, and assist students to facilitate their engagement with their surroundings and daily experiences. The assignments provided to students pertain to their environment and surrounds. Consequently, students are capable of reasoning and identifying solutions to issues in accordance with their intellectual development (Diplaya and Corebima, 2016). Implementing prediction exercises, facilitating class debates, and integrating analysis into the educational framework via the PDEODE learning technique are viable alternatives. The PDEODE strategy enhances students' cognitive and analytical abilities. The ability to articulate, observe, and go over the dialogue may also be used to get responses (Rohman et al., 2013).

The PDEODE strategy relies on collaborative groups. Students are organized into tiny, segregated groups. Each group functions as a cohesive unit to get the appropriate information. Students participate in organizations that provoke debate and conflict. This results in enhanced comprehension. When students collaborate in small groups, their ideas undergo refinement, necessitating that each student contributes actively.



This interaction mitigates the passivity of certain learners by fostering engagement with peers, facilitating the exchange of ideas, gathering information, and conducting experiments. Engage in walking to get answers to issues (Hussein and Fayyadh, 2019).

2.2 Steps of Applying PDEODE Strategy

Alabdulaziz (2022) and Al-Kreimeen (2024) explain that the steps of applying PDEODE strategy can be summarized as follows:

1.Prediction: In this stage, the teacher introduces the phenomena or topic to be studied, subsequently allowing students to forecast the consequences or effects of the provided phenomenon. Students ought to complete this task separately, after which the instructor allows them to independently forecast the conclusion of the given issue, accompanied by arguments for their judgments.

2.Discussion: In this phase, the teacher cultivates a conducive environment for the students. The students are organized into small groups, providing them the chance to collaboratively debate their ideas, share experiences, and engage in dialogue that facilitates the interchange of viewpoints.

3.Clarify: In this phase, students collaboratively devise a solution to the issue and communicate their findings to other groups via discussion. The instructor requests that each group of students formulate explanations for the reported occurrence and thereafter share their findings via group discussions.

4.Observe: In this step, students evaluate their thoughts, views, expectations, predictions, and interpretations on the topic via group activities and experiments, while documenting notes pertinent to the issue. At this stage, the student may experience cognitive dissonance if they disagree with his reasoning, explanations, or expectations throughout the debate. The students must observe modifications in the phenomena, and the teacher must direct students to make observations pertinent to the newly introduced notion.

5.Discuss: In this phase, the predictions and conclusions attained are compared with observations, leading to adjustments in their predictions based on the actual findings from the preceding step. This involves the application of analytical, comparative, and critical skills among peers within the groups. Subsequently, the teacher engages in a discussion with the students regarding the observations they have made.

6.Explain: Students encounter discrepancies between observations and predictions; via these conflicts, they acquire accurate knowledge.

2.3 Teachers' and Students' Role in PDEODE Strategy

Maha (2019) declares that the role of the teacher in performing PDEODE strategy can be listed in the following points:

1. Inspiring students during conversations, collaborative learning within groups, and interactions among peers.
2. Pose inquiries to students that provoke critical thinking and introduce an issue for their consideration.
3. Facilitating suitable educational possibilities for learning in small groups that collaborate, engaging in discussions on the group's thoughts and predictions for answers collectively, and rectifying erroneous forecasts.
4. A facilitator of the process of learning, a coordinator of the educational environment, and an active participant in the management and assessment of learning.
5. Investigate learners' existing expertise and knowledge and connect them to new information and experiences.

Moreover, the student's role, according to Alabdulaziz (2022), can be summarized in the following points:

1. Explorer, knowledge seeker, access to significance, and self-directed knowledge construction.
2. Formulating predictions on the suggested solutions to the challenges presented by the instructor.
3. Offering justifications for the predictions articulated by the issues.
4. Collaborating with his peers in the group to resolve an issue or respond to a question posed by the instructor.
5. Engaging in discussion with his colleagues over their responses to the inquiries posed by the teacher.
6. Evaluating, comparing, and assessing the concepts related to the predictions he formulated for the answers to the issue presented by the teacher, as well as the insights he derived by executing the tasks given by the teacher.

2.4 Advantages of PDEODE Strategy

Costu (2008) clarifies that the PDEODE method has certain advantages, with the most significant being as follows:

1. It fosters a learning atmosphere that encourages conversation and diverse perspectives among students, integrating individual and collaborative work.
2. It promotes cooperative efforts.
3. It integrates the student's prior knowledge with new information, fostering a secure environment of learning devoid of the fear of retribution during mathematics instruction.



4.It encourages students to engage actively and maintain a positive attitude in mathematics instruction, facilitating the acquisition of mathematical information.

5.It offers suitable possibilities for significant learning and assists the learner in maintaining engagement in the learning process for an extended duration.

2.5 Analytical Thinking

Analytical thinking is an effective cognitive skill for comprehending the components of a situation. It is described as “the capacity to analyze and deconstruct facts and ideas into their strengths and weaknesses.” Enhancing the ability to think critically, resolve issues, evaluate facts, and retrieve and apply knowledge. It is the capacity to address complex problems by analyzing collected and arranged information. Furthermore, it allows individuals to comprehend the elements of the total situation and deconstruct them into their constituent components (as shown in Figure 1). Analytical thinkers may identify patterns across datasets that often result in innovative solutions. They can transform chaotic information and data into actionable insights. Just like critical thinkers, they assist teams in making informed choices grounded on gathered evidence and established objectives. Analytical thinkers assist their team in adopting new concepts and cultivating a development attitude (Amer, 2005).

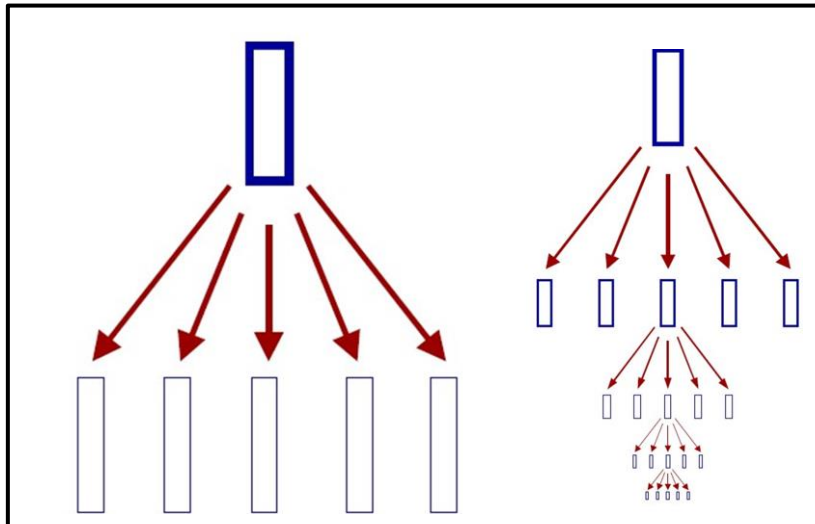


Figure (1): The Process of Analytical Thinking.

Analytical thinking refers to an individual's capacity to recognize a problem or concept, deconstruct it into its constituent parts, and systematically organize the requisite information to facilitate sound decision-making or judgment, ultimately establishing a specific criterion for evaluation and conclusion. Analytical thinking is a cognitive paradigm that originated in the works of the philosopher Descartes. His

model, which is the foundation of contemporary scientific thinking, demonstrates the feasibility of achieving complete comprehension of the topic by discerning the qualities of its components. Analysis involves distinguishing one entity from others to comprehend it. Analysis of components cannot proceed without their reduction into smaller segments. It is “a cognitive approach for learners who invest more time contemplating, scrutinizing hypotheses, and assessing their answers or responses prior to their articulation” (Atiya, 2015).

It may be succinctly characterized as interrogating and illustrating concepts. An analytical thinker needs to consider causality, differences and similarities, trends, current examples, procedural steps, methods for resolving intricate problems, the functionality of complex systems, event sequences, interrelationships among components, and associations between entities. Individuals with analytical thinking skills can explain, envision, and resolve both basic and complicated situations, making judicious judgments grounded upon available knowledge. In other terms, it may be characterized as an individual's process of problem identification and their subsequent attempts to resolve the issue by proposing solutions (Soybilge, 2014).

Nowadays, people must possess the ability to think critically, rationally, creatively, and autonomously to adapt to changing circumstances. To think independently, one must identify and characterize various views and perceive the links among them. Students may enhance these capabilities via critical thinking skills. A person capable of analytical thinking may assimilate acquired information and skills and implement them in practical situations. A primary objective of education is to provide students with the ability to resolve everyday challenges via the application of acquired knowledge. The cognitive process necessary for problem-solving is intricately linked to analytical thinking skills. As analytical thinking skills improve, the cognitive development process likewise intensifies (Lin, 2021).

2.6 Phases of Analytical Thinking

Al-Hasnawi and Al-Mousawi (2021) state that there are several phases of analytical thinking, and they are as follows:

- 1.The presence of a problem confronting the person, motivating him to undertake the necessary actions for resolution.
- 2.Continuous observation to collect essential facts on the issue for comprehension and analysis.



3. Formulating hypotheses subsequent to information gathering, issue identification, and analysis.
4. Attaining these hypotheses and substantiating them with more data and the individual's prior experiences.
5. Access to conclusive outcomes and overarching rules and regulations.

2.7 Importance of Analytical Thinking

Due to Al-Hasnawi and Al-Mousawi (2021), students' engagement in an effective analytical thinking process results in:

1. Independent and efficient learning to enhance the communication of relevant subjects.
2. The chance to enhance communication skills and use understanding and assessment skills.
3. Employing analytical skills, evaluative techniques, problem-solving abilities, decision-making processes, and good subject presentation.
4. Sufficient chance to read, comprehend, and evaluate the issue.
5. To engage in a rational discussion regarding the concepts and functions of language, irrespective of the symbols that are present.
6. Proficient in verbal analysis, assessment, and the communication of knowledge to arrange, edit, and evaluate concepts.
7. The capacity to attain objectives and constraints in the use of analytical abilities.
8. Gathering, structuring, monitoring, and assessing data throughout the learning process.
9. The capacity to apply knowledge across various learning contexts.

2.8 Previous Studies

2.8.1 Costu (2008)

The main goal of this research was to examine the efficacy of the PDEODE instructional strategy in aiding students' comprehension of daily settings. The idea of condensation was selected among other scientific concepts because of its relevance to various daily occurrences. This research comprised forty-eight eleventh-grade students. Students were given a pre- and post-test with two real-life issues to see how well they applied what they learned. Throughout the intervention stage, two PDEODE issues were utilized to teach about condensation. The test findings were analyzed using both qualitative and quantitative methodologies. Statistical analysis employing a paired t-test of student test scores indicates statistically significant differences in test and overall scores ($p < 0.05$), indicating that the PDEODE teaching strategy either aids

students in comprehending everyday situations or enhances their conceptual understanding of the concept of condensation.

2.8.2 Dipalaya and Corebima (2016)

The objective of this study is to determine the variations in students' critical thinking abilities between conventional and PDEODE learning, the disparities in students' critical thinking skills among those with higher and lower academic capacities, and the critical thinking skills of students that result from the interaction between the learning strategy and academic ability. The pretest and posttest were administered using a non-equivalent control design in the study. The sample included 40 high school students and was conducted in the first semester of the academic year 2015-2016. Data were acquired by pre-test and post-test essay assessments. Data were analyzed with the ANCOVA test. The data analysis indicated that learning approach, academic ability, and the connection between these two factors greatly influence students' critical thinking abilities. The PDEODE learning style enhances students' critical thinking abilities by 71.43% compared to standard learning methods. High academic ability enhances students' critical thinking abilities by 67.03% compared to poor academic skill. It is shown that students with poor academic performance in the PDEODE class exhibit an enhancement in critical thinking abilities comparable to those of high-achieving students in traditional classes. The PDEODE learning technique may assist academically disadvantaged students in enhancing their critical thinking abilities. The PDEODE learning technique is the most effective method for enhancing critical thinking abilities in individuals with excellent academic ability.

2.8.3 Hussein and Fayyadh (2019)

This study examines the impact of PDEODE strategy on the students' grammatical concepts acquisition and the improvement of critical thinking. The researchers adhered to the experimental design consisting of experimental and control groups. They deliberately selected two schools for the experiment and employed a random sampling method. The total number of students in both groups was (62) with the experimental group utilizing the PDEODE strategy, which had been carefully prepared in advance. The commencement of the experiment aimed at statistically equating the two study groups across many factors presumed to influence the trial's safety. The researchers selected the instructional material, namely the Arabic grammar book, and developed sample plans for instruction for both groups. The study instrument was an



assessment of grammatical concept acquisition, with 33 multiple-choice questions that evaluated the three phases involved in acquiring the idea. Thirty paragraphs were analyzed for honesty and consistency in this exam. Following the setup of the study instruments, the critical thinking exam was administered. The findings indicated a statistically significant distinction at the 0.05 level among the average scores of the group that was experimentally treated using the PDEODE strategy and their performance on the grammatical concept acquisition test, favoring the experimental group.

2.8.4 Alabdulaziz (2022)

The objective of the present study is to ascertain the impact of the PDEODE strategy, augmented by the environment of e-learning, on enhancing conceptual understanding and problem-solving abilities in fourth-grade primary students. The experimental technique used a semi-experimental design to fulfill the study aims. The research sample included (76) students, split into an experimental group of (38) students who used PDEODE inside an e-learning environment, and a control group of (38) students who engaged in conventional study methods. The findings indicated statistically significant distinctions at the 0.05 significance level between the mean scores of students in the experimental and control groups on the conceptual comprehension exam, favoring the experimental group. Moreover, there are also statistically significant distinctions at the 0.05 significance level in the results of the students in the experimental and control groups on the problem-solving abilities exam, favoring the experimental group. Finally, a positive association exists between the conceptual comprehension test scores and the problem-solving abilities test scores of students in the experimental group in mathematics.

2.8.5 Rohmah et al. (2023)

This research aims to assess the impact of the PDEODE strategy on the critical thinking of students and their mathematical evaluation abilities. This study employs a quantitative methodology using a semi-experimental design with a posttest-only control group. The study population included all eighth-grade students (256 students). The method used for sampling was clustered random sampling. The analytical procedures used were the normalcy test and the uniformity test. The hypothesis testing used was a (MANOVA) test. The findings from the study and the MANOVA test indicate that the PDEODE learning strategy

positively influences the critical thinking of students in addition to their mathematical analytical abilities.

3.Methodology

3.1 Method of Research

This research used the experimental design to evaluate the effectiveness of PDEODE strategy by using pre and post-tests. This strategy allows researcher to evaluate the final posttest outcomes of both the control and experimental groups, indicating the overall success of the treatment. Moreover, the researcher may assess the degree of change in both groups from the pretest to the posttest and ascertain if one, both, or none of them has shown progress over time. If the control group also demonstrates a significant improvement, the researcher must investigate the underlying variables leading to this occurrence. Additionally, the researcher may evaluate the outcomes of each of the pre-test groups to ascertain the efficacy of the randomization technique (Mertler, 2015).

3.2 Population and Sample of the Study

A population as seen by Best and Khan (2006) is defined as “a group of people with at least one distinguishing characteristic that differentiates them from other individuals. The characteristics of these collections are of interest for scholars to examine”. Sample, on the other hand is defined as the process of picking a sample from a population, which is the whole of elements from which the sample is obtained. The sample accurately represents the population and consists of components selected from a broader population according to certain criteria (Johnson and Christensen, 2016).

The entire population of the current study comprises (216) male and female students, from which the researcher has randomly chosen a sample of (65) students to represent the study's sample. Subsequently, he divided it into two groups: the experimental group, which consisted of (33) male and female students, and the control group, which consisted of (32) male and female students, as illustrated in Table (1) below:

Table (1): Population and Sample of the Study

No.	Groups	No. of Students
1	Experimental	33
2	Control	32
3	Total	65



3.3 Conducting the Experiment

For the execution of the current study's experiment, the researcher divided the study's sample into two groups, as previously stated. The experimental group included 33 male and female students, while the control group comprised 32 male and female students. The researcher conducted a pre-test for both groups to evaluate the students' analytical thinking and their ability in writing and design capabilities before to using the PDEODE method. He collected the scores from the two groups for additional evaluation and interpretation of the results. Thereafter, the researcher began teaching the students in the experimental group with the PDEODE approach, according to the six phases delineated by Alabdulaziz and Al-Kreimeen in the theoretical structure. The control group was instructed using traditional techniques. The experiment continued during the first semester of the school year (2023-2024), during which knowledge was provided to both groups, but with a different instructional method. The researcher then conducted a post-test for both groups to evaluate the extent of the improvement in students' analytical thinking and test design after the use of this approach. Scores were collected for comparative analysis of statistics using the t-test.

4. Results and Discussion

4.1 Results of the First Null Hypothesis

To evaluate the first hypothesis, which posits that "There is no statistically significant difference at the 0.05 level between the mean scores of the pre-test results for both the experimental group (taught using the PDEODE strategy) and the control group (taught via the traditional method)," the researcher employed the t-test for two samples to ascertain the outcomes. Students in both the experimental and control groups have undergone a pre-test. Following the collection and analysis of the scores, the variance, arithmetic mean, and standard deviation have been computed as shown in Table (2) below:

Table (2) The Results of the T-test for the First Null Hypothesis

Groups	N	Mean	Std. Deviation	DF	T-test Value		Sig.
Experimental	33	32.33	4.320	63	Cal.	Tab.	0.399
Control	32	32.31	4.829		0.018	1.98	

According to the results of the above table, it has been noted that the experimental group's mean score is (32.33) with a value of a standard deviation of (4.320), while the control group's mean score is (32.31) with a value of a standard deviation of (4.829); and the calculated value of the T-test is (0.018), which is lower than the tabulated value (1.98) with a degree of freedom of 63. The findings of the statistics reveal that the association between the two pre-tests for both groups is not statistically significant since the researcher has not yet performed the experiment, therefore the result is not significant in favor of the experimental group. As a result, there is no statistically significant difference at 0.05, hence the null hypothesis is accepted and the alternative hypothesis is rejected.

4.2 Results of the Second Null Hypothesis

To evaluate the second hypothesis, which posits that "there is no statistically significant difference at the 0.05 level between the mean

scores of the post-test results for the experimental group (taught using the PDEODE strategy) and the control group (taught via the traditional method)." the researcher employed a T-test for two samples to determine the outcomes. Students in both the experimental and control groups underwent a post-test at the conclusion of the course to assess the effect of the PDEODE approach given to the experimental group. Upon collecting and evaluating the scores, the variance, arithmetic mean, and standard deviation have been computed as shown in Table (3) below:

Table (3) The Results of the T-test for the Second Null Hypothesis

Group	N	Mean	Std. Deviation	DF	T-test Value		Sig.
Experimental	33	37.03	5.151	63	Cal.	Tab.	0.121
Control	32	34.00	6.575		2.072	1.98	

According to the results of the above table, it has been noted that the experimental group's mean score is (37.03) with a value of standard deviation of (5.151), while the control group's mean score is (34.00) with a value of standard deviation of (6.575); and the calculated value of the T-test is (2.072), that is greater than the tabulated value (1.98) with a degree of freedom of (63). Observing the statistical findings reveals that the association between the two post-tests for the two groups is statistically significant in favor of the experimental group. This shows that the implementation of this technique resulted in more growth of students' analytical thinking in the testing course than students in the control group who were not taught using this strategy. As a result, there is a statistically significant difference at (0.05), hence the null hypothesis is rejected and the alternative hypothesis is accepted.

4.3 Results of the Third Null Hypothesis

To evaluate the third hypothesis, which posits that "there is no statistically significant difference at the 0.05 level between the mean scores of the pre-test and post-test for the experimental group regarding the effectiveness of the PDEODE strategy on the enhancement of analytical thinking in Iraqi EFL learners," the researcher employed a T-test of two samples to ascertain the results. Pre-tests and post-tests have been administered to the experimental group students to evaluate the influence of the PDEODE teaching strategy on improving and enhancing of students' analytical thinking. Following the collection and analysis of the scores, the variance, arithmetic mean, and standard deviation have been computed as shown in Table (4) below:

Table (4) The Results of the T-test for the Third Null Hypothesis

Group	N	Mean	Std. Deviation	DF	T-test Value		Sig.
Pre-test Experimental	33	37.03	5.151	64	Cal.	Tab.	0.211
Post-test Experimental	33	32.82	4.319		3.600	1.98	

According to the results of the above table, it has been noted that the mean score of the pre-test is (37.03) with a standard deviation of (5.151), while the mean score of the post-test is (32.82) with a standard deviation of (4.319); and the calculated value of the T-test is (3.600), that is greater



than the tabulated value (1.98) with a degree of freedom of (64). The statistical results show that the association between the experimental group's pre- and post-tests is statistically significant in regard to the post-test outcome. This implies that the implementation of this technique resulted in the improvement of students' analytical thinking in the testing course, since the students' post-test scores grew dramatically. As a result, there is definitely a statistically significant difference at (0.05), hence the null hypothesis is rejected and the alternative hypothesis accepted.

4.4 Discussion on the Previous Studies

The studies previously mentioned are examined within the framework of the current research. The discussion will encompass critical components including the subject of study, its objectives, the population and sample, as well as the suggested methodologies for data collection. The present study has gained insights from previous and pertinent research within the theoretical framework of the investigation.

The current study aligns with all previous studies on the usefulness of the PDEODE technique, which is recognized as a successful method for boosting students' analytical thinking. In terms of research goals, this research seeks to figure out the effect of this strategy on enhancing university students' analytical thinking, while previous studies had varying aims. The research by **Costu (2008)** sought to examine the efficacy of the PDEODE teaching technique in aiding students' comprehension of daily scenarios. The research by **Dipalaya and Corebima (2016)** aimed to identify the variances in critical thinking skills among students receiving PDEODE instruction compared to those in traditional learning environments. Additionally, it assessed the variations in critical thinking abilities among students with different academic abilities and examined the influence of the connection between strategies for learning and academic achievement on these skills.

The research conducted by **Hussein and Favvadh (2019)** sought to examine the influence of the PDEODE method on the comprehension of grammatical ideas among fifth-grade literature students and the enhancement of critical thinking skills. The research conducted by **Alabdulaziz (2022)** sought to examine the impact of utilizing the PDEODE teaching strategy, augmented by an environment of e-learning, on enhancing conceptual comprehension and problem-solving abilities in 4th grade primary pupils. The research conducted by **Rohmah et al. (2023)** sought to evaluate the impact of the PDEODE learning technique on students' critical thinking and mathematical analytical abilities. The present research aims to analyze the vocabulary testing capabilities of university students using analytical thinking.

This study aligns with earlier since it also focuses on students, although the educational levels examined vary from elementary to university students. The present study sample comprises 65 students, while **Costu (2008)** included 48 students, **Dinalava and Corebima (2016)** involved 40 students, **Hussein and Fayyadh (2019)** consisted of

62 students. **Alabdulaziz (2022)** encompassed 76 students, and **Rohmah et al. (2023)** also comprised 76 students.

The present study employed an experimental methodology, utilizing two pre- and post-tests for data collection. This approach aligns with the research conducted by **Costu (2008)**, **Dinalava and Corebima (2016)**, **Hussein and Favvadh (2019)**, and **Alabdulaziz (2022)**, while differing from the study by **Rohmah et al. (2023)**, which utilized a quantitative research design featuring a semi-experimental posttest-only for control group.

The findings of the current study align with those of prior studies, all of that demonstrate the effectiveness of PDEODE strategy in improving and enhancing the analytical thinking skills of Iraqi EFL university students in testing courses, as evidenced by the results and statistical analyses presented.

5. Conclusions

It has been concluded that the achieved results from a series of hypothesis tests and data analyses show that the PDEODE learning strategy does, in fact, improve the analytical thinking of Iraqi university EFL students. Results from the post-test show that this strategy is effective in developing specific types of thinking that are vital to learning, which makes it a good fit for teaching languages, particularly English, in many contexts.

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