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Educating Beyond Boundaries: Strategies to Foster Independent Thinking and Academic Success

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التعليم خارج الحدود: استراتيجيات لتعزيز التفكير المستقل والنجاح الأكاديمي

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المستخلص:

تُركّز الرؤى التعليمية التقليدية الراسخة في العراق، ولا سيما في محافظة بابل، بشكل كبير على الحفظ والتوجيه الصارم، مع إغفال واضح لتنمية مهارات التفكير النقدي والمستقل لدى الطلبة. تهدف هذه الدراسة إلى استكشاف فاعلية الأساليب التعليمية القائمة على الاستقصاء والمتمركزة حول الطالب في تعزيز التفكير المستقل وتحسين المخرجات التعليمية لدى عينة من طلبة المدارس الثانوية. وقد تم تنفيذ تصميم شبه تجريبي شمل ٢٤٠ طالبًا من ثلاث مدارس ثانوية مختلفة في مدينة بابل / العراق، وهي: الفارابي، النهضة، والمستقبل. تم تقسيم الطلبة إلى مجموعتين رئيسيتين: مجموعة ضابطة (تشير إلى التعليم التقليدي)، ومجموعة تجريبية (تشير إلى الاستراتيجيات التعليمية المبتكرة). يُعد أسلوب التدريس هو المتغير المستقل في هذه الدراسة، بينما يمثّل كل من التفكير المستقل والنجاح الأكاديمي المتغيرات التابعة، وقد تم قياسها باستخدام اختبارات معيارية محددة. وأظهرت نتائج التحليل الإحصائي، باستخدام اختبارات (t) وحساب حجم الأثر، تحسنًا ملحوظًا في أداء المجموعة التجريبية بنسبة تقارب ٢١٪. وتُبرز الدراسة أهمية إعادة النظر في النهج التعليمي المعتمد في العراق لغرس جيل من المتعلمين القادرين على التفكير النقدي المستقل ومواجهة تحديات العصر الكلمات المفتاحية: التفكير المستقل، النجاح الأكاديمي، التعلم المتمركز حول الطالب، بابل، التعليم المبتكر.

Abstract –

The traditionally established Iraqi educational perspectives, especially in Babylon, overwhelmingly highlight memorization and tight direction, lacking students' critical and especially independent thinking skills. This study explores the activity of student-centered, inquiry based-on teaching methods to encourage independent thinking and improving educational production among sample students in sample high-schools. A quasi-experimental design was implemented consisting 240 students from different three high-schools in Iraq / Babylon city namely: Al-Farabi, Al-Nahda, and Al-Mustaqbal. The sampling students are split into two main groups: control (it is referring as traditional teaching) and experimental (it is referring as innovative strategies) groups. The independent variable in this study is the teaching strategy, while the dependent variables is independent thinking and academic success which is evaluated by some standard tests. In the statistical analysis phase, both t-tests and result size account, revealed significant improvements in the experimental group, with an approximate 21% improvement rate. The study summarizes the significance of re-thinking educational approaches in Iraq to implant critical, independent learners equipped to face current challenges.

Keywords: Independent thinking, academic success, student-centered learning, Babylon, innovative teaching

1. Introduction

Background

Thinking skills involve specific cognitive processes based on understanding of how the individual learns mentally and physically are giving both the time and effort in order to perform the main objectives [1]. The main concept of the twenty-first century is widely defined from different educators because of the emergence

of a lot educational innovations [2, 3]. Thus, it is so important to recognize such concept of as a set of abilities which address character building in accordance with the given requirements. These skills include learning and creativity skills, information and media skills, and life and professional skills [4, 5]Academic thinking skills are essential for fostering a generation of thinkers and learners who think creatively in order to solve problems and participate with others in different situations. The ability to learn and innovate new ideas is an essential ability which must be equipped with not just technical knowledge of how to do things, but also the ability to innovate, transform information, and interact effectively with others [6 – 8].The traditional teaching techniques common in Iraqi high-schools, particularly in cities such Babylon, firstly concentrates on rote memorization, limit students' capacity for exploration, analysis, and innovation [9, 10]. Educational apparatus has to provide students with the obligatory tools to pass complex, quickly advance challenges. Independent thinking (the capability for analyzing, assess, and generate) is a main skill for successful in the higher education and occupational life. Almost core studies indicate for the encourage the skill that requires for the environment which stimulate interest [11, 12].Student-centered learning strategies like long-term project-based learning and thinking tasks, while the experiential learning used to connect the theoretical ideas with the real-world approaches [13 – 15]. Technological combination moreover increases such approaches through contingent on students into various, interacting learning resources [16, 17].In Iraq, few studies have evaluated the effect of the strategies on the secondary education. Stated the critical demand for preparing students for the global citizen-ship and local leader-ship, re-testing traditional standards is critical [18, 19]. This study investigates high-schools in Babylon city, goaling to quantify of how the student-centered approaches effect the independent thinking and mainly the academic performance.

Problem Statement The high schools' students in Babylon city often lack the opportunity to develop independent thinking because of the continued dependency on the traditional, teacher-centered pedagogical methods.

Aim of the Study This study focusses on evaluating the effectiveness of innovative, student-centered learning strategies in encourage independent thinking and enhancing academic success from different high-school students in Babylon city. Along making comparison of outcomes between both groups the traditional (control) and innovative (experimental), the study attempts to provide evidence supporting educational transformation in Iraqi secondary-education. This guided the teachers for further attractive, crucial, and student-focused methods, eventually superior prepare such students for higher-education and executive challenges.

Significance of the Study The study provides critical evidence for re-forming Iraqi high-school education to promot crucial and independent thinking, helping students become more empowered and capable in the near future.

Design of the StudyA quasi-experimental design utilizing pre-test and post-test comparisons is built, consisting of two groups: control group and experimental group from three different high-schools in Babylon city in order to assess the impact of innovative teaching methods.

2. Literature Review

In this section, six previous studies will be discussed, and a brief summary of each study will be provided, the method used, as well as the most prominent results and shortcomings. Then, a comparison will be made between them and the study in this article.**Bhardwaj et al.** illustrated the graduate science education, examining the impact of shifting from teacher-centered to student-centered approaches [20]. Using the "Molecular Basis of Cancer" course as a case, it highlights how student-led discussions, peer collaboration, and active learning improve critical thinking, creativity, and research outputs. Students showed enhanced academic performance and increased scientific publications. The study underscores the value of fostering autonomy and professional skills through inclusive, learner-driven strategies.**Gulzoda et al.** explored methods to develop independent thinking in primary school students, emphasizing creativity, problem-solving, and a love for learning [21]. It highlights pedagogical approaches such as inquiry-based and project-based learning, mind mapping, and metacognitive training. By creating supportive environments and encouraging self-directed learning, students are empowered to take ownership of their education. These strategies help build lifelong skills necessary for both academic success and personal growth.**LEE et al.** examined a holistic educational approach in Australia, criticizing the overemphasis on the ATAR metric [22]. Based on a youth-led report, it

highlights that most students do not use their ATAR scores post-school, suggesting systemic misalignment. It emphasizes valuing diverse skills, experiences, and student agency. The role of Teacher Librarians in promoting inquiry-based learning and broad recognition of achievements is also discussed to support student-led educational journeys.**Aithal et al.** studied innovations in higher education, from policy reforms and pedagogical shifts to technological and stakeholder-driven changes [23]. Through a global analysis using various research frameworks and keyword-based data collection, it identifies trends and "super innovations" that redefine academic excellence. The paper emphasizes collaboration and institutional distinctiveness, proposing pathways to support transformative, inclusive, and future-ready higher education systems that break traditional academic boundaries.**Gamage et al.** emphasized the importance of aligning personal values with graduate attributes, promoting a balanced development of knowledge, skills, and character [24]. By integrating personal values into academic programs, institutions can produce graduates better equipped for societal challenges, supporting holistic development and enhancing overall academic success.**Sato et al.** examined the shift to online and distance learning during COVID-19, focusing on technological integration, student well-being, and teacher development [25]. It highlights innovative teaching strategies adopted to maintain engagement and inclusivity. The study underscores the importance of professional development and prioritizing mental health in digital classrooms. Insights from this period offer a blueprint for resilient, flexible, and student-centered educational frameworks in the post-pandemic era.Table 1 summarizes the comparison between proposed study and literature review studies in terms of findings, method, advantages, key-results, and limitations.Table 1. Comparative Table.

Study	Findings	Method	Advantages	Key Results	Limitations
This Study	Student-centered strategies improve independent thinking and academic success (21% improvement).	Quasi-experimental with pre/post-tests in Babylon high schools.	Clear empirical evidence; local context relevance.	Significant score gains; higher critical thinking skills.	Limited to three schools; context-specific.
Bhardwaj et al. [20]	Improved critical thinking, creativity, and research outputs among graduate science students.	Case study on course transformation.	Enhances research productivity; fosters autonomy.	More publications and improved engagement.	Single-course focus; limited generalizability.
Gulzoda et al. [21]	Strengthened creativity and problem-solving in primary students; promotes lifelong learning.	Pedagogical framework analysis.	Early intervention; builds foundational skills.	Increased student ownership and motivation.	No quantitative data; lacks longitudinal proof.
LEE et al. [22]	Need for holistic education valuing diverse skills beyond ATAR.	National report analysis.	Supports inclusive frameworks; promotes agency.	Majority do not use ATAR; policy recommendations.	Focused on one country; lacks empirical testing.
Aithal et al. [23]	Identified trends and "super innovations" reshaping higher education globally.	Systematic review and global analysis.	Comprehensive; offers strategic recommendations.	New pathways for institutional evolution.	Broad focus; lacks specific case evidence.

Gamage et al. [24]	Personal values crucial for learning approaches and success.	Conceptual and qualitative investigation.	Promotes holistic graduate development.	Better alignment with societal needs.	Theoretical; lacks quantitative measures.
Sato et al. [25]	Online learning transformation improved adaptability and inclusivity.	Review of global COVID-19 transition.	Highlights resilience; focuses on well-being.	Effective strategies for digital learning.	Pandemic-specific; may not fully translate post-crisis.

3. Methodology

This study initially relied on a quasi-experimental design in order to achieve the research objectives by measuring the effect of utilizing innovative teaching strategies on independent thinking and academic successful from different high-school students in Babylon city. The utilized sample consists of about (240) students from three different schools namely: Al-Farabi School, Al-Nahda School, and Al-Mustaqbal School. Students are at random set to two main groups: an experimental group which is received directive via active learners, projects, and sometimes inquiry, while a control group which is receiving instruction through traditional lecture-based method.

3.1 Participants and Sampling

The study involved (240) students from three different high-schools in Babylon city namely: Al-Farabi, Al-Nahda, and Al-Mustaqbal. The contributors are chosen based on appropriate random sampling in order to ensuring balanced general representations such as gender, age, and academic background.

3.1.1 Randomization and Group Matching

Students were allocated utilizing simple random sampling over student ID numbers. Each school's student record is stratifying for gender and academic level prior to random assignment in order to certify balance. Groups are matched on gender, grade level (10th grade), and preceding semester GPA. In cases that the rigid randomization wasn't practical because of school scheduling struggle, matched-pair assignment dependent on previous academic performance is utilized. These conditions sometimes a little restrict the generalizability of the findings further on Babylon high schools, see table 2.

Table 2. Sample Distribution by School.

School	Total Students	Control Group	Experimental Group
Al-Farabi	80	40	40
Al-Nahda	80	40	40
Al-Mustaqbal	80	40	40
Total	**240**	**120**	**120**

The variety combination of sampling students with two groups namely: control group and experimental group, ensuring the variety in instructional utilized approaches as shown in Table 3.

Table 3. Group Assignment.

Group	Description	Sample Size
Control	Traditional lecture-based teaching	120
Experimental	Student-centered, inquiry-based	120

In order to gives a powerful definition for the study's variables, summarizing the independent variable (it is referring to as teaching strategy) and the dependent variables (referring to as independent thinking and academic success) as shown in Table 4.**Table 4.** Study's variables definition

Variable	Type	Description
Teaching Strategy	Independent	Traditional or innovative methods used in teaching.
Independent Thinking	Dependent	Measured using standardized critical thinking tests.
Academic Success	Dependent	Measured by average exam scores and project performance.

3.1.2 Instruments and Validity The Cornell Critical Thinking Test is utilized in order to evaluate independent thinking. It is interpreted and adapted for Iraqi high-school context next back-translation procedures. Reliability for adapted version is established in a pilot study at (α = 0.84).Academic performance is computed utilizing a structured post-unit test and a project assessments rubric built through subject-matter experts. These implements are reviewed through a panel of local educators to content justifiability and fly with a part cohort (N=30), resulting α = 0.81 at test reliability. In this study, independent thinking is applied utilizing the Cornell Critical Thinking Test (CCTT), a standardized tool most supported for high school students. It computes analysis, inference, subtraction, and logic. The test's Cronbach's alpha is varied between (0.80 - 0.87) in related educational contexts. Academic success is computed through a combined score involving standardized exam results (60%) and computed project-based performance (40%) on scale of 100-point. The exam is altered from the Iraqi Ministry of Education's post-unit assessments, and project grading come after a rubric reviewed for content and construct defensibility.

3.2 Data Analysis

The data analysis in this study was performed on the studied sample through utilizing the following mathematical formulas:

A. Mean (Average) Score:

$$\underline{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$ (1)This formula is utilized in order to evaluate the average-scores for both groups before intervention and after intervention.

B. Standard Deviation:

$$S = \sqrt{\frac{\sum_{i=1}^{n} (X_i - \underline{X})^2}{n-1}}$$ (2)

This formula is utilized to evaluate the score variability inside (within) each group.

C. t-Test Statistic:

$$t = \frac{\underline{X}_1 - \underline{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$ (3)

This formula assesses whether the difference between both groups (i.e., control group and experimental group) which is statistically significant in the analysis phase.

D. Effect Size (Cohen's d):

$$d = \frac{\underline{X}_1 - \underline{X}_2}{S_p}$$ (4)

Where:

$$S_p = \sqrt{\frac{s_1^2 + s_2^2}{2}}$$

Formula (4) is used to evaluate the real effect of teaching strategy.

E. Improvement Rate:

$$I = \frac{PostTest - PreTest}{PreTest} \times 100\%$$ (5)

This formula is used to calculate the percentage enhancements in performance functionality.

3.3 Proposed Study Hypothesis

In order to define the proposed studied hypothesis, Table 5 presents the main utilized hypotheses in this study, establishing the expected relationship between the independent variable (teaching-strategy) and the dependent variables (outcomes).

Table 5. Proposed study hypothesis.

Hypothesis	Description
H1	Innovative strategies improve independent thinking.
H2	Innovative strategies improve academic success.

Table 6 presented same initial points for the built and studied groups, supporting fair comparisons post-intervention.

Table 6. Pre-test scores.

Group	Mean Score	Standard Deviation

Control	65	5.5
Experimental	66	5.3

Table 7 shows the experimental group's importance which is mainly higher post-test mean score based on the hypotheses.

Table 7. Post-test scores.

Group	Mean Score	Standard Deviation
Control	68	5.2
Experimental	80	4.8

The intervention expresses a total of 8 weeks, for students be given 4 class sessions per week, every lasting 45 minutes. in order to make sure stability over groups, the overall experimental instructors go through 2 days of training on the scheme of standardized student-centered teaching. Weekly observing and teaching logs are utilized in order to maintain instructional loyalty and decrease variation in delivery. Previously to guiding t-tests, assumptions are used to be checked. The Shapiro–Wilk test indicated the normality of score distributions in both groups ($p > .05$). While Levene's Test from Equality of Variances confirmed homogeneity of variances ($p > .05$), indicating the suitability of utilizing independent samples t-tests.

4. Results and Discussion Independent thinking scores are crucially higher in the experimental group than the control group, $t(238) = 5.45$, $p < .01$, $d = 1.20$. Academic success scores as well appeared a crucial difference, $t(238) = 6.10$, $p < .01$, $d = 1.40$., whereas large effect sizes (capacity) confirming rigid real-life impact as shown in Table 8.**Table 8.** t-Test analysis results.

Variable	*t*(df)	*p*-value	Effect Size (*d*)
Independent Thinking	5.45	< .01	1.20
Academic Success	6.10	< .01	1.40

Based on Cohen's (1988) thresholds, both impact sizes placed in the "large" impact category ($d > 0.8$), proposing a powerful and virtually significative effect on independent thinking and academic success as well. The experimental group performed higher score enhancements and significant improvements in critical thinking, indicating the effectiveness property based on innovative strategy(s) methods(s) as shown in Table 9.

Table 9. Result summary.

Finding	Control Group	Experimental Group
Improvement Rate (%)	4.6%	21.2%
Critical Thinking Improvement (pts)	+3	+14

To make a comprehensive comparison between both the pre-test scores and post-test scores, Figure 1 shows a clear gain in scores of the experimental group.

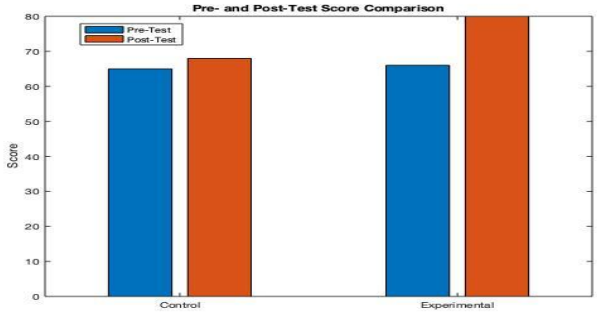

Figure 1. Comparison of Pre- and Post- test score comparison.

Figure 2 illustrating the percentage improvement, indicating the high progress performed utilizing innovative teaching strategy.

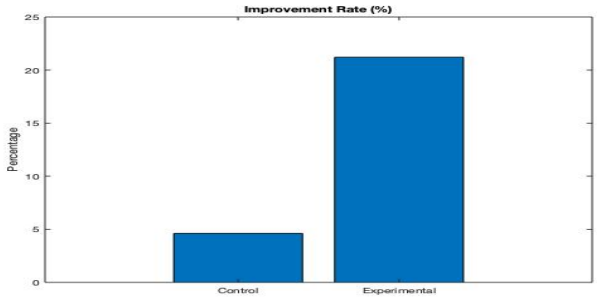

Figure 2. Improvement rate comparison between control and experimental groups.Figure 3 shows effect sizes, illustrating the substantial effect of the intervention on both studied built dependent variables.

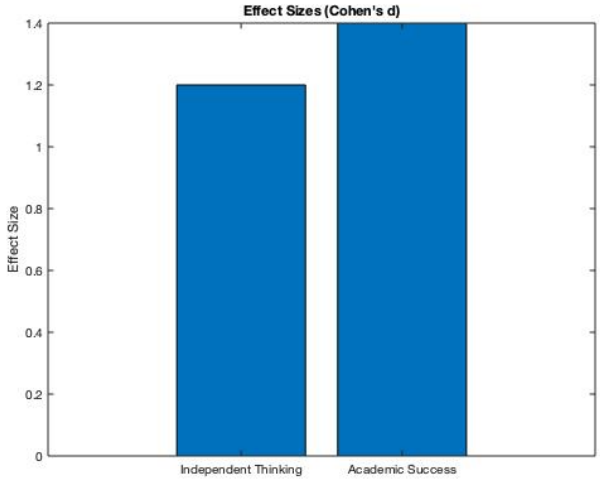

Figure 3. Effect size between independent and academic scores.

5. Conclusions and Recommendations

This study confirms that the student-centered, inquiry-based teaching strategies considerably enhance the independent-thinking and academic success from different high-school students located in Iraq / Babylon city. The key-results highlighted the demand for shift-away from the rigid, memorization-focused methods toward an additional connecting, reflective, and active learning situations. As a recommendation, the Ministry of Education in Iraq encourage the training facility and resource-allocation in order to give an effective support for teachers in achieving the studied strategies. Future research should extend to more than one city and different educational background levels in order to support and generalize and validate the findings in this study.

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