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The impact of design thinking on the learning of basketball and badminton

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ABSTRACT

This study investigated the impact of the design thinking strategy on students' acquisition, learning, and maintenance of basketball and badminton skills. Using an experimental method, researchers compared two groups: an experimental group (Group A) that utilized the design thinking strategy and a control group (Group C) that used traditional teaching. The sample consisted of 58 third-year students from the Faculty of Physical Education and Sports Sciences at Al-Mustaqbal University, representing both groups. The acquisition test, prepared by the researchers, covered comprehension, interpretation, and application of concepts. It followed the same lesson sequence as the control group. Pre-existing basketball and badminton skills tests from the Hilla College curriculum were used. Statistically significant differences were found between the experimental and control groups, with the experimental group outperforming the control group in both the acquisition ($p < 0.05$) and maintenance tests ($p < 0.05$). The design thinking strategy effectively enhances the acquisition and maintenance of basketball and badminton skills compared to traditional methods. It also increases student engagement by fostering active participation, discussions, and creative problem-solving.

KEYWORDS

Design Thinking; Basketball; Badminton; Students

1. INTRODUCTION

Teaching plays an important and prominent role in learning and acquiring knowledge and information. However, education in universities often remains focused on indoctrination and memorization, as confirmed by numerous studies and research across various scientific and humanities disciplines. Learning motor skills, such as those in mathematics, requires physical

capabilities and abilities from students. It also demands teaching methods, techniques, and strategies that align with students' abilities and potential.

Since teaching skills to students is one of the primary aims of education, it is necessary to move away from traditional methods and adopt alternative approaches that encourage critical thinking and self-learning. These methods allow students to better understand motor skills, grasp the mechanisms of movement, and accurately perform the steps involved in executing the skill. Design thinking strategies are examples of such teaching methods (Gravetter & Wallnau, 2017).

The learners' design thinking strategy is also characterized by its ability to combine empathy with the circumstances of a problem, creativity in generating visions and logical solutions, and the analysis and adaptation of these solutions based on the problem's circumstances. While the term "design thinking" has become common in modern design and engineering applications, its widespread use in business and management to describe a specific style of creative applied thinking is also increasingly influencing twenty-first-century culture across various branches of knowledge. (Abdel Aziz, 2013).

Basketball and badminton hold an important and prominent place in sports in general, and in physical education and sports science curricula in particular. Based on the researchers' modest experience as teachers, it was observed that the methods used by most teachers across various academic levels for teaching basketball and badminton skills often rely on the same traditional approaches, avoiding the use of diverse and alternative teaching methods. Therefore, this study aims to explore the impact of the design thinking strategy on students of the Faculty of Physical Education and Sports Sciences at Al-Mustaqbal University, specifically in acquiring, learning, and maintaining basketball and badminton skills. The research will focus on how this innovative teaching approach can enhance students' ability to acquire and retain these skills, highlighting the effectiveness of design thinking in promoting both initial skill development and long-term retention in these sports.

1.1. Study Hypothesis

H1: There are no statistically significant differences in learning basketball and badminton skills between students taught using the design thinking method and those taught using traditional methods.

2. METHODS

2.1. Study Design

The researchers used the experimental method with two groups (experimental and control), applying a post-test due to its suitability and the nature of the present research, as shown in Table 1. Table 1 appears to outline the structure and variables involved in the experimental study.

Table 1. Experimental design overview

Group	Parity	Independent variable	Dependent variable	Post test
Experimental	Age	**Design thinking**	Acquisition + Retention	Acquisition test + Retention test
Control	Previous information	**The method used**		

2.2. The research community and sample

The research population for this study consisted of third-year students from the Faculty of Physical Education and Sports Sciences at Al-Mustaqbal University, totaling 183 students distributed across four academic sections. The research sample was selected randomly from two of these sections (A and C) to represent the experimental and control groups. Section A was designated as the experimental group (which followed the design thinking strategy), and Section C as the control group (which followed the traditional teaching approach), with a total of 58 students representing both groups.

2.3. Equivalence of research groups

Equivalence between the two research groups was assessed based on variables such as age and previous knowledge of the skills test. The T-values calculated for the two independent samples indicated no statistically significant differences between the groups concerning these variables. The results are presented in the following table (Table 2).

Table 2. T-values for equivalence between experimental and control groups

Group	Parity	Calculated T value	Tabular (T) value	Significance
Experimental + **Control**	Age	0,02	1,98	Non-significant
	Previous Information Test	0,078	1,98	Non-significant

2.4. Controlling variables

Controlling internal variables is crucial in experimental research to ensure an acceptable degree of internal validity for the experimental design. To maintain the integrity of the experiment, non-experimental variables affecting the experiment were controlled, including incidents accompanying the experiment, experimental extinction, the measurement tool, maturity, and the effect of experimental procedures.

2.5. Means, tools, and devices used

2.5.1. Research Methods: The researchers employed the following methods and tools to collect data:

- Questionnaire
- Personal interviews
- Tests and measurements

2.5.2. Devices and Tools Used:

- Two training fields
- Two stopwatches
- Colorful chart bars for measuring ball and hammer throw distances
- Computer (Dell Core i7)

2.6. Field research procedures

2.6.1. Determining the scientific subject

The scientific subject that was taught to the students of the two groups was determined based on the academic vocabulary prescribed by the faculty. This included basketball and badminton skills, as well as other skills taught to the students.

2.6.2. Formulating objectives

The first task the researchers undertook when constructing the tests was to define the behavioral objectives, as shown in the following table (Table 3).

Table 3. Behavioral objectives defined for skill tests

Skills	Memorizing	Understanding	Application	Analysis	Installation	Test	Total
Technical steps for the skill of tapping	6	8	10	8	2	4	38
Technical steps for the thoracic handling skill							
Technical steps for the free throw skill							
Technical steps for the shuttlecock skill							
Technical steps for badminton backhand skills							

2.6.3. Teaching Plan

The teaching plan involves the teacher's preparation for various situations they may encounter, necessitating a comprehensive understanding of the academic subject to be taught. Accordingly, a set of teaching plans was developed to cover basketball and hammer throw skills. Each group had two plans per week, resulting in a total of 16 plans for each group, with two classes per week.

2.6.4. Preparing the acquisition test

The acquisition test was prepared by the researchers and included three main field: (comprehension of the concept, interpretation of information, and application of principles). Each field was given a set of teaching lessons in a manner consistent with the lessons in the control group and in sequence.

2.6.5. Selected basketball skills tests

The researchers used the tests for basketball skills and badminton skills that were prepared in advance within the curriculum and vocabulary of the faculty of Physical Education and Sports Sciences at Hilla College and applied them as they are within the curriculum.

2.6.6. Scientific transactions for tests

- **Validity:** Apparent validity was measured based on the opinions of experts and specialists in the sports field and specialization (learning, testing, measurement and teaching methods). It was found that the tests are valid in measuring what they were designed to measure based on the opinion of experts and specialists.
- **Reliability:** The researchers used the test and re-test method to find the reliability coefficient. The test was applied to the students and was repeated after a week and under the same conditions. It was calculated using the simple correlation law (Pearson) between the first and second tests. After conducting statistical treatment of the results, it was found that the value of (R) is (0.92), which is an acceptable correlation coefficient.
- **Objectivity:** To find the objectivity coefficient in the tests, the researchers used the method of finding the rank correlation coefficient (Spearman), and it turned out that the calculated (R) value is equal to (0.95), which is greater than the tabulated value, which is equal to (0.83), indicating that it has a high degree of objectivity.

2.7. The exploratory experience

The exploratory experiment was conducted by the researchers to verify the equipment and tools used and identify the time required to perform each activity skill.

2.8. Pre-tests

The researchers conducted pre-tests on November 23, 2022, to establish baseline data on the students' technical performance of skills before implementing the design thinking strategy. These pre-tests were conducted on the playgrounds of the Faculty of Physical Education at Al-Mustaqbal University College to assess the true role and impact of the strategy on learning basketball skills and the hammer throw.

2.9. The main experience of the training program

The main research experiment involved implementing the design thinking strategy within educational units over a period of 4 weeks, with 2 educational units per week. The program was conducted from November 28, 2022, to December 28, 2022.

2.10. Post-tests

After implementing the strategy within the educational program, the researchers conducted tests at the end of the program to determine the level of development in learning basketball and badminton skills. This aimed to assess the impact of the design thinking strategy on the technical performance of these skills for both the control and experimental groups. The statistical software (SPSS) was utilized to thoroughly analyze and interpret the quantitative results obtained from the tests.

3. RESULTS

3.1. Displaying the Acquisition Results

The researchers calculated the arithmetic mean and the t-value using a t-test for two independent samples to compare the results between the average scores of the two groups (experimental and control) in the acquisition test. It was noted that there were clear differences in the values of the arithmetic means and standard deviations for the experimental and control groups. The arithmetic mean for the experimental group was 40.45 with a standard deviation of 7.01, while the arithmetic mean for the control group was 37.6 with a standard deviation of 5.99 (Table 4).

It was also noted that the calculated t-value for the two groups was 3.90, which is greater than the tabulated t-value of 1.98 at a degree of freedom of 60 and a significance level of 0.05. This indicates statistically significant differences between the average scores of the experimental and control groups in favor of the experimental group in the acquisition test (Table 4).

The researchers also calculated the effect size of the independent variable on the dependent variable using the Eta squared (η2\eta^2η2). It was found that the effect size of 0.71 is an appropriate value to interpret the effect size and indicates a strong effect of the design thinking variable on acquiring basketball and badminton skills (Table 4) according to Cohen's guidelines (Tsai, 2000).

Table 4. Group statistics for acquisition test

Group	Mean	SD	*t*-value	df	*p*	*η2*
Experimental	40.45	7.01	3.9	60	0.05	0.71
Control	37.6	5.99				

3.2. Displaying the Maintenance Results

The researchers calculated the arithmetic mean and the t-value using a t-test for two independent samples to compare the results between the average scores of the two groups (experimental and control) in the maintenance test. The results revealed clear differences in the values of the arithmetic means and standard deviations for the experimental and control groups. Specifically, the arithmetic mean for the experimental group was 34.87 with a standard deviation of 5.51, while the arithmetic mean for the control group was 31.45 with a standard deviation of 3.79 (Table 5).

Additionally, the findings indicate that the calculated t-value for the two groups was 2.83, which is greater than the tabulated t-value of 1.98 at a degree of freedom of 60 and a significance level of 0.05. This demonstrates statistically significant differences between the average scores of the experimental and control groups in favor of the experimental group in the maintenance test (Table 5).

The study also assessed the effect size of the independent variable on the dependent variable using Eta squared (η2\eta^2η2). The effect size of 0.46 was found to be appropriate for interpreting a moderate effect size of the design thinking variable in retaining basketball and badminton skills. In contrast, the effect size for the traditional teaching method was 0.20, indicating a low effect size for the traditional method on the acquisition and maintenance of these skills (Table 5).

Table 5. Group statistics for maintenance test

Group	Mean	SD	t-value	df	p	η2 (Design Thinking)	η2 (Traditional Thinking)
Experimental	34.87	5.51	2.83	60	0.05	0.71	0.2
Control	31.45	3.79					

4. DISCUSSION

The results obtained in the current research showed statistically significant differences between the experimental and control groups ($p < 0.05$). The findings indicate the superiority of the design thinking strategy in acquiring and maintaining basketball and badminton skills compared to the traditional teaching method used by teachers. The researchers attribute this to the following reasons. The design thinking strategy is modern and has great importance in developing the conceptual formation of students, by creating design thinking for students between the previous concepts they have and perceptions about the new concept. This arouses student's curiosity and motivation to learn, solve this thinking, create psychological adaptation, and reach the scientific

concepts and principles behind it, so learning becomes meaningful and significant (Christensen et al., 2015; Ghanem, 2001).

Using design thinking allows students to gain insight into the relationship between concepts by providing perceptions that support the concepts, so they become more capable of solving problems (Magill, 1998). The use of design thinking has a major role in developing attitudes and modifying students' tendencies regarding learning basketball and badminton skills (Al-Ithawi, 2003; Gravetter & Wallnau, 2017).

5. CONCLUSIONS

The design thinking strategy is effective in increasing the acquisition of basketball and badminton skills, as demonstrated by the superiority of the experimental group over the control group, which followed the traditional teaching approach. Additionally, the design thinking strategy proved to be more effective in maintaining students' basketball and badminton skills compared to the traditional method of teaching.

Moreover, the design thinking strategy contributes to making students more engaged and effective by encouraging discussions and answering questions raised during lessons. It also plays a crucial role in positioning students at the center of the educational process, as it fosters their active participation in discussion and inquiry, promotes the search for optimal educational methods, and encourages the development and correct application of creative ideas.

6. RECOMMENDATIONS

Based on the results of our study, we recommend the following:

- Implementing the design thinking strategy in teaching basketball and badminton skills across different study levels.
- Informing basketball and athletics teachers in various universities about the findings of this research and the role of the design thinking strategy in acquiring and maintaining skills, particularly in basketball and badminton.
- Applying the design thinking strategy to all academic subjects within the College of Physical Education, recognizing its significant role in enhancing the acquisition and retention of information and skills across various disciplines.

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All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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