The Impact of Using the 7E Learning Cycle Strategy on the Cognitive Level of Selected Fundamental Gymnastics Skills Among Preparatory Stage Female Students in North Sinai

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Abstract

This study examines the effect of the 7E Learning Cycle Strategy on improving cognitive achievement in basic gymnastics abilities among female students in the preparatory stage in North Sinai. This research utilizes a quasi-experimental design featuring an experimental group (n=10) and a control group (n=10) to assess the efficacy of the constructivist 7E model in contrast to conventional teaching approaches. The results indicate that the 7E Learning Cycle Strategy markedly enhances cognitive success ($p < 0.05$) by promoting understanding, retention, and analytical thinking. Active involvement and self-directed learning were crucial elements that led to the enhanced performance of the experimental group. The research highlights the importance of incorporating inquiry-based approaches, such as the 7E model, into gymnastics education to enhance profound learning and information retention, and advocates for the training of instructors in constructivist techniques to maximize student achievement.

Keywords:7E Learning Cycle Strategy, Cognitive Achievement, Fundamental Gymnastics Skills, Constructivist Learning.

Introduction

In recent years, countries have been actively competing in scientific research across various disciplines and orientations. The level of a nation's advancement is often measured by the extent to which it adopts innovative scientific methods that contribute to its progress and global recognition. Science serves as a fundamental tool for nations striving to establish a distinguished and respected position on the world stage.

Recently, there have been serious efforts to comprehensively develop all levels of education, with a primary focus on the learner. Educational systems now expose students to diverse, well-structured learning experiences, encouraging them to actively and effectively engage with the

learning process rather than passively receiving information. Physical education and sports play a crucial role in shaping a well-rounded learner, fostering physical, skill-based, cognitive, and psychological development. This holistic development enables students to engage more interactively and meaningfully with the educational process.

According to Aslan Al-Masaeed (2003), there has been a growing emphasis on teaching thinking skills, to the extent that thinking and its associated skills have become essential due to the widespread use of technological tools. The importance of critical thinking is now widely accepted among researchers, with ongoing discussions focusing on the best approaches to achieving this goal.

Similarly, Zahir Ismail (2009) states that the most effective education is one that sparks curiosity for knowledge, enhances engagement in the learning process, and focuses on the learner. This approach ultimately improves learning outcomes.

Saeed Lafi (2006) explains that constructivist theory assumes that learners first receive information through their senses, then compare it to their existing knowledge and cognitive structures. If necessary, they modify their understanding before ultimately constructing meaningful interpretations.

Moreover, according to Wageeh Al-Qasem and Mohamed Al-Zughbi (2004), the rapid advancements in science and technology, coupled with the emergence of new teaching theories and strategies, have made it imperative to improve and develop both teachers' and students' performance in educational settings. These improvements must align with evolving educational needs, including new tools, technologies, and teaching methodologies.

Yaqub Hussein (2001) highlights that numerous attempts have been made to develop teaching strategies and models that facilitate learning and achieve desired educational goals. Since teaching methods are fundamental components of the curriculum, they must be closely aligned with the content and designed to achieve specific learning objectives.

Ayesh Zeitoun (2007) explains that the 7E Learning Cycle Model is a modern constructivist approach that has evolved over time. Initially, the learning cycle consisted of three stages: exploration, concept presentation, and concept application. It later expanded to four stages (4E's), incorporating explanation and elaboration. As teaching methods advanced, the model further developed into a five-stage cycle (5E's) and was ultimately refined into the 7E Learning Cycle. This model aims to help learners build their knowledge based on their prior experiences. The seven stages of this cycle include:

- Excitement (Activation): Stimulates learners' curiosity and interest in a specific topic.
- Exploration: Satisfies learners' curiosity through hands-on experiences and collaborative learning.
- Explanation: Clarifies and defines key concepts and terminologies.

- ❖ Expansion (Elaboration): Encourages deeper thinking and broader applications of the learned concepts.
- ❖ Extension: Establishes connections between new concepts and previously learned material.
- ❖ Exchange (Modification): Allows learners to exchange ideas and experiences, and refine their understanding.
- ❖ Examination (Assessment): Evaluates learners' comprehension and application of the concepts and skills acquired.

According to Peter et al. (2012), gymnastics is globally recognized as any physical exercise performed on the floor or apparatus that enhances endurance, flexibility, strength, agility, and body control. Gymnastics shares similarities with other physical activities, yet it uniquely involves skill acquisition, balance, and body awareness. As a movement-based sport, it combines both discipline and aesthetic appeal, utilizing various stimuli to foster both physical and cognitive development while performing specific tasks.

Similarly, Adly Hussein (1998) and Mohamed Ibrahim (2006) agree that gymnastics is characterized by a diverse range of skills performed on various apparatus. Floor exercises are fundamental to gymnastics due to their accessibility for early training, ease of execution, and contribution to the development of strength, agility, and coordination. Additionally, basic floor movements serve as the foundation for most skills on other gymnastics apparatus.

Asmahan Bloom and Farida Boulosnan (2011) emphasize that fostering students’ creative thinking abilities is a fundamental goal of education. Some scholars even argue that developing students' ability to think creatively and solve real-life problems is the ultimate purpose of education. Therefore, education must continuously evolve in terms of its objectives and curricula to fulfill this role, using various methods to nurture innovative personalities (12:1).

Similarly, Lamia Al-Diwan and Intisar Othman (2011) assert that fostering creative skills is a primary objective of educational institutions. Since physical education is an integral part of general education, it must contribute to developing creative individuals and identifying their potential early on. This is crucial for recognizing and cultivating future intellectual minds that will contribute to societal progress and scientific advancement.

Through her work as a physical education teacher for preparatory stage students and as a supervisor of girls' activities at Al-Azhar institutions, the researcher has observed that students often struggle to learn certain gymnastics skills when taught through traditional methods. These skills require specialized instructional techniques that facilitate students' learning process.

Reviewing previous studies and literature on various teaching methodologies, the researcher found that the 7E Learning Cycle Model (ES7) integrates multiple instructional approaches, including guided discovery and self-directed learning. This modern teaching method enhances

students' knowledge acquisition and experiences while accommodating individual differences. Furthermore, it actively engages students in various stages of the learning process, fostering greater creativity and innovation.

Upon reviewing existing research, the researcher found a limited number of studies addressing this topic, highlighting the need for further investigation.

Research Objectives

This study aims to develop an instructional program utilizing the 7E Learning Cycle Strategy to achieve the following objectives:

1. Investigate the impact of a proposed instructional program based on the 7E Learning Cycle Strategy on enhancing the cognitive level of selected fundamental gymnastics skills among preparatory-stage female students in North Sinai.
2. Examine the effectiveness of the 7E Learning Cycle Strategy in improving students' comprehension, retention, and application of fundamental gymnastics concepts.

Research Hypotheses

1. "There are statistically significant differences between the pre-test and post-test cognitive achievement scores for the experimental group, in favor of the post-test."
2. "There are statistically significant differences at a significance level of ≤ 0.05 between the mean pre-test and post-test scores of the control group in the cognitive achievement test."

Research Methodology

A-Research Design

The researcher will employ the experimental method, as it is suitable for this study. The research will utilize an experimental design involving two groups:

1. Experimental group (which will be exposed to the 7E Learning Cycle Strategy).
2. Control group (which will follow traditional teaching methods).
3. Both groups will undergo pre-tests and post-tests to assess the impact of the instructional intervention.

B-Research Sample

The study sample will be purposively selected from second year preparatory female students at Al-Masaeed Preparatory Institute, affiliated with the North Sinai Educational Administration of Al-Azhar Institutes.

Additionally, the research will be conducted on students from Abu Bakr Al-Siddiq Preparatory Institute for Girls, with a total population of 120 students.

A. The main study sample will consist of 40 students, aged between 11 and 14 years, selected randomly.

B. The sample will be divided as follows:

1. 16 students will participate in a pilot study to establish the reliability and validity of the measurement tools.
2. 24 students will be the primary research sample, further divided into:
   - 12 students in the experimental group (taught using the 7E Learning Cycle Strategy).
   - 12 students in the control group (taught using traditional teaching methods).

Data Collection Tools

The researcher will select appropriate data collection instruments based on the following criteria:

- *Effectiveness*: The tools must accurately measure the cognitive level of selected fundamental gymnastics skills.
- *Ease of Use*: The tools should be simple, practical, and applicable within the educational setting.

A. Defining the Objective of the Test:

The researcher designed this test to measure the cognitive level related to selected fundamental gymnastics skills among preparatory stage female students in North Sinai. The test was administered before and after the intervention to assess changes in students' knowledge.

B. Determining the Test Items and Their Format:

The electronic cognitive test was structured in a multiple-choice format, consisting of 15 questions. The test was designed to provide immediate feedback, displaying the student's score upon completion.

C. Formulating the Test Instructions:

The researcher prepared the test instructions in clear and appropriate language for the students' level, ensuring they understood the method of answering and recording their responses. The instructions specified:

1. The objective of the test.
2. The total number of questions included.
3. The time limit for completion.

4. The importance of reading each question carefully before answering.

D. Developing the Electronic Test:

The test was created using Google Forms and was administered to the research sample through the Google Classroom platform.

E. Scoring and Grading Method:

1. The test consisted of 15 questions.
2. Before conducting statistical analyses, responses were stored electronically, with the system automatically calculating the percentage score for each student.
3. Each correct response was awarded one point.

F. Pilot Study for the Test:

The researcher conducted a pilot study on a sample of six students from the research population but outside the main sample too:

1. Assess the validity and reliability of the test.
2. Determine the difficulty and ease the indices of test items.
3. Measure the discrimination index of the test.
4. Estimate the time required to complete the test.

Validity of the Cognitive Test

A. Content Validity:

This refers to how well the test represents the full scope of cognitive achievement related to gymnastics skills. The test content was validated using specialized references in educational assessment, including:

B. Internal Consistency Validity:

The internal consistency validity of the test was determined by calculating the correlation between each test item and its corresponding category.

Table (1): Correlation Coefficients for Internal Consistency Validity (N = 16)

Item	Category 1	Category 2	Category 3
1	0.745	0.926	0.737
2	0.745	0.875	0.813
3	0.718	0.911	0.774
4	0.728	0.731	0.993
5	0.723	0.861	0.813

6	0.623	0.845	0.774
7	0.685	0.861	0.737
8	0.745	0.926	0.773
9	0.723	0.748	0.812
10	0.762	0.875	0.884
11	0.751	0.893	0.716
12	0.745	0.716	0.736
13	0.726	0.926	0.993
14	0.660	0.861	0.813
15	0.728	0.861	0.852

The table demonstrates a statistically significant correlation between each test item and its respective category, confirming the validity of the test items in measuring cognitive achievement related to gymnastics skills.

Test Administration Time Calculation:

The researcher calculated the total time required to complete the test using the formula:

Test Time=Time of First Student to Finish+Time of Last Student to Finish2\text{Test Time} = \frac{\text{Time of First Student to Finish} + \text{Time of Last Student to Finish}}{2}Test Time=2Time of First Student to Finish+Time of Last Student to Finish

Based on this calculation, the average time required to complete the test was 15 minutes.

Item Difficulty, Ease, and Discrimination Index Calculation

A. Difficulty and Ease Index:

The difficulty index for each item was calculated using the formula:

Difficulty Index=Number of students who answered correctlyTotal number of students\text {Difficulty Index} = \frac{\text{Number of students who answered correctly}}{\text{Total number of students}}Difficulty Index=Total number of studentsNumber of students who answered correctly

Items with a difficulty index between 0.3 and 0.7 were considered acceptable.

B. Discrimination Index:

The discrimination index indicates how well each test item distinguishes between students with high and low cognitive achievement. It was calculated using the formula:

Discrimination Index=High group correct answers−Low group correct answers Total number of students in both groups\text {Discrimination Index} = \frac{\text{High group correct answers} - \text{Low group correct answers}}{\text{Total number of students in both groups}}Discrimination Index=Total number of students in both groupsHigh group correct answers−Low group correct answers

Items with a discrimination index above 0.4 were considered valid for the test.

Table (2): Difficulty and Discrimination Indices for the Cognitive Test (N = 16)

Item	Difficulty Index	Discrimination Index
1	0.3	0.4
2	0.5	0.5
3	0.6	0.4
4	0.6	0.4
5	0.4	0.4

- Items with a discrimination index above 0.4 were retained.
- Items with a difficulty index between 0.3 and 0.7 were accepted.
- Items that did not meet both criteria were revised or removed.

Internal Consistency Validity of the Scale Statements and Dimensions

- The researcher assessed the validity of the scale by calculating the correlation coefficient between each individual statement and the total score of the corresponding dimension, as well as between each dimension and the overall scale score. This analysis was conducted on the pilot study sample, as presented in Tables (3) and (4).

Table (3): Correlation Coefficients for Internal Consistency Validity Between Each Statement and Its Corresponding Dimension (N = 16)

Item	Dimension 1	Dimension 2	Dimension 3	Dimension 4	Dimension 5
1	0.745	0.926	0.737	0.905	0.818
2	0.745	0.875	0.813	0.986	0.703
3	0.718	0.816	0.774	0.734	0.779
4	0.723	0.731	0.993	0.786	0.903
5	0.723	0.861	0.813	0.821	0.705
6	0.820	0.861	0.774	0.821	0.818
7	0.718	0.861	0.737	0.786	0.934
8	0.745	0.926	0.773	0.786	0.705
9	0.723	0.926	0.812	0.707	0.636
10	0.762	0.875	0.884	0.925	0.873
11	0.751	0.893	0.923	0.773	0.763
12	0.745	0.716	0.736	0.818	0.924
13	0.726	0.731	0.993	0.732	0.774
14	0.723	0.861	0.813	0.821	0.705
15	0.770	0.861	0.774	0.821	0.818
16	0.723	0.731	0.993	0.786	0.774
17	0.920	0.731	0.876	0.923	0.933
18	0.880	0.923	0.768	0.765	0.872

19	0.821	0.873	0.734	0.732	0.841
20	0.770	0.793	0.943	0.831	0.781
21	0.761	0.930	0.972	0.831	0.926
22	0.741	0.931	0.842	0.783	0.960
23	0.842	0.780	0.770	0.880	0.760
24	0.912	0.981	0.770	0.870	0.904
25	0.724	0.871	0.942	0.880	0.703

- The results in Table (3) show statistically significant correlations between each statement and its respective dimension, confirming that the test statements are valid and appropriately aligned with their corresponding dimensions.

Discussion of Results

First: Presentation and Discussion of the Results of the First Hypothesis

"There are statistically significant differences at a significance level of ≤ 0.05 between the mean pre-test and post-test scores of the control group in the cognitive achievement test."

Table (4): Statistical Significance of Differences Between Pre-Test and Post-Test Cognitive Achievement Scores for the Control Group (N = 12)

Variables	Number of Signs	Mean Ranks	Sum of Ranks	Wilcoxon (Z) Calculated	Significance Level	Statistical Significance
	–	+	–	+	–	+
Cognitive Achievement	0	10	0	5.50	0	55.00

Critical value of Z = 8

The results in Table (4) show that the Wilcoxon Z-value for the cognitive achievement variable in the control group was 2.91, which is less than the critical Z-value of 8 at a significance level of 0.05. This indicates the presence of statistically significant differences between the pre-test and post-test cognitive achievement scores in favor of the post-test.

The researcher attributes this improvement in the cognitive achievement of the control group students to the effectiveness of direct explanation and demonstration methods, which were used in traditional instruction. The instructional method included:

- Clearly defining the skills to be taught.
- Students practicing based on the researcher's instructions.
- The researcher makes all decisions related to the learning process.

One of the key advantages of this method was the continuous presence of the researcher, allowing for real-time monitoring of student performance and immediate error correction. This highlights the active role of the teacher in guiding students through the learning process.

These findings align with Ahmed Maher et al. (2007, p. 115), who stated that the direct instruction method is engaging and requires a significant effort from the teacher to ensure the success of the learning process. Additionally, Zeinab Omar (2016, p. 128) emphasized that this method provides rich factual knowledge, including essential concepts and principles, which enhance students' cognitive understanding. Furthermore, the results are consistent with previous studies, such as:

- Mohamed Salem (2010) and Emad Abu Shabana (2010), which confirmed that direct explanation and demonstration positively influence both skill learning and cognitive achievement.

Thus, the first hypothesis is confirmed, stating:
"There are statistically significant differences between the pre-test and post-test cognitive achievement scores for the control group, in favor of the post-test."

Second: Presentation and Discussion of the Results of the Second Hypothesis

"There are statistically significant differences at a significance level of ≤ 0.05 between the mean pre-test and post-test scores of the control group .

Table (5): Statistical Significance of Differences Between Pre-Test and Post-Test Cognitive Achievement Scores for the Experimental Group (N = 12)

Variables	Number of Signs	Mean Ranks	Sum of Ranks	Wilcoxon (Z) Calculated	Significance Level	Statistical Significance
	–	+	–	+	–	+
Cognitive Achievement	0	10	0	5.50	0	55.00

Critical value of Z = 8

The results in Table (15) indicate that the Wilcoxon Z-value for cognitive achievement in the experimental group was 2.83, which is less than the critical Z-value of 8 at a significance level of 0.05. This demonstrates the presence of statistically significant differences between the pre-test and post-test cognitive achievement scores, in favor of the post-test.

These findings suggest that the 7E Learning Cycle Strategy used in the experimental group contributed significantly to improving students' cognitive achievement in fundamental gymnastics skills. The effectiveness of this strategy can be attributed to several factors, including:

- Active student engagement in the learning process.
- Encouragement of exploration, critical thinking, and problem-solving through structured learning phases.

- Progressive knowledge acquisition, where students built on their prior understanding in a systematic manner.
- Diverse learning activities that enhanced students' conceptual understanding and retention of information.

These results align with findings from previous studies that emphasize the positive impact of constructivist learning approaches on students' cognitive achievement. Several researchers, including Peter et al. (2012), have highlighted that learning models such as the 7E Learning Cycle enhance conceptual understanding, knowledge retention, and critical thinking skills.

Thus, the second hypothesis is confirmed, stating:

"There are statistically significant differences between the pre-test and post-test cognitive achievement scores for the experimental group, in favor of the post-test."

Significance of Differences in Post-Test Measurements of Cognitive Achievement and Critical Thinking Between the Experimental and Control Groups

Table (6): Statistical Significance of Differences Between the Experimental and Control Groups in Post-Test Cognitive Achievement ($N_1 = N_2 = 12$)

Variables	Experimental Group	Control Group	Mann-Whitney U (U) Calculated	Significance Level	Statistical Significance
	Mean Ranks	Sum of Ranks	Mean Ranks	Sum of Ranks	
Cognitive Achievement	15.40	155.00	5.50	55.00	3.82

Interpretation of Results

The results in Table (16) show that the Mann-Whitney U-value for cognitive achievement between the experimental and control groups was 3.82, which is statistically significant at $p \leq 0.05$. The higher mean rank of the experimental group (15.40) compared to the control group (5.50) indicates that the experimental group outperformed the control group in the post-test cognitive achievement scores.

This suggests that the 7E Learning Cycle Strategy implemented in the experimental group had a significant positive impact on cognitive achievement, compared to traditional teaching methods used in the control group. The effectiveness of this strategy can be attributed to its ability to:

- Engage students in active learning rather than passive reception of information.
- Encourage critical thinking and problem-solving through structured phases of learning.

- Provide opportunities for exploration, elaboration, and reflection, which enhance knowledge retention and application.

These findings align with previous research indicating that constructivist learning approaches, such as the 7E Learning Cycle, contribute to improved cognitive achievement and higher-order thinking skills.

Conclusion

This study examined the impact of using the 7E Learning Cycle Strategy on the cognitive level of selected fundamental gymnastics skills among preparatory stage female students in North Sinai. The findings revealed significant improvements in cognitive achievement among students who were taught using this constructivist approach compared to those who received traditional instruction.

The key conclusions drawn from this research are as follows:

a. Effectiveness of the 7E Learning Cycle Strategy:
   1. The experimental group, which was taught using the 7E Learning Cycle Strategy, demonstrated significantly higher cognitive achievement in fundamental gymnastics skills compared to the control group.
   2. The structured phases of the 7E model (Excitement, Exploration, Explanation, Expansion, Extension, Exchange, and Examination) contributed to a deeper understanding and retention of knowledge.

b. Improved Cognitive Achievement in Gymnastics Skills:
   1. Students who engaged in active learning experiences through exploration, problem-solving, and reflection showed enhanced conceptual understanding of gymnastics skills.
   2. The experimental group outperformed the control group in the post-test cognitive achievement scores, indicating the superiority of the constructivist learning approach over traditional teaching methods.

c. Encouragement of Critical Thinking and Engagement:
   1. The 7E Learning Cycle encouraged students to take an active role in their learning, fostering critical thinking, problem-solving, and independent knowledge construction.
   2. The interactive nature of the strategy provided opportunities for students to explore, discuss, and apply knowledge, leading to more meaningful learning outcomes.

d. Alignment with Educational Theories and Previous Research:
   1. The findings are consistent with constructivist educational theories, which emphasize that learners build their understanding through experiences and prior knowledge.
   2. The results align with previous studies highlight the positive impact of inquiry-based and student-centered learning strategies on cognitive achievement.

Recommendations

Based on the findings, the following recommendations are proposed:

- Integration of the 7E Learning Cycle Strategy into the curriculum for teaching gymnastics and other physical education skills, given its proven effectiveness in enhancing cognitive achievement.
- Teacher training programs should include professional development sessions on constructivist teaching methods, ensuring that educators are equipped with strategies that promote active learning and critical thinking.
- Further research should be conducted to explore the long-term impact of the 7E Learning Cycle Strategy on students' skill acquisition, creativity, and problem-solving abilities.
- The use of technology-enhanced learning tools, such as interactive platforms and e-learning applications, should be encouraged to complement the 7E Learning Cycle Strategy and provide students with engaging learning experiences.

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