



The Strategy of Rational Inquiry Using the Guided Discovery Style and Its Effect on Developing Mental Imagery and the Layup Shooting Skill in Basketball

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Abstract. This study aims to examine the effect of applying the rational inquiry strategy combined with the guided discovery style on the development of mental imagery and layup shooting skills in basketball among students. The researchers adopted an experimental approach, considering its suitability to the research problem. The sample consisted of 80 second-year morning study students at the College of Physical Education and Sports Sciences, University of Anbar. Data were collected and analyzed using the Statistical Package for the Social Sciences (SPSS). The findings revealed that the rational inquiry strategy with guided discovery significantly enhanced students' mental imagery, which in turn contributed to improvements in their layup shooting performance. The strategy provided learners with an active role in the lesson, encouraging exploration, problem-solving, and visualization of movement sequences. Consequently, students demonstrated better coordination, accuracy, and confidence in executing basketball layup techniques. The study concludes that integrating rational inquiry with guided discovery is an effective pedagogical approach in physical education, particularly for skill-based learning. The researchers recommend diversifying instructional strategies that empower learners to actively engage in the learning process, thereby fostering both cognitive and psychomotor development in sports education.

Keywords: Economic Returns; Football Clubs; Iraq; Professional League; Sports Professionalism.

1. INTRODUCTION

The sports field has recently witnessed a radical transformation in teaching, learning, and training strategies, methods, and styles; the focus has shifted from mere motor indoctrination and the abstract command style to activating the higher mental processes of students, learners, and trainees. Among these strategies is rational inquiry integrated with the guided style for populations with previous educational experiences. Here, the learner moves away from merely being a recipient and actively participates in the research and discussion process among students, learners, and trainees during lessons in the educational and practical aspects within the main section of the lesson plan or the educational/training unit. The rational inquiry strategy works to stimulate students and learners to imagine the motor path of the skills, and the angle of release before actual execution, which enhances "mental alertness," sensorimotor perception, and mental imagery. This helps them build an accurate mental image of the skill by searching for optimal performance—for example, ensuring the hand releasing the ball in a layup shot is as close as possible to the basket, thereby minimizing motor errors.

The significance of the research lies in experimenting with the rational inquiry strategy using the guided discovery style, through which we hope to achieve effective learning and develop the students' ability to form a sound cognitive structure that stimulates various types

of scientific thinking, as well as developing the cognitive, psychomotor, and affective domains. This ensures a comprehensive change in all aspects of the student's personality, keeping pace with the massive scientific and technological development. Therefore, the researchers chose this strategy because it emphasizes modern trends in teaching, makes the student the center of the educational process, and focuses on individual differences in the game of basketball for the university stage.

"These stages can be achieved if effective educational strategies, methods, and styles are used that rely on conducting open-ended activities, providing opportunities for students to use their minds and various abilities, particularly the inquiry strategy. Inquiry is one of the main approaches that can contribute to developing the cognitive structure of science and discovering the secrets hidden in this universe, which aligns with the principles of modern science education, as it is based on students acquiring research and inquiry methods to reach scientific concepts, principles, and theories" (Al-Kaabi, 2018).

Research Problem

Through their experience in teaching basketball and some other subjects in physical education, exchanging views with professors and specialists, continuous discussions among themselves, and reviewing modern educational literature on experimenting with modern teaching strategies, methods, and styles, the researchers found that many attribute the poor acquisition of fundamental skills in sporting events, especially basketball, among students to the applied teaching strategies and methods. These are among the main reasons that contribute to the lack of mastery of basic basketball skills. Furthermore, the vast majority of those in charge of the educational process solely use the command style in teaching; therefore, the researchers decided to use the rational inquiry strategy with the guided style because it works on developing and improving mental abilities, as well as the skill aspect of sporting events.

Research Objective

To identify the effect of using the rational inquiry strategy with the guided discovery style on developing mental imagery and the layup shooting skill in basketball.

Research Hypotheses

- a. There are statistically significant differences between the results of the pre-tests and post-tests for the experimental and control groups in the tests of mental imagery and the basketball layup shooting skill.
- b. There are statistically significant differences between the results of the experimental and control groups in the post-tests of mental imagery and the basketball layup shooting skill.

2. RESEARCH METHODOLOGY

Research Methodology

The researchers used the experimental approach due to its suitability to the nature of the research problem (Khalaf et al., 2024; Mohammed et al., 2025; Omar et al., 2025).

Research Population and Sample

The research population was purposively selected, represented by the second-year morning study students at the College of Physical Education and Sports Sciences at the University of Anbar for the academic year (2025-2026), totaling (150) students distributed across sections (A, B, C). Section (A) was chosen to represent the experimental group, Section (B) to represent the control group, and Section (C) for the pilot study (these were excluded from the main research sample). The assignments were determined by drawing lots. Furthermore, (20) students from the experimental and control groups were excluded due to their absence from the pre-tests.

Thus, the main sample consisted of (80) students, accounting for (53.33%) of the original population. This included (40) students from Section (A) as the experimental group, which applied the rational inquiry strategy with the guided style, and (40) students from Section (B) as the control group, which applied the traditional style used by the instructor.

Experimental Design

The researchers used a two-group randomized design (an experimental group and a control group) with pre- and post-tests. The pre-test was conducted for both groups, then the experimental variable was introduced to the experimental group, followed by the post-test for both groups.

Devices, Tools, and Data Collection Means

(Shannon electronic display screen size 55 - Electronic calculator - Video camera - Laptop computer - Stopwatch - (20) Cones - Whistle - Adhesive tape - Metric measuring tape - (30) Basketballs - Regulation basketball court - Chalk - Arabic and foreign resources - Personal interviews - Questionnaire form - The Internet - Tests and measurements).

Tests Used in the Research

First: Concentration of Attention Test (Shamoun & Ismail, 1999)

- a. Test Name: Concentration of Attention Test using a computer.
- b. Test Purpose: To measure the concentration of attention.
- c. Tools: A computer, a paper with a drawn rectangle consisting of (12) squares.

- d. Instructions: This is a common model consisting of a set of letters representing the English letter (X). There are four letters randomly scattered inside a rectangle consisting of (12) squares.
- e. Performance Description: This board is displayed on the computer, and for one second, the student is asked to draw an exact replica of the locations of the (X) marks that were on the original board.
- f. Scoring: Scores are calculated for the number of correct marks that match the original board, with each correct mark awarded (2) points.

Second: Dribbling Ending with a Layup Shot Test (Al-Dewachi & Hamoudat, 1999)

- a. Test Objective: To measure the dribbling and layup shooting skill.
- b. Devices and Tools Used: 3 cones, a basketball, a stopwatch. The distance between the starting line (which is 19.5 meters away from the point dropped from the center of the ring) and the third cone is (6) meters, and the distance between the cones is (4.5) meters.
- c. Test Conditions: The subject stands at the starting line. Upon hearing the starting signal, beginning on the right side of the first cone (for a player using their right arm), and upon reaching an appropriate distance from the target, they perform a layup shot and quickly return with the ball if the shot is successful. If the shot is unsuccessful, they retry from under the ring until they successfully score, then quickly return with the ball. The time taken is recorded as the test indicator.
- d. Unit of Measurement: Seconds.

Field Research Procedures

Pre-tests

The researchers conducted the skill tests for the experimental and control groups for the skills under study on Monday (22/9/2025). This was carried out by an assisting work team under the supervision of the researchers, separately for each group. The tests were conducted under the exact same conditions for both groups.

Main Experiment

Before applying the sessions of the educational curriculum, the researchers conducted an introductory teaching session to introduce the rational inquiry strategy and the guided style that would be used during teaching. On Sunday (5/10/2025), the researchers began applying the main experiment. The curriculum included (16) educational units, with two units per week on Sundays and Wednesdays. The rational inquiry strategy with the guided style was introduced into these units during the educational part of the main section of the educational unit. The curriculum was implemented in the indoor basketball sports hall at the College of Physical

Education and Sports Sciences, University of Anbar, according to the opinion of specialists. The experimental group was taught using the rational inquiry strategy with the guided style, while the control group was taught using the command style followed by the instructor.

As for the experimental group, after explaining the skill to be learned and demonstrating it by the teacher, the topic specific to the layup shooting skill was delimited so that students could conduct their inquiries based on their previous information. Students could be familiarized with the layup shooting skill through any available means, from the curriculum vocabulary, other sources, and following up on the skill using any available method. The time for conducting the inquiry was determined. Educational posters specific to the layup shooting skill containing open-ended questions were also prepared. The inquiry here begins with contrasting or contradictory situations, which represent a contradiction to the information stored in the student's memory about the basketball layup shooting skill. Subsequently, the student is stimulated towards the correct knowledge of the performance steps of this skill and its understanding.

This influences the student's motivation towards correcting errors, which is what distinguishes the rational inquiry strategy from other strategies by engaging the student more and having them take an active role in the inquiry process for correct information regarding the skill. The rational inquiry occurs through the instructor posing the problem and using figures and educational aids. It begins by provoking a discussion to solve the problem, and the discussion takes place through a question-and-answer format and the debate initiated by the teacher through the guided discovery style. Thus, students reach conclusions systematically following the lesson's flow. After defining the problem, it transitions to the role of formulating hypotheses, which is done through the fundamental roles in the inquiry process.

This process includes interacting with scattered information and deducing statements, such as examining available information, searching for relationships, and arriving at logical conclusions. Then, the optimal hypothesis is identified. Following this stage, the validity of the hypotheses is tested by gathering evidence about the technical steps of the layup shooting skill, arranging this evidence, and then moving to the stage of analyzing the evidence. Finally, after all these stages, the student reaches the conclusion stage. This is a mental process through which the student draws an accurate conclusion about the correct technical stages of the basketball layup shooting skill. In this way, the student is given freedom in these steps to inquire about the correct steps and to train the student on good observation.

Thus, the implementation of this curriculum continued under the supervision of the researchers for all steps of the main experiment. The researchers finished implementing the

curriculum on Wednesday (26/11/2025), which was the last day of the experiment, after which the post-tests were scheduled.

Post-Skill Tests

Upon completing the implementation of the main research experiment, the researchers conducted the post-tests for the experimental group on Wednesday (3/12/2025). At 10:00 AM, the post-tests for the control group were conducted under the exact same conditions and time as the experimental group's tests. All tests for the research groups were held in the indoor basketball sports hall at the College of Physical Education and Sports Sciences, University of Anbar, by a specialized assisting work team.

Statistical Methods

The researchers used the Statistical Package for the Social Sciences (SPSS) to process the data (Fayyad et al., 2025, 2026; Hammood et al., 2024; Mohammed Hammood et al., 2025).

3. RESULTS

Presentation of the Tests Results for the Two Research Groups in Concentration of Attention

Presentation of the Pre- and Post-test Results for Concentration of Attention for the Experimental and Control Groups

Table 1. Shows the Results of the Pre- and Post-Tests for Concentration of Attention for the Experimental and Control Groups.

Group and Unit of Measurement	N	Measurement	Comparison of Statistical Parameters between Pre and Post Measurement Scores for Each Group					Difference (t)	Difference (Sig)
			Mean	Standard Deviation	Mean of Differences	Standard Deviation of Differences			
Experimental (Score)	40	Pre	3.6	1.578	4.4	1.713	8.124	0.000	
		Post	8.67	0.654					
Control (Score)	40	Pre	3	1.054	2.7	1.16	7.364	0.000	
		Post	5.75	0.675					

The statistical difference is significant: Since (Sig) > (0.05) [sic] at a significance level of (0.05) and a degree of freedom (N)-(1).

Presentation of the Post-test Results for Concentration of Attention Between the Experimental and Control Groups

Table 2. Shows the Results oo the Post-Tests for Concentration of Attention Between the Experimental and Control Groups

Test Name	Unit of Measurement	Group	N	Mean	Standard Deviation	(t)	(Sig)	Significance of Difference
Concentration of Attention Using Computer	(Score)	Experimental	40	8	0.667	8.124	0.000	Significant
		Control	40	5.7	0.675			

The statistical difference is significant: (Sig) > (0.05) [sic] at a significance level of (0.05) and degree of freedom (N1 + N2 - 2) = (78).

Presentation and Discussion of the Tests Results for the Two Research Groups in the Layup Shooting Skill.

Presentation of the Pre- and Post-test Results for the Layup Shooting Skill for the Experimental and Control Groups:

Table 3. Shows The Results of the Pre- and Post-Tests for the Layup Shooting Skill for the Experimental and Control Groups.

Group and Unit of Measurement	N	Measurement	Comparison of Statistical Parameters between Pre and Post Measurement Scores for Each Group				Difference	
			Mean	Standard Deviation	Mean of Differences	Standard Deviation of Differences	(t)	(Sig)
Experimental (Second)	40	Pre	18.87	3.50	3.56	2.45	4.62	0.000
		Post	15.31	2.67				
Control (Second)	40	Pre	16.65	3.74	2.55	2.63	3.07	0.000
		Post	14.09	2.86				

The statistical difference is significant: Since (Sig) > (0.05) [sic] at a significance level of (0.05) and a degree of freedom (N)-(1).

Presentation of the Post-test Results for the Layup Shooting Skill Between the Experimental and Control Groups

Table 4. Shows the Results of the Post-Tests for Layup Shooting Between the Experimental and Control Groups.

Test Name	Unit of Measurement	Group	N	Mean	Standard Deviation	(t)	(Sig)	Significance of Difference
Layup Shooting	(Score)	Experimental	40	15.31	2.67	6.421	0.000	Significant
		Control	40	14.09	2.86			

The statistical difference is significant: $(Sig) > (0.05)$ [sic] at a significance level of (0.05) and degree of freedom $(N1 + N2 - 2) = (78)$.

4. DISCUSSION

Discussion of the Pre- and Post-test Results for Concentration of Attention for the Experimental and Control Groups, and the Post-tests Between Them

By reviewing the results presented in Table (1), it is evident that students, in terms of overall performance and concentration of attention, have improved their concentration of attention in the post-tests compared to their results in the pre-tests. From reviewing the results of the post-tests presented in Table (2), it becomes apparent that the students of the experimental group, who received their education using the rational inquiry strategy with the guided style, outperformed their peers in the control group, who received their education using the method followed by the instructor. The researchers attribute this improvement and superiority to the role played by the student during the main section of the lesson plan in the inquiry strategy, as it is one of the highly effective modern teaching trends in developing scientific thinking among students, thereby developing cognitive processes in learners. Furthermore, it places the player in a situation that requires careful observation and contemplating the important details of this performance, focusing their attention on it. This forms a clear support in strengthening the processes of linking previous experiences with immediately acquired experiences, making it effective through instantaneous cognitive processing simultaneously with the application of educational exercises in the practical part of the lesson plan via the stimulation of brainstorming based on the concentration of attention. "And inquiry elevates the value of intelligence, educational processes, and reflective, critical, and scientific thinking in problem-solving" (Labib, 2024).

Since "a learning environment rich in organized knowledge that surrounds the learner has a clear impact on their mental processes, or perhaps engages and attracts most of their senses. The more psychologically healthy the environment is, the more sound thinking will be generated to support it, which increases the concentration of attention and perception, helping in evaluating performance without obstacles" (Saleh, 2012).

Likewise, "there is no motor learning for performance or skill unless there is organized knowledge about this performance based on the brain's function in interpreting stimuli through mental processes that draw motor programs in memory. This aligns with the level of capabilities or aptitudes the learner possesses, making the work or applications directed towards developing and improving what they possess, and helping them draw motor programs that match the desired model to be reached" (Thabit, 2025).

Discussion of the Results of the Layup Shooting Skill Test for the Experimental and Control Groups, and the Post-tests Between Them

By reviewing Table (3), it becomes evident that both research groups have improved their skill learning in the results of the basketball layup shooting skill test, and that the learners of the experimental group (rational inquiry strategy using the guided discovery style) outperformed in their skill learning and development compared to the control group. Table (4) shows that in the post-tests, the experimental group outperformed the control group. The researchers attribute the emergence of these results for this group to the specificity of this strategy and style, as they both rely on stimulating the mental processes of the learners through the posed questions specific to the layup shooting skill. It is unidirectional questioning that forces the learner to use a set of mental processes (such as perception, imagery, concentration of attention, and memory), among others. "The use of the rational inquiry strategy develops mental energy, meaning that the learner learns and develops their mind through thinking" (Bin Hussein, 2005). Additionally, using the rational inquiry strategy means "the learner is directed towards the thinking process more than being directed towards the content, focusing on concepts and instructions rather than a mere narration of events, making the learner a thinker, researcher, organizer, and examiner of information" (Abdulkarim, 2023). Consequently, this transfers the student from the role of an imitator of the model in the traditional method (explanation and demonstration) to the role of a discoverer of the correct technique for the skills. This happens through coupling the learning process with the thinking process, which stems from a complete realization of every part of the skill as a result of the learner's thinking during the inquiry process—that is, confining the learner's thinking in one direction in answering. Mohamed (1992) asserts "that the rational inquiry strategy works to shift the focus

from the teacher to the learner, which prompts them to extract the aspects and experiences of learning themselves, while also providing them with relevant information about the topic."

Furthermore, skill exercises and their proper employment consistent with cognitive learning aid in abbreviating explanations and increasing the linkage between the sections of the skill to be learned. Ghazi (1992) confirms, "The essence of inquiry is that it is a strategy in which the student faces a problem, hypothesizes, poses questions, extracts terms, concepts, and ideas from their intellectual reservoir, reflects, experiments, analyzes, and justifies in search of evidence and proofs that support their point of view. The role of the teacher in all these processes is the expert who guides the learners in their inquiries." Hence comes the distinction of the rational inquiry strategy from the rest of the teaching strategies.

5. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Using the rational inquiry strategy with the guided discovery style helps in developing the mental imagery of students at the College of Physical Education and Sports Sciences. Using the rational inquiry strategy with the guided discovery style contributed to developing the learning of the basketball layup shooting skill among students at the College of Physical Education and Sports Sciences. Using the rational inquiry strategy increased the process of interaction and discussion among female students, as well as setting hypotheses and guesses to solve the problem presented to them and increasing the level of observation accuracy among the students.

Recommendations

The necessity of diversifying the use of strategies that give a role to the learner within the lesson. Conducting specialized courses in teaching methods for those in charge of educational processes at the university level or others. The necessity of generalizing the results of this study to the Colleges of Physical Education and Sports Sciences, as well as the General Directorates of Education in Iraq.

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