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The Impact of the Question-and-Answer Method on Reasoning Skills and Scientific Creativity in the Social Studies Subject of Middle School Students in Baghdad

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Abstract

This study aimed to investigate the impact of the question-and-answer method on reasoning skills and scientific creativity in the social studies subject of middle school students in Baghdad. This research was a quasi-experimental design with a pre-test and post-test, using a control group. The target population for this study consisted of all middle school students studying social studies, totaling 2400 students. The selected sample included 40 students who were randomly assigned to an experimental group and a control group (20 students in each group). The research tools in this study included the Abadi Creativity Questionnaire (1363) and the Virginia Shipman Reasoning Skills Questionnaire (1981). The teaching method based on question-and-answer was taught to the group members. Data were analyzed using multivariate analysis of covariance (MANCOVA). The results showed that, according to the data in the table, there was a significant difference between the experimental and control groups in the reasoning skills and scientific creativity scores in the social studies subject of middle school students in Baghdad, with a p-value of 0.05. The question-and-answer method was found to enhance reasoning skills in the social studies subject of middle school students in Baghdad in the post-test phase. Additionally, the results of the multivariate analysis of variance (MANOVA) indicated a significant difference between the experimental and control groups in the fluency, elaboration, flexibility, and originality scores in the social studies subject. According to the data, there was a significant difference between the two groups in these measures, with a p-value of 0.05. The test power was 1, indicating the adequacy of the sample size. It is suggested that teachers use group question-and-answer sessions where students can discuss their answers with each other before sharing them with the class. This collaborative approach promotes respectful listening, encourages diverse perspectives, and strengthens peer relationships.

Keywords: *Question and Answer; Reasoning Skills; Scientific Creativity*

Introduction

The question-and-answer method is an educational approach that encourages active student participation by promoting critical thinking and responding to questions posed by the teacher or peers.

This method allows students to clarify concepts, deepen their understanding, and foster a dynamic learning environment in which ideas can be collectively explored. It also enables teachers to assess students' understanding in real-time and adjust their instruction accordingly (Abdul-Jabbar Al-Muhammad, 2022). Reasoning skills refer to the ability to logically analyze situations, identify relationships between concepts, and draw valid conclusions based on evidence or logical progression. This includes critical thinking and problem-solving skills that allow individuals to systematically approach complex issues and make informed decisions (Vikanigrom & Yunyawan, 2018). Scientific creativity refers to the capacity to address scientific problems with originality, using imaginative and analytical thinking to discover solutions and novel insights. It involves the ability to link seemingly unrelated ideas, propose new hypotheses, and apply scientific knowledge in unique ways that push the boundaries of current understanding. Scientific creativity not only leads to experimentation and discovery but also encourages adaptability in problem-solving and enables scientists to modify or even revolutionize existing theories. This skill is essential for advancing knowledge, as it leads to the development of new concepts, methods, and technologies across various scientific fields (Abat, Schaffer, & Pawan, 2018).

The main problem addressed in this research is understanding how the question-and-answer teaching method impacts the reasoning skills and scientific creativity of middle school students in the social studies curriculum in Baghdad. While traditional lecturing often leads to passive learning, the question-and-answer approach may encourage active participation, critical thinking, and deeper engagement with the material. Reasoning skills—the ability of students to think logically and establish connections between concepts—and scientific creativity, or the capacity to generate novel ideas and approaches to problem-solving, are essential for students' overall cognitive development and success in subjects that require analytical thinking. However, the effectiveness of the question-and-answer method in enhancing these skills, particularly in social studies, is unclear, as the subject typically emphasizes factual recall over exploratory thinking. By investigating this issue, this research aims to determine whether the question-and-answer method can foster an interactive learning environment that promotes higher-order thinking and creativity, and potentially informs teaching practices that go beyond rote memorization to support skill development.

Addressing the impact of the question-and-answer (Q&A) method on reasoning skills and scientific creativity in social studies at the middle school level is crucial for creating an educational environment that transcends mere memorization. Social studies often involve interpreting complex social, historical, and cultural information, which requires both analytical reasoning and creative thinking to fully understand and connect concepts. The question-and-answer method encourages active participation and critical questioning, which can help students deepen their understanding of social studies content, sharpen their logical reasoning, and discover creative solutions to historical or social issues. Investigating the impact of this approach in middle schools in Baghdad is particularly important for adapting teaching methods to meet the diverse cognitive needs of students and for developing their skills in problem-solving, critical analysis, and innovative thinking—skills essential for navigating real-world issues in a globalized society. The insights from this research could inform teaching practices that foster critical and creative thinking and support the development of more engaged, thoughtful, and capable learners. Farhadi Pour, Abbasi, Iffat, and Karimzai (2021) conducted a study comparing the effectiveness of the question-and-answer method, inductive thinking, and reasoning skills methods on the scientific creativity of fifth-grade students. The findings indicated that the reasoning skills method was more effective than inductive thinking in fostering creativity, both in general and in the components of originality and elaboration in science lessons. However, both methods were found to be effective in nurturing the components of fluency and flexibility.

Therefore, the present research seeks to answer the question: Does the question-and-answer method affect the enhancement of reasoning skills and scientific creativity in the social studies lessons of middle school students in Baghdad?

Research Method

The research method in this study is a quasi-experimental field study. Since the minimum sample size in quasi-experimental research is 20 participants (Delavar, 2011), this study considers 40 students from the middle school social studies class, selected through cluster sampling (two classes from one school) in the specified community. A number of middle schools were randomly selected, and after sampling, participants were randomly assigned into two groups (experimental and control groups, with 20 students in each group). The data collection tools used in this study include the Richo Verbal Communication Skills Questionnaire (1989), the Peer Interaction Index (IPR) by Walter W. Hudson (1992), the Abadi Creativity Questionnaire (1363), and the Virginia Shipman Reasoning Skills Questionnaire (1981).

Reasoning Skills Questionnaire - New Jersey Test of Reasoning Skills (NJTRS): This test was developed by Virginia Shipman between 1976 and 1981 and later reviewed by psychologists at the Princeton Testing Center for assessing the "Philosophy for Children" program. The skills measured by this test correspond to fundamental operations in the realm of logic. These skills are varied and represent a broad area. The language used in the questions is simple, clear, and non-imperative. This test consists of 50 multiple-choice questions in the form of logical syllogisms, representing 22 reasoning skills (e.g., identifying causal relationships, logical reasoning, inductive reasoning, avoiding jumping to conclusions, analogical reasoning, recognizing opposing forces, and identifying underlying assumptions). In a study by Cohen (1990), it was reported that this test is one of the most useful and effective tools for assessing the thinking and reasoning abilities of middle school students. As this test was designed to evaluate the "Philosophy for Children" program, which introduces logic and reasoning methods to children, it draws on cognitive psychology and philosophies from figures such as George Herbert Mead, Vygotsky, Dewey, and Socrates. This test is designed for use in large classroom groups and typically takes between 30 to 45 minutes to administer (Shipman & Cohen, 1983). Reliability and validity have been established in various studies (Allen, 1988; Cohen, 1988), with Cronbach's alpha coefficients ranging from 84% to 94%, which have been reported as satisfactory. Additionally, concurrent validity was assessed through a study on first-year college students in New Jersey, and correlations were found between the NJTRS test and the SAT Mathematics test (35). In this research, internal consistency of the test was assessed using Cronbach's alpha, split-half, and test-retest methods, resulting in values of 0.70, 0.50, and 0.69, respectively, which are considered satisfactory. Moreover, for validity and credibility, Marashi used the concurrent validity method on a sample of 50 individuals, providing a set of questions for each of the 22 reasoning skills that correspond to the test. The correlation coefficient between the mean answers to each skill's questions and the reference criterion was calculated, with a total test validity coefficient of 0.54, which is significant at the 0.0001 level.

Creativity Questionnaire: This questionnaire includes 60 questions, each with three response options. The options represent the level of creativity, from low to high, with scores ranging from 0 to 2. The total score obtained in each sub-test represents the participant's score in that area, and the overall creativity score is the sum of the scores from four sub-tests (fluency, elaboration, originality, and flexibility). The total creativity score ranges from 0 to 120. Questions 1 to 22 are related to fluency, 23 to 33 to elaboration, 34 to 49 to originality, and 50 to 60 to flexibility. The higher the score, the higher the creativity of the individual. Abadi calculated the validity of this questionnaire through factor analysis and correlation with similar tests (Torrance). The correlation coefficient between the total score of the Torrance test and the total score of this test was found to be 0.46 (Abadi, 1994). Reliability was assessed using test-retest and Cronbach's alpha methods. The reliability coefficients for fluency, originality, flexibility, and elaboration were reported as 0.80, 0.82, 0.84, and 0.80, respectively (Abadi, 1994). In Spain, the Cronbach's alpha internal consistency method was used for reliability calculation. The reliability coefficients for creativity components were fluency 0.70, originality 0.67, flexibility 0.61, and elaboration 0.61 (Abadi, 1994). Further studies, including Shehni et al. (2005), Sohrabi & Sohrabi (2002), Kafiat (1994), and Haghighat (1998), have confirmed the validity and reliability of this test using factor analysis, test-retest, and Cronbach's alpha methods.

Teaching the Question-and-Answer Method: The teaching package for the social studies question-and-answer method is inspired by the work of Osser and Bariswell (2001) and was taught to participants in 8 to 10 sessions. The social problem-solving package was taught over 10 sessions, each lasting 90 minutes.

Table 1 - Social Problem Solving Training Package in One Session

sessions	content
First	Familiarity with the Question-and-Answer Model, Explanation, and General Clarification of the Model and Its Goals
Second	Clarification and Explanation of the Implementation Stages of the Model
Third	How to Teach a Concept Based on the Stages of the Model
Fourth	Clarification and Explanation of the Principles of the Model and How to Apply Them in the Classroom
Fifth	Explanation of the Methods and Techniques of the Model and Their Use in the Classroom
Sixth	Explanation and Clarification of the Strategies of the Model and How to Apply Them in the Classroom
Seventh	Important Points to Consider During Question and Answer
Eighth	Types of Questions in Social Studies Lessons
Ninth	Asking Oral Questions in the Classroom
Tenth	How to Evaluate in the Question-and-Answer Model

The research population in this study consisted of all middle school students in Baghdad who were enrolled in the 2024-2025 academic year. A total of 30 students were selected purposefully. The sampling method used was random sampling. Descriptive statistics were used in this research to determine the mean and standard deviation for the variables of interest, and multivariate analysis of covariance was conducted using SPSS software.

Findings

The question-and-answer method has an impact on reasoning skills, scientific creativity, and their dimensions in the social studies subject of middle school students in Baghdad. The results in Table (2) show the findings of multivariate analysis of variance (MANOVA), indicating a significant difference between the experimental and control groups in reasoning skills and scientific creativity scores in the social studies subject of middle school students in Baghdad. Based on the data in the table, there is a significant difference between the experimental and control groups in reasoning skills and scientific creativity scores in the social studies subject of middle school students in Baghdad, with a p-value of 0.05. The eta value is 0.852, meaning that 85.2% of the difference between the two groups is explained by the scores in reasoning skills and scientific creativity in the social studies subject. Additionally, the test power is 1%, which indicates that the sample size is adequate.

Table (2)**:** Results of Multivariate Analysis of Covariance (MANOVA) Showing the Difference Between the Experimental and Control Groups for Reasoning Skills and Scientific Creativity in the Social Studies Subject of Middle School Students in Baghdad

source	value	F	degrees of freedom of the hypothesis	degrees of freedom of error	level of significance	**Eta squared**	statistical power
Pillai effect	0/852	30.173	4/000	21/000	0/001	0/852	1/000
Wilks' Lambda	0/148	30.173	4/000	21/000	0/001	0/852	1/000
Hotelling's T-squared effect	5/747	30.173	4/000	21/000	0/001	0/852	1/000
Roy's largest root	5/747	30.173	4/000	21/000	0/001	0/852	1/000

The question-and-answer method is effective in improving reasoning skills in the social studies subject of middle school students in Baghdad.

As the results in Table (3) show, there is a significant difference between the groups at the 0.01 level (P > 0.01). Given that the mean scores for reasoning skills in the experimental group are higher than those of the control group in the post-test, this difference favors the experimental group. This means that the question-and-answer method was able to enhance reasoning skills in the social studies subject of middle school students in Baghdad during the post-test phase.

Table (3)**:** Multivariate Analysis of Covariance (ANCOVA) of Reasoning Skills Scores in the Studied Groups

source	sum of squares	degree of freedom	mean square	F	level of significance	Eta value	statistical power
pretest	95.585	1	95.585	5.507	0.011	0.238	0.748
group	91.731	1	91.731	7.205	0.013	0.231	0.731
error	305.570	34	12.732				
Total	20193	40					

The question-and-answer method has an effect on scientific creativity and its dimensions in the social studies course for middle school students in Baghdad.

As shown in the results of Table (4), the multivariate analysis of variance (MANOVA) reveals a significant difference between the experimental and control groups in the scores of fluency, flexibility, originality, and elaboration in the social studies course for middle school students in Baghdad. Based on the data from the table, there is a significant difference between the experimental and control groups in fluency, flexibility, originality, and elaboration scores in the social studies course at a significance level of $p < 0.05$. The eta-squared value is 0.852, meaning that 85.2% of the difference between the two groups is explained by the fluency, flexibility, originality, and elaboration scores in the social studies course. Additionally, the test power is 1%, indicating the adequacy of the sample size.

Table (4) Results of Multivariate Analysis of Variance (MANOVA) for the Difference Between Experimental and Control Groups in the Dimensions of Scientific Creativity in the Social Studies Course for Middle School Students in Baghdad.

source	value	F	degrees of freedom of the hypothesis	degrees of freedom of error	level of significance	**Eta squared**	statistical power
Pillai effect	0/852	30.173	4/000	21/000	0/000	0/852	1/000
Wilks' Lambda	0/148	30.173	4/000	21/000	0/000	0/852	1/000
Hotelling's T-squared effect	5/747	30.173	4/000	21/000	0/000	0/852	1/000
Roy's largest root	5/747	30.173	4/000	21/000	0/000	0/852	1/000

As shown in the results of Table (5), there is a significant difference between the groups in the scores of scientific creativity, and the dimensions of fluency, flexibility, originality, and elaboration at the 0.05 level ($p > 0.05$). Given that the mean scores of scientific creativity, and the dimensions of fluency, flexibility, originality, and elaboration in the experimental group are higher than the mean scores in the control group at the post-test, this difference is in favor of the experimental group. This indicates that the question-and-answer method was able to increase the scores of scientific creativity, and the dimensions of fluency, flexibility, originality, and elaboration in the social studies course for middle school students in Baghdad at the post-test stage.

Table (5) covariance analysis (multivariate) of scientific creativity scores and its dimensions in the studied groups

source	variable	sum of squares	degree of freedom	mean square	F	level of significance	Eta squared	statistical power
pretest	scientific creativity	2016.117	1	2016.117	148.923	0.001	0.861	1.000
group		886.878	1	886.878	65.510	0.001	0.732	1.000
error		324.912	34	13.538				
Total		247726	40					
pretest	fluidity	441.191	1	441.191	137.412	0.001	0.851	1.000
group		76.967	1	76.967	23.972	0.001	0.500	0.997
error		77.058	34	3.211				
Total		17053	40					
pretest	Expansion	464.119	1	464.119	204.792	0.001	0.895	1.000
group		39.929	1	39.929	17.619	0.001	0.423	0.981
error		54.391	34	2.266				
Total		13166	40					
pretest	flexibility	478.254	1	478.254	85.350	0.001	0.781	1.000
group		35.758	1	35.758	6.381	0.019	0.210	0.679
error		134.482	34	5.603				
Total		13166	40					
pretest	innovation	295.423	1	295.423	115.562	0.001	0.828	1.000
group		56.385	1	56.385	22.056	0.001	0.479	0.994
error		61.354	34	2.556				
Total		15180	40					

Discussion and Conclusion

The question-and-answer method affects reasoning skills, scientific creativity, and their dimensions in the social studies course for middle school students in Baghdad. As shown in the results of Table (1), the results of the multivariate analysis of variance (MANOVA) reveal a significant difference between the experimental and control groups in reasoning skills and scientific creativity scores in the social studies course for middle school students in Baghdad. According to the data in the table, there is a significant difference between the experimental and control groups in verbal skills, peer interaction, reasoning skills, and scientific creativity scores in the social studies course at the 0.05 level ($p < 0.05$). The eta-squared value is 0.852, meaning that 85.2% of the difference between the two groups is explained by verbal skills, peer interaction, reasoning skills, and scientific creativity scores in the social studies course for middle school students in Baghdad. Additionally, the test power is 1%, indicating the adequacy of the sample size. The results of this hypothesis are consistent with the findings of research by Yarmohammadi Asal, Zoghi Paydar, and Mohammadi (2023), Farahdipour, Abbasi, Iftikhar, and Karimzai (2021), Dehdari and Mahmoudinia (2020), Abd al-Jabbar Al-Muhammad (2022), Obeid al-Aboudi (2021), and others. In explaining this hypothesis, it can be stated that the question-and-answer method significantly impacts middle school students' learning in social studies, especially in developing reasoning and scientific creativity skills. This method fosters verbal confidence and clarity by requiring students to express their responses and participate in discussions, which are essential for both academic and social contexts. The participatory nature of the question-and-answer method also strengthens peer interaction as students listen, share ideas, and respond to each other's viewpoints, creating a more interactive and communicative learning environment. Furthermore, the question-and-answer method enhances reasoning skills by encouraging students to think critically about the questions, link ideas, and construct coherent arguments, which are key cognitive abilities necessary for understanding complex topics in social studies. Additionally, scientific creativity is cultivated as students explore diverse viewpoints, hypothesize potential scenarios, and apply knowledge creatively in various social contexts, helping them develop innovative thinking and deeper curiosity about the subject.

The question-and-answer method is effective in improving reasoning skills in the social studies course for middle school students in Baghdad. As shown in the results of Table (2), there is a significant difference between the groups at the 0.01 level ($p < 0.01$). Given that the mean reasoning scores in the experimental group are higher than those in the control group at the post-test, this difference favors the experimental group. This indicates that the question-and-answer method successfully improved reasoning skills in the social studies course for middle school students in Baghdad at the post-test stage. The results of this hypothesis are consistent with the findings of Yarmohammadi Asal, Zoghi Paydar, and Mohammadi (2023), Farahdipour, Abbasi, Iftikhar, and Karimzai (2021), Dehdari and Mahmoudinia (2020), Abd al-Jabbar Al-Muhammad (2022), Obeid al-Aboudi (2021). In explaining this hypothesis, it can be stated that the question-and-answer method enhances reasoning skills in social studies by encouraging students to think critically and logically when responding to questions. By analyzing each question, students learn to consider different viewpoints, use relevant knowledge, and structure their responses coherently. This process helps them develop analytical skills as they connect ideas, evaluate evidence, and form reasoned responses—skills essential for understanding complex social studies topics. Furthermore, the question-and-answer method fosters both deductive and inductive reasoning by requiring students to apply general concepts to specific cases and gain broader insights from individual examples. This method also allows teachers to ask exploratory questions and encourages students to refine their thoughts, test hypotheses, and improve the clarity of their reasoning. Over time, these skills increase students' ability to critically analyze social issues and prepare them to solve more complex problems in their academic and personal lives.

The question-and-answer method is effective in enhancing scientific creativity and its dimensions in the social studies course for middle school students in Baghdad. As shown in the results of Table (3), there is a significant difference between the groups in scientific creativity scores and the dimensions of fluency, flexibility, originality, and elaboration at the 0.05 level ($p < 0.05$). Given that the mean scores of

scientific creativity and the dimensions of fluency, flexibility, originality, and elaboration in the experimental group are higher than the mean scores in the control group at the post-test, this difference favors the experimental group. This indicates that the question-and-answer method was able to increase the scores of scientific creativity and the dimensions of fluency, flexibility, originality, and elaboration in the social studies course for middle school students in Baghdad at the post-test stage. The results of this hypothesis are consistent with the findings of Dehdari and Mahmoudinia (2020), Amini (2019), Lampert (2024), Abedisah and Getainet (2023), Abd al-Jabbar Al-Muhammad (2022), Obeid al-Aboudi (2021). In explaining this hypothesis, it can be said that the question-and-answer method, by encouraging students to think beyond standard answers and engage with topics with curiosity and originality, positively impacts the scientific creativity of middle school students in social studies. This method nurtures a creative mindset, as students explore diverse ways to answer questions, hypothesize alternative outcomes in historical or social contexts, and apply social studies concepts in novel ways. It enables students to see social phenomena from multiple perspectives and fosters adaptability and open-mindedness. Additionally, the question-and-answer method supports various dimensions of scientific creativity, including fluency, flexibility, and originality. Students generate multiple ideas and perspectives on a topic, while flexibility allows them to consider multiple approaches to a question. Originality is enhanced by the creation of unique and enlightening responses that go beyond fragmented learning, making the question-and-answer method invaluable in fostering creative problem-solving and critical thinking in the social studies classroom.

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