PalArch's Journal of Archaeology of Egypt / Egyptology

# The effect of Five-Finger strategy on the holistic thinking of chemistry students in the second intermediate grade

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**Najwa Abdulmunem Jasim Alnoori. The effect of Five-Finger strategy on the holistic thinking of chemistry students in the secondintermediate grade--Palarch's Journal Of Archaeology Of Egypt/Egyptology 17(7), 13234-13244. ISSN 1567-214x**

**Keywords: Five-Finger strategy, holistic thinking.**

## Abstract

The objective of the research is to identify the effect of the five-finger strategy on the holistic thinking of chemistry students in the second intermediate grade, where the sample consisted of 60 female students in a second classfrom one of the intermediate schools in Baghdad city, divided into two groups: control and experimental.

The experimental design was based on the partial control; the scientific course was defined in the third and fourth chapters of the science book of the second intermediate grade.The two research tools were prepared: the attainment test with the scientific course and the holistic thinking scale paragraph (36) of multiple-choice pre- and post-test. The results showed a statistically significant difference between the two research groups in favor of the experimental group that followed the five-finger strategy with a significant effect.

## Introduction

The objective of the research is to identify the effect of the five-finger strategy on the holistic thinking of chemistry students in the second intermediate grade.Two control and experimental groups adopted the experimental design. The scientific course (reaction, chemical equation, and hydrogen) is defined as chemistry in the second intermediate grade science book.

**Research problem:** One of the most important things in the education organization is that which depends on the teacher's teaching style and

adapting teaching methods that work toward the goal of the education process by linking information and educational experiences to real-life and the need to develop and employ them to face life. This is through methods of teaching chemistry, especially those that rely on students to acquire many mental skills with a strategy that is engaging different age-related and to employ the five key question words (when, who, what, why, how), and if required to add (where) sometimes to achieve specific learning goals. However, one of the most important difficulties preventing their achievement is the teachers 'continued reliance on traditional methods of education and not seeking change or revitalizing different pathways for thinking, including holistic thinking to prepare students for creativity. A survey and discussion of the opinion of a random sample of chemistry teachers and 27 students from one of Al-Karkh education schools conducted, and the problem was identified by answering the following question: "What is the effect of the five-finger strategy on the holistic thinking of chemistry students in the second intermediate grade?"

The main question is split into the following sub-questions:

1. What is the effect of the five-finger strategy on the attainment of chemistry students in the second intermediate grade?
2. What is the effect of the five-finger strategy on the holistic thinking of second intermediate grade students?
3. Is there a statistically significant relationship at the level (0.05) between the scores of the experimental group students in the attainment test and their scores in the holistic thinking test?

**Importance of research:**

The teacher is an important and effective element in the learning process, especially the teaching methods and strategies that he relies on to deliver the educational material and achieve the main objective of the learning process by achieving qualitative learning outcomes. The five-finger strategy is effective for attaining active learning, engaging the learner, and transforming his role from just a recipient to an effective one that can modify his behavior through what he has learned and the skills he has acquired (Al-Khatib, 1996, 26); by using an effective method with essential questioning tools to achieve specific educational goals (Jawdat Saadeh et al., 2006, p: 354), to activate the holistic thinking method in order to solve scientific problems; especially for the learner who depends on dealing with the problem holistically first and then moving to the parts (Abu Awwad and others, 2014, p: 574), to motivate the learner to pay attention and participate in learning (Ghazal Mahjoub, 2011, p: 1720), and to allow them to review their problems by using a different way than they used to focus on the problem and find solutions quickly, which sometimes lead to failure to find the right solution, as few of them rely on more than one way of thinking (Harrison and Bramson, 2002). The way of thinking is not separate from the nature of personality, it is no

autonomous, but an important element of personality components that operate within their dynamic system and do not exist outside this framework (Ghabawi and Khaled, 2015, p: 16).

Holistic thinking is directed towards specific goals that the student seeks to achieve depending on deduction and access to the general idea as a whole, meaning that it depends on the cognitive domain (Atieh, 2015, p: 136).

Holistic thinking is about seeing the situation or problem from multiple perspectives, using various thinking skills, such as critical, creative, and contemplative.

According to Lunch's (1986) study, individuals with holistic thinking tend to be quick in generating ideas, unlike individuals with non-holistic thinking (Lunch, 1986, p: 3).

Holistic thinking arranges and prepares information in order to solve the problem; it receives information, arranges it, and organizes it so that it has the ability to process multiple and independent information (Medin& Ross, 1997, p: 20).

As intermediate stage students are the subject of current research, this stage plays a distinct role in shaping the personality of adolescent students and gelling their complex preferences and abilities to be relatively stable. The intermediate school is the educational and social institution in which students investigate and support themselves and their personalities, as they will practice sooner or later, working life, whether in school achievements or when they enter the labor market, social life, or enrollment in middle school (Ahmad, 1990, p: 23).

The importance of research can be described as follows:

1. Giving the learner the opportunity to be able to correctly formulate questions that boost creative thinking processes.
2. Raising team spirit among learners in the workplace and promoting effective participation during the lesson.
3. Boosting self-confidence and issuance of solutions and judgments.
4. Being able to summarize ideas with fingers to keep learning alive.
5. Looking at the problem in general and comprehensively, identifying the partial elements and within the specified time of the lesson.
6. Breaking free from the limits of traditional thinkingto enhance creative thinking.

**Research objective and its thesis:**

The research is intended to identify the effect of the five-finger strategy on the holistic thinking of second intermediate grade chemistry students. To this end, the following null hypothesis was formulated:

1. There is no statistically significant difference at the level (0.05) between the averages scores of the experimental and control groups of female students in the post-test of attainment.

2. There is no statistically significant difference at the level (0.05) between the averages scores of the experimental and control groups of female students in the holistic thinking test.

3. There is no statistically significant difference at the level (0.05) between the averages scores of the experimental and control groups of female students in attainment and holistic thinking.

**Research limitations:**

- The second intermediate grade female students from a government school for girls / Al-Karkh First.
- The first semester of the academic year 2019-2020.
- The scientific course (second and third chapters of second intermediate grade chemistry book).

**Definition of terms:**

**Strategy:**Defined by “El Hila", it is planned for procedures and activities that the teacher provides, respectively and sequentially, to achieve specific goals and according to the available capabilities (El Hila, 2008, 150).

**Five-Finger strategy:**A strategy in which the learner builds a number of mental skills and questions by using the five fingers that make the learner more effective and active (Kazem and Abbas, 2016, 97).

**Holistic thinking:**Defined by Al-Falou (2005): "It is a balanced capacity to develop theindividual ability and promote self-awareness and social awareness to realize that he is part of a world in which different issues are intertwined." (Al Falou, 2005, p: 10).

**Theoretical background:**

**Five-Finger strategy:** an educational strategy to help students gain several skills such as listening, deduction, prediction, summarization, and many other important skills related to student thinking and understanding.

Five questions are built with the five-question words in the Arabic language (when, who, what, why, how), and some other question words can be added such as (where) if some educational goals are met for any of the courses or student activities.

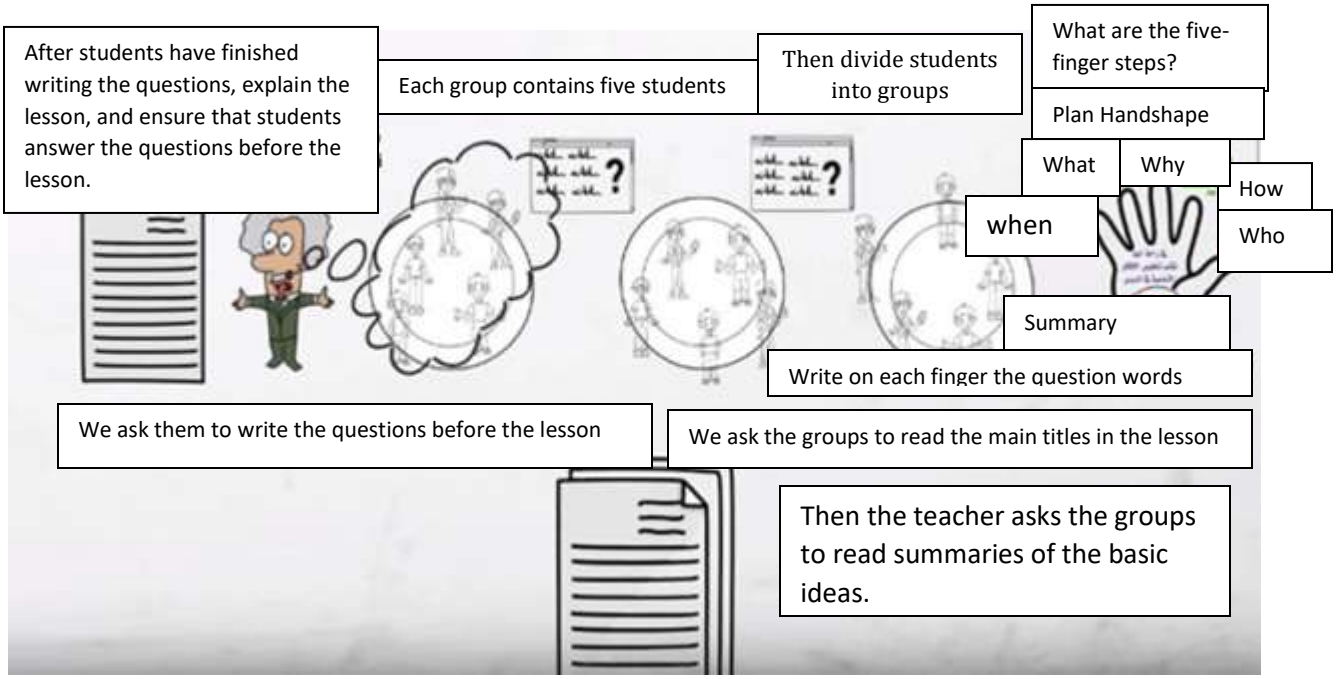
**Strategy steps:**

- Prepare a handshape chart.

- Write on each finger, when, what, why, how, who, and on the palm of the hand, summarize the main ideas of the lesson.
- Divide the female students into groups of five students each.
- Ask them to read the main titles of the lesson, and then to write the questions before the beginning of the lesson.
- After students complete writing questions, the lesson is presented, and we assure them that they focus on the answers to their questions.
- We start the activity and ask them to solve the questions.
- After completing, ask students to summarize the most prominent ideas in the lesson on the palm of the hand.
- Present the charts in front of the female students and each group reads their own answers.

**Table 1**

**A chart showing the progress of the strategy steps**




**The teacher's role in the Five-Finger strategy:**

1. Divide students into quintuple groups, and encourage purposeful collaborative work.
2. Explain how the five-finger strategy works, and how to employ questioning tools.
3. Prompt students to answer the questions they wrote as they understood the explained lesson.
4. Employ methods and strategies that develop the thinking of female students.
5. Givefemale students the opportunity to formulate sound and challenging questions.

6. Provide continuous feedback on the validity of the structure of questions, and the validity of the answers that have been obtained.
7. Create a classroom environment rich in educational stimuli and teaching aids.

**The learner's role in the Five-Finger strategy:**

1. Create structured questions about the task at hand, beginning with specific question words.
2. Asking powerful, thought-provoking questions about the task at hand.
3. Students challenge themselves to make efforts to solve the learning tasks they created themselves.
4. Female students engage in individual and collaborative work to complete educational tasks.
5. Pay attention to the teacher's explanation, and answer the questions they wrote.
6. Show answers to everyone and benefit from feedback.
7. Students participate in the evaluation process itself, and it is a continuous, purposeful evaluation.

**The importance of the Five-Finger strategy:**

1. Emphasize summarizing the main ideas of the subject and identifying them on fingers to keep learning alive.
2. Students are given the ability to formulate and solve the various questions that come into their own minds during the teacher's lesson presentation.
3. Enhance the confidence of female students in their ability and responsibility, and foster a spirit of cooperation between them.
4. This strategy helps to create a spirit of positive participation between them and the teacher in the learning process.
5. Develop female students' vocabulary and dialogue mode to create questions and answers through teacher explanation.
6. Writing the main points of the lesson in the palm of hands female students has a role in keeping the information in mind (Kazem and Abbas, 2016, 103).

**Holistic thinking:**

Thinking is the way that students prefer in cognitive processing processes and their tendency to pay attention to the big picture and then move to the details. Among its main advantages:

- Giving the student the ability to communicate and interact with his peers (Holt, 2004, p25).
- Learning is best when there are exploratory groups.
- This approach tends to translate tasks into practical projects.

- Benefiting from educational activities, especially those that depend on writing reports or working on a project.
- Quickly resolve complex problems without explaining how they arrived at the solution.
- Displaying the course in extracts, sometimes random without following a specific sequence (Abu Awwad et al., 2014).

**The importance of the Holistic thinking:**

- Developing students' ability to generate key ideas that help solve a problem.
- Creating a classroom environment that is free to discuss and purposeful dialog.
- Developing students' talents in terms of development, inference, planning, and understanding in different aspects of life.
- Developing the spirit of participation and exploring ideas.
- Helping students open up to new ideas that do not match their previous ones.
- Enabling students to search for alternative perspectives and to overcome many of the situations that confront them.
- Developing students' ability to self-control learning.
- Helping them recognize contradictions.
- Converting the knowledge acquisition process into a mental activity that leads to deeper mastery and understanding of cognitive content.

**Concepts of holistic thinking:**

**Holistic thinking contains two important concepts:**

1. **Expectation:**It is the ability to respond to new situations, deal with upcoming events, understand the results of current and future business, show a vision of future scenarios, and develop the way people work that can influence future events. (Springer,1993,p: 8).
2. Participation: Is the free aspectof expectation that students should participate directly in learning where it can be developed through holistic thinking based on the student's constructive ideas:

- Knowledge was not received passively but was actively and actively constructed by the student.
- The perception and adaptation function organizes the student's world.
- Participation gives students an opportunity to learn more about the social environment in which they live and are able to solve the problems they face by working with others in groups that are a holistic view towards these problems, and one of the characteristics of holistic thinking individual. It strengthens social relationships, develops their ability to communicate and interact with others easily, and makes them influence

others and succeed in interacting with them (Springer, 1993, p: 9).**Research methodology:**

Reliance on the heuristic method of partial control by creating two control and experimental groups with pre and post-test for attainmentand reflective thinking.

**Research society and sample:**

The community represents all the female middle school students during the morning study in an intentional manner. Whilstthe research sample is their number, which is 97female students for the academic year 2019-2020. The experimental groups are randomly assigned; group A consisted of 30female students who studied using the five-finger strategy, and group C of 30 other female students who studied in the traditional way. Postponed students who did not adhere to the attendance were excluded, and thus the percentage constituted 61.85% of the total original research community. The researcher did not encounter any difficulty in applying the research experience despite the Corona pandemic, as middle schools continued their official working hours.

**Research tools:**

Attainment test in the scientific course (reaction, chemical equation, and hydrogen) which is defined as chemistry in the second intermediate grade science book, and the holistic thinking scale.

**Table2**

**Arithmetic mean, standard deviation, T-value, and Eta squared of the achievement test scores of female students in the experimental and control groups**

| Variables | Group | No. | Arithmetic Mean | Standard Deviation | T-value | | Eta squared | Indication |
|---|---|---|---|---|---|---|---|---|
| Attainment test | Experimental | 30 | 20.82 | 3.12 | Calculated | Tabulated* | 0.471 | Indication for the experimental group |
| | | | | | 8.857.6 | 2 | | |
| | Control | 30 | 16.31 | 2.66 | | | | |

*****The Tabulated T-value is equal to 2 at 0.05 level and 74 at degree of freedom.

The table above shows that the calculated T-value (8.85) is greater than the Tabulated value (2) at the level (0.05) and (74) at the degree of freedom, i.e. there is a statistically significant difference between the two research groups in favor of the experimental group and thus rejects the first null hypothesis. This is attributed to the role of the Five-Finger strategy as it provides opportunities for female students to organize the

lesson, encourage collaborative work among groups, and make them more ready to learn, and access the main ideas of the lesson topic.

Table 2 also shows that the ETA square values were greater than (0.16), where the ETA square value for the overall attainment test was (0.47), indicating that the effect is significant.

**Table 3**

**Arithmetic mean, standard deviation, T-value, and ETA squared for scale scores of the holistic thinking of the female students of the experimental and control groups**

| Variables | Group | No. | Arithmetic Mean | Difference | T-value | | Eta squared | Significance |
|---|---|---|---|---|---|---|---|---|
| Holistic thinking Scale | Experimental | 30 | 3.91 | 0.698 | Calculated | Tabulated* | 0.331 Big | Significant for the experimental group |
| | | | | | 5.89 | 2 | | |
| | Control | 30 | 2.67 | 0.845 | | | | |

*****The Tabulated T-value is equal to 2 at 0.05 level and 74 at degree of freedom.

To answer the second question and through table (3), the table above shows that the calculated T-value (5.89) is greater than the Tabulated value (2) at the level (0.05) and (74) at the degree of freedom, i.e. there is a statistically significant difference between the two research groups in favor of the experimental group and thus rejects the second null hypothesis.

The Five-Finger strategy provides an opportunity to look at the understanding of the main ideas of the scientific course by identifying the question words on which the strategy depends (when, who, why, how), and thus the female students arrive at the most prominent ideas of the lesson on the palm of the hand, thereby contributing to keeping learning alive.

Working in groups also makes female students effective and willing to help their peers and access key ideas through a strategy that makes them reach the general subject matter and greatly (0.033) helps them solve their problems, which is a concept of holistic thinking, as defined by (Blosser, 2002, p:8).

To answer the third question which states: Is there a statistically significant relationship at the level (0.05) between the scores of the experimental group's students in the test of attainment and their scores in the test of postholistic thinking?

In order to verify the validity of the hypothesis, a correlation coefficient was found between the scores of the experimental group students in the

academic attainmenttest and their scores in the holistic thinking test in post thinking. The following table shows the results:

**Table 4**

| Post-application | Holistic Thinking Test | |
|---|---|---|
| AttainmentTest | Correlation Coefficient | SignificanceLevel |
| | **0.431 | Significant at (0.01) |

*****The Tabulated T-value is 74 at degree of freedom andequal to 266 at 0.05 level.

It is clear from table (4) that the correlation coefficient is statistically significant, where there is a positive direct relationship between academic attainment and holistic thinking.

We conclude from this relationship that the information, abilities, and mental abilities of female students are increasing through the Five-Finger strategy and cooperative work; this conclusion is not new if we consider the educational situation, which has raised the rate of holistic thinking completely.

**Recommendations:**

According to the research results, the researcher recommends the following:

1. Encourage the use of the Five-Finger strategy in planning and implementing Chemistry lessons.
2. Integrate training courses for Chemistry teachers to use modern strategies, such as active learning strategies, five-finger strategy, patterns of thinking, and especially holistic thinking.
3. The necessity to make attention and emphasize the development of holistic thinking among female students, as it is a pattern adopted in the formulation of school curricula, especially chemistry.

**Suggestions:**

1. Conducting further studies on the five-finger strategy for the rest of the courses and other academic cycles, through a digital application of Webinar such as Google Meet or FCC, as conditions change due to the Corona pandemic and 70% reliance on e-learning.
2. Conducting further studies concerning the relationship between holistic thinking and other variables not covered by the present research.

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