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**Deductive Thinking at the Preparatory stage Students.****Yasmine M. Hamad<sup>1</sup>, Assist Prof. Dr. Zainab A. Ahmed <sup>2</sup>, Prof. Dr. Ismail I. Al<sup>3</sup>**

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**Article History:** Received: 10 January 2021; Revised: 12 February 2021; Accepted: 27 March 2021; Published online: 28 April 2021

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**Abstract**

The aim of the current research is to identify the extent of possessing deductive thinking among middle school students, and the researchers chose the descriptive approach.

The sample consisted of (400) male and female students of the fourth scientific grade from (9) schools (preparatory and secondary) in the three directorates of al-Karkh education (first, second, and third) who were chosen by random stratification method, by (154) males and (246). Females.

The researchers prepared the research tool: the deductive reasoning test that consisted of (24) items. Second, the psychometric properties of the apparent and constructive validity and reliability were verified by the internal consistency method. The following statistical methods were used: (Chi-square, the equation of difficulty and ease, the discrimination equation, the T-test for one sample, the T-test for two independent samples, the point bilateral correlation coefficient, the Pearson correlation coefficient, the Keoder Richardson equation 20, the Alpha Cronbach equation. (Middle school students have a high degree of deductive reasoning.)

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**Key Words:** Deductive Thinking

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**Research problem :**

With what God has granted him of thinking mental strength, we find that he is distracted to think, but we find him often, erring in his thoughts and not finding a correct result, evidence, or conclusion for his ideas, so he is in a problem that needs thinking that corrects his mistakes and guides him to the right and the correct conclusion and organization His ideas and their modification, and this may be related to a clear lack of possession of logical reasoning and conclusion, as thinking in educational sciences and other sciences takes a major position, because the task of thinking is to find appropriate solutions to problems, including deductive thinking, which represents a pattern of analytical thinking descending from the faculties to the parts or Top to bottom, and thus the research problem was represented by responding to the following question: What is the level of inferential thinking among middle school students?

**research importance :**

Teaching thinking within the educational curriculum is an important goal to understand the cognitive content and a wider field for developing creativity and self-development, raising the level of achievement, and developing positive directions towards learning. Teaching thinking in the curriculum does not mean merging thinking skills between the folds of the curriculum only, but rather through a review of The curriculum is complete when planning to develop all thinking skills (Al-Sir, 2018: 193).

Deductive thinking is one of the types of thinking through which the causes and causes of the occurrence of things are reached, and evidence and proofs are obtained that prove or deny a certain point of view, so deductive thinking is the starting point for other types of thinking, including creative and critical thinking, and it is determined by special rules and laws that control the process Solving problems, as the development of these thinking capabilities, especially deductive ones, is what helps students to get along well with the present circumstances, scrutinize what

they read or hear and judge it without being affected by repeated opinions, especially since the preparatory stage may be the end of the stages of education for some students, This prompts us to prepare them intellectually to keep pace with the world that is characterized by rapid change, and the explosion of knowledge and culture, and this is very important (Al-Damakh, 2006: 3-4)

### **Research goal:**

The current research aims to identify the level of inferential thinking among middle school students

### **search limits :**

### **Research limits include:**

- 1- The first semester of the academic year (2020-2021).
2. Fourth-grade scientific students in secondary and middle schools in Baghdad governorate / Al-Karkh Education Directorates (first, second and third).

### **Define terms:**

**Inferential thinking:( Robertson, 2001)) as a mental process in which a set of explanations based on observations and these observations are interpreted, some of which are influenced by previous experience (Razouki and Nabil, 2019: 215).**

**The researcher defines deductive thinking as procedural: a mental process in which a set of explanations based on observations is interpreted, and it is measured by the degree that students get when they respond to the paragraphs of the deductive reasoning test prepared for the purposes of the current research.**

### **Theoretical background:**

In the current era, the era of communication, technology, globalization and speed, the development of thinking and its skills has become a necessity, and the ultimate goal of education has become the development of thinking. Efforts towards teaching thinking processes, to enable students to face new challenges, and to give them the ability to solve problems and make sound decisions in light of the multiplicity of options and their differences, as one of the important means to reach this goal (Thabit, 2003: 122)

Faced with this reality, the importance of developing thinking emerges and teaching its skills and processes that remain valid and renewable in terms of their usefulness and uses in processing information. Knowledge and information are important, but often become old. As for thinking skills, they remain new at all and enable us to acquire knowledge and infer it regardless of place and time. Or the types of knowledge that use thinking skills to deal with. (Jerwan, 2002: 28) And the types of thinking are many and varied, including critical, creative, contemplative, deductive, and deductive ... and other modes of thinking. Inferential thinking includes reaching the conclusion there are no known introductions, and this is what distinguishes inference from other types of thinking and reasoning that requires the intervention of operations The higher mentality, such as remembering, imagining, judgment, understanding, insight, abstraction, generalizations, planning, distinction, reasoning, criticism and conclusion, and inferential thinking is the ability to logical reasoning, deduction, and perception of relationships to link between causes and results, and it includes processes such as abstraction, reaching generalizations, establishing relationships, and reaching solutions to problems. And the evaluation of opinions and deduction of conclusions (Rips, 1990) and the conclusion is a pattern of analytical thinking descending from the faculties to the parts, and from top to bottom, or explaining a specific note and linking it to previous information, interpreting these observations and issuing specific judgments, and from the requirements of tribalism to learn the deduction process the ability to Interpretation, and on linking and analysis of the data given (Al-Afun, and Muntaha, 2012,393), which is a process of logical inference It aims to reach a conclusion or new knowledge based on assumptions or

introductions made and available information, and the deductive evidence takes the form of a symbolic or linguistic structure, the first part includes one or more hypotheses that pave the way to reach an inevitable conclusion, and the second part is some or part of the first part. (Groane, 1999: 12 :)

### **Research methodology and procedures**

The descriptive method was chosen as it is the most appropriate method for studying the phenomenon as it actually is, and it is concerned with being an accurate description, and it expresses it quantitatively and qualitatively.

#### **Search procedures:**

##### **research community**

The research community includes (32882) students from the fourth scientific grade in the morning schools (public sector) in the three general directorates of education in Baghdad Al-Karkh (first, second, and third), by (17513) females by (53.26%), and (15369) Male (46.74%), for the academic year (2020-2021).

#### **The research sample:**

(400) male and female students from the fourth scientific grade from the three Karkh education directorates schools (first, second, and third) were selected by the Stratified Random Sample, with a proportional distribution of (154) males, and (246) Females.

#### **search tools**

1. The deductive thinking test: The scale was prepared according to the following steps:

- Defining the concept of inferential thinking

Formulating the test items: In order for the test to be accurate in its measurement, it is necessary:

- We define the behavior to be measured clearly and precisely, so the researcher adopted Robertson (2001) definition of deductive thinking: that (a mental process in which a set of explanations based on observations and these observations is interpreted, some of which are affected by previous experience).
- Access to the available tests that dealt with inferential thinking, such as the Tobin and Capie test (Tobin & Capie, 1981), (Al-Qadiri, 2002), and (Al-Harishawi 2014).
- Interviewing a group of experts in educational and psychological sciences to get acquainted with the skills that constitute in their subjects the deductive thinking of middle school students.
- Based on what was done in the previous steps, the researcher obtained (25) items representing the test items in its initial form, Appendix (2).

#### **The apparent validity of the paragraphs of the deductive reasoning test**

For the purpose of identifying the validity of the paragraphs (apparent truthfulness), the test was presented to (14) arbitrators in educational and psychological sciences, Appendix (3) to verify the veracity of its paragraphs, and the calculated Chi-Square value was used as a criterion for deleting the paragraph, if its calculated value was less. From the tabular value, and accepting it if the calculated value is greater than the tabular, and it has been found that the value of the chi-square calculated for all test items is greater than the tabular value of (3.84) at the level of significance (0.05) with a degree of freedom (1), except for paragraph (19).

**Setting scale instructions:**

Clear, appropriate and understandable instructions were prepared for fourth-level students, and included the method of answering, and a model answer was developed to guide it.

**Scale correction method:**

For each paragraph (4) alternatives for the multiple choice answer, one score is given for the correct answer, and zero for the wrong answer.

**Clarity of paragraphs and time taken to answer:**

(30) students were selected from the high school of the martyr Muhammad Baqir al-Sadr of the Baghdad Education Directorate Al-Karkh II, and it was found that the paragraphs are clear for the members of the sample, and it became clear that the time required to answer the paragraphs of the deductive reasoning test ranged between (20-30) minutes with an average of (25) minutes .

**Statistical analysis of the scale paragraphs**

Verification of the psychometric properties of educational and psychological standards and tests is one of the basic requirements, as it is an indicator of the quality of the scale in measuring what was prepared to measure so that it can be trusted to measure the characteristic or phenomenon (Zeller & Carmines, 1980: 77).

**Sample statistical analysis**

(400) male and female students from the fourth scientific grade from the three schools of Karkh Education Directorates (first, second, and third) were chosen by the random stratified method, with a proportional distribution of (154) males and (246) females.

**Psychometric properties of the deductive reasoning test.****Constructive honesty****The difficulty factor and ease of paragraphs:**

After applying the test, the answers were corrected and their total scores were arranged in descending order, and a percentage (27%) was chosen from the upper group and (27%) from the lower group, and in light of this percentage, the number of forms in each group reached (108) forms.

To verify the difficulty and ease of the deductive reasoning test items, the equation for the objective items was applied, and it was found that the difficulty coefficients ranged between (0.26 - 0.61), and the ease coefficients ranged between (0.39-0.69), and the test items were acceptable.

**Paragraph discrimination coefficient:**

And it means the ability of the paragraph to distinguish between students with higher levels and students with lower levels, with respect to the characteristic that the test measures (Al-Zahir and others, 1999: 129).

When calculating the paragraph discrimination coefficient for each of the objective paragraphs using the discrimination equation, it was found that it ranges between (0.41-0.59), and the test is good if the strength of discrimination of its paragraphs is (0.20) and above.

### **The effectiveness of false substitutes**

The formula for the effectiveness of the wrong alternatives was adopted for all the paragraphs, and it was found that the effectiveness coefficients of all alternatives (the wrong ones are negative), meaning that these alternatives attracted more to them than the students of the lower group compared to the answers of the students of the higher group, and accordingly the substitutes of the paragraphs were preserved.

### **The relationship of the paragraph score to the total score of the test:**

As the Pearson correlation coefficient was calculated, to extract the correlation between the score of each of the test items and the total score of the test.

### **Stability of the deductive reasoning test**

(Internal consistency method) (Kiodor Richardson KR20 equation)):

The test's stability was verified by the internal consistency method. The Chardorson equation 20 was used for a random sample of (200) male and female students from the statistical analysis sample, and the correlation coefficient in this way reached (0.76). 0.70 - 0.90) of the general balance of the correlation coefficients indicators.

### **Descriptive statistical indicators for the test**

#### **Final reasoning test**

The final reasoning test consists of (24) items, so the highest score for the test is (24), and the lowest score is (zero), with a theoretical average (12).

### **Presentation, interpretation and discussion of results**

#### **Identifying the level of inferential thinking among middle school students:**

To verify the goal, the deductive reasoning test was applied to the research sample of (400) male and female students, and it was found that their average score on the test was (13.67), with a standard deviation of (4,647) degrees, and to know the significance of the difference between the arithmetic average and the theoretical average that reached (12) degrees. The t-test was used for one sample and it was found that the calculated T value reached (7.187), which is greater than the tabular T value of (1.96), with a degree of freedom (399) and a level of significance (0.05), and this means that the students have a high degree of Deductive thinking.

Table of arithmetic mean, standard deviation, and t-value of the inferential reasoning test

The number, the arithmetic mean, the standard deviation, the hypothetical mean, the degree of freedom, the T-value, the statistical indication 0.05 level

#### **Computed tabular**

400 13.67 4.647 12 399 7.187 1.96 is a statistically significant function

This result is consistent with Piaget's assumptions in his model (cognitive advancement), as he sees that the individual at this age (adolescence) can use the rules of logical inference (induction and deduction, syllogism, and control of variables) as well as understanding the relationship between cause and effect, and this view supports Robertson, 2001), which affirms that the individual at this stage has the skills: drawing conclusions from a set of observations, identifying indicators that support conclusions, distinguishing between observation and conclusion, and accepting or rejecting the conclusion reached by relying on the available observations.

This result is attributed to the fact that students of the fourth science, who are in the stage of formal thinking, are able to generalize experiences on life situations by using thinking skills in general and deductive thinking skills in particular, in addition to that the specialization of the fourth scientific students, may be one of the reasons for their having a good level of these skills. The nature of the curriculum vocabulary for fourth grade science, as the scientific environment plays an important role in the development of skills and mental abilities.

The chemistry teacher should invest in learning and teaching strategies and modern teaching methods when presenting the vocabulary of the subject to enable his students to acquire these skills by allowing them to verify the validity of scientific principles, laws and rules, and to train them to conclude information in light of the available rules and principles, and to discuss with them. In the details they are expected to know about; Because they studied the generalities that fall under those molecules.

### **Conclusions:**

In light of the results reached, the following conclusions can be formulated:

1. Middle school students have the ability to use the rules of logical inference from the general to the specific.
2. Middle school students have the ability to make judgments about chemical subjects, in light of his evaluation or appreciation of these topics, through their interaction with the surrounding environment.

### **Recommendations:**

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

1. Employing deductive thinking in school curricula in general, and in chemistry curricula in particular.
2. Suggest strategies that develop inferential thinking.

### **The proposals:**

To complement the current research, the researchers suggested conducting the following studies:

1. Analysis of chemistry books for the preparatory stage according to the skills of the twenty-first century.
2. The impact of a training program according to the skills of the twenty-first century in the creative teaching of chemistry teachers, and the deductive thinking of their students.

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