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Research Article

Analytical thinking and its relationship to logical intelligence for scientific fifth-grade students in mathematics

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Abstract

The aim of the research is to identify the correlational relationship between analytical thinking and logical intelligence among fifth-grade scientific students in the Directorate of Education in Diwaniyah in mathematics, and in order to verify the goal, the researchers adopted the descriptive approach to conform to the nature of the research, and the following null hypotheses were formulated:

1) There are no statistically significant differences at the level of significance (0.05) between the average true and hypothetical performance of fifth grade students in the Diwaniyah Education Directorate in the analytical thinking test.

2) There are no statistically significant differences at the significance level (0.05) between the mean scores of male and female students in analytical thinking.

3) There are no statistically significant differences at the level of significance (0.05) between the average true and hypothetical performance of the fifth grade students in the Diwaniyah Education Directorate in the logical intelligence test.

4) There are no statistically significant differences at the significance level (0.05) between the mean scores of male and female students in logical intelligence.

5) There is no statistically significant correlation at a significance level (0.05) between analytical thinking and logical intelligence among the fifth scientific students (biological) in the Diwaniyah Education Directorate.

6) There is no statistically significant correlation at a significance level (0.05) between analytical thinking and logical intelligence among students of the fifth scientific (biological) in the Diwaniyah Education Directorate.

Then the research community was identified, represented by the scientific (biological) fifth-grade students in the Directorate of Education in Diwaniyah, and the sample was chosen by the stratified random method as it consisted of (400) students and by (176) students and (224) students, and the two research tools were built: the analytical thinking test and the logical intelligence test And application to the sample, then conducting statistical analyzes of the paragraphs of the two tests and making sure of the psychometric properties and using the appropriate statistical tools and statistical package (spss) to analyze the results of the application of the two tests, and the following results were revealed:

1) Fifth-grade students possessing the scientific (biological) in the Diwaniyah Education Directorate for analytical thinking.

2) There is no difference between male and female students in having analytical thinking.

3) Fifth-grade students do not possess science (biological) in the Diwaniyah Education Directorate for Logical Intelligence.

4) There is no difference between male and female students in having logical intelligence.

In light of the results of the current research, a number of recommendations and proposals have been drawn up concerning the educational field and the field of scientific research, including:

1) Directing the attention of those in charge of educational institutions in the number of different curricula, which include analytical thinking skills and areas of logical intelligence in mathematics curricula and for all academic levels and not being limited to information only.

2) Conducting similar research on other societies and stages of study to find out the extent of their possession of analytical thinking and logical intelligence, as well as the relationship of analytical thinking with other types of multiple intelligences to know the nature of the relationship and its direction.

Keywords :Analytical thinking, logical intelligence.

Chapter One: Definition of Research

First: Research Problem:

All educational and educational institutions have sought, since decades of the last century, to make education based on training students to think and move away from methods of memorization and indoctrination, and we live today in light of rapid changes and transformations and technological development, as the scientific material presented to students has become very large, which led to the difficulty of students' ability To store the information provided to them and the emergence of many difficulties in the education process, which led to resorting and relying on teaching students how to think and considering this one of the main goals and priorities that educational institutions seek to achieve.

The two researchers touched on the research problem from the data collected through the exploratory questionnaire, which included a set of questions directed to a sample of the fifth scientific students (biological), and after reviewing the students 'answers, it was revealed that their level of thinking is weak in their logical mental abilities and dealing with numbers and symbols as well as their weak level of thinking General and analytical thinking in particular, as their answers indicated the use of memorization and indoctrination without analyzing and dividing the situations they are exposed to into their sub-parts and knowing the relationships between them in order to be able to collect information and arrive at solutions and correct them in order to take appropriate decisions in line with the situation.

Therefore, the two researchers saw that the current research seeks to answer the following questions:

1) Do fifth-grade students of science (biological) in the Diwaniyah Education Directorate have analytical thinking?
2) Is there a difference between male and female students in having analytical thinking in the research sample?
3) Do the fifth grade students (biological) in the Diwaniyah Education Directorate possess logical intelligence?
4) Is there a difference between male and female students in having logical intelligence in the research sample?
5) Is there a correlation between analytical thinking and logical intelligence among the scientific (biological) fifth-grade students in the Diwaniyah Education Directorate? What is its type?
6) Is there a difference between male and female students in the correlational relationship between analytical thinking and logical intelligence in the research sample?

Second: Importance Research:

(Qatami, 2014) believes that analytical thinking is one of the finest types of thinking as it requires students to analyze issues, problems and facts before making judgments about them and their validity. Analytical thinking is regular, sequential and sequential thinking with steady steps in its development as it makes students' thinking go through multiple stages and with defined standards. Their success out.

(Qatami, 2014: 654)

Intelligence represents competence and the ability to solve problems or creativity in producing new things of distinctive value in a culture or society. (Salah, 2010: 23)

The need for thinking capabilities and intelligence increases in the era of information development based on knowledge, and any shortcomings in these aspects would put students in the face of the challenges of this age more than ever before, and in light of this great importance of thinking and intelligence, the need for a future outlook related to the study of thinking emerges. And intelligence and its measurement. (Ghanem, 2009: 81)

The importance of the current research is evident in identifying the nature of the correlational relationship between analytical thinking and logical intelligence among fifth-grade scientific students, as they are the conscious and educated youth group that helps develop and advance society.

Third: Research Objectives:

The current research aims to study the correlational relationship between analytical thinking and logical intelligence among fifth-grade students in the biological sciences in the Diwaniyah Education Directorate.

Fourth: Hypotheses Research:

1) There are no statistically significant differences at the level of significance (0.05) between the average true and hypothetical performance of fifth grade students in the Diwaniyah Education Directorate in the analytical thinking test.
2) There are no statistically significant differences at the significance level (0.05) between the mean scores of the students And students in analytical thinking.
3) There are no statistically significant differences at the level of significance (0.05) between the average true and hypothetical performance of the fifth grade students in the Diwaniyah Education Directorate in the logical intelligence test.
4) There are no statistically significant differences at the significance level (0.05) between the mean scores of male and female students in logical intelligence.
5) There is no statistically significant correlational relationship at a significance level (0.05) between analytical thinking and logical intelligence among the fifth scientific students in the Diwaniyah Education Directorate.
6) There is no statistically significant correlational relationship at a significance level (0.05) between analytical thinking and logical intelligence among the scientific fifth students in the Diwaniyah Education Directorate.
7) There is no statistically significant correlational relationship at a significance level (0.05) between analytical thinking and logical intelligence among the fifth scientific students in the Diwaniyah Education Directorate.

Fifth: Research Limits:

The current search procedures were determined by a set of limits, as they included:
The objective limit: (the variables of analytical thinking and logical intelligence) and the human limit: (students of the scientific fifth grade (biological)), the spatial limit: (the Directorate of Education of Diwaniyah in the Governorate of Diwaniyah), and the temporal limit: (the first semester of the academic year 2021/2020).

Sixth: Items Determination:

1) Analysis Thinking:

Define it (Gregory, 1988): that it is a pattern of thinking and it is represented by the students' ability to confront the problems they face by dividing them into their parts on a regular basis, good planning and attention to details before making a decision and being able to collect as much information as possible and the ability to clarify things and reach Distinguished conclusions based on facts and information.

(Gregory, 1988: 101)

- The two researchers know it procedurally that: It is a mental activity and it is represented by the students' ability to confront the problems that they are exposed to by dividing them into their sub-parts on a regular basis. Analytical thinking prepared for them.

2) Logical Intelligence:

He defined it (Gardner, 1997): as the students' ability to analyze mathematical problems based on the rules of mathematical logic, the ability to generate mathematical hypotheses, examine problems and issues logically, deal with numbers and solve mathematical and engineering problems of high complexity by developing hypotheses and building abstract relationships that take place Through inference by symbols. (Gardner, 1997: 93)

- The researchers know it procedurally: It is the students' ability to analyze mathematical problems depending on the rules of mathematical logic and the ability to generate mathematical hypotheses, deal with numbers easily and solve mathematical

puzzles, and it is measured by the degree that students of the fifth grade obtain in the scientific (biological) test of logical intelligence, which was prepared for the purpose of research .

The second semester: background theory and previous studies

The first axis: background theory
Analytical Thinking:

Thinking is one of the most important goals that educational institutions seek to achieve.
(Al-Maamouri, 2010: 12)

(Al-Atwani, 2011) refers to analytical thinking that it is a mental skill that requires students to be able to divide situations, relationships and things into their elements. The analysis skill requires the learner to divide information and topics into their small parts, find hypotheses or axioms, identify differences between facts and characteristics, and discover causal relationships between the elements of the situation. Shaper. (Al-Atwani, 2011: 11)

■ Analytical thinking skills:

Analytical thinking has many skills, and many researchers such as (Mahmoud, 2017: 148) and Richard Hersh (2006: 87) and Sternberg (Sternberg, 2003: 51) agree that among the most important analytical thinking skills that should be taught to students are as follows:

1) Defining Characteristics: It is the ability to determine the name or common features and distinguishing characteristics of things.
2) The relationship of the part to the whole: it is the relationship of things to their components, that is, knowing the small parts that make up the whole, then knowing what would happen to the whole if this part of it had been lost and knowing its relationship to the whole.
3) Active observation procedure: is the ability to choose appropriate tools, features and procedures that guide and assist in the information gathering process.
4) Comparison and interview: that is, the ability to examine two ideas or two situations to discover points of similarity and points of difference and to identify general characteristics that help to find differences between objects and ideas.
5) Grouping and tabulation: is the ability to group and classify similar objects or elements into groups that include specific features or characteristics that were previously constructed.
6) Classification: It is the ability to classify information, organize it and put it into groups, through the use of tables, symbols, or circles.
7) Arrangement and sequence: It is the ability to place events, information and things in a specific order
Or an idea after another, according to (quantity, type) or according to value and priorities.
8) Finding patterns: is the ability to recognize the special differences between two or more characteristics in a specific relationship that lead to a repeating pattern.
9) Relationship vision: is the ability to compare ideas in order to define the system between operations.
10) Determine the cause and effect: is the ability to determine the causes and consequences through the use of information possessed by the individual and previous events to arrive at results.
11) Measuring procedure: that is, determining the relationships between familiar items or familiar events and similar items and events in new situations for the purpose of solving a problem or creative production.
12) Generalization: It is used to build a group of phrases, sentences and broad-meaning ideas that are derived from the relationships between concepts and can be applied in most issues and events if not in all of them.

Second: Logical Intelligence:

Logical Intelligence:

Logical intelligence is the basis of difficult natural sciences and all kinds of mathematics, and students who use logical intelligence tend to rationalize and they are usually of a good level in finding patterns, establishing cause-and-effect relationships, conducting scientific experiments and creating sequences, and they generally find them thinking in the language of concepts and logic, and they are distinguished by frequent questioning. (Harvey and others, 2006: 8)

Logical intelligence appears at its basic level in students' ability to perform counting and classification operations, knowing numbers, linking numerical symbols with corresponding objects and performing inferential operations, and it reaches its complex level in students 'ability to perform organized mathematical operations and calculations and employ a group of them in solving problems and having abstract thinking that depends on Concepts and understanding mathematical procedures and logical diagrams, employ mathematical operations and find unknown quantities while solving complex problems, use logical thinking and perform inductive and deductive operations. (Al-Faqihi, 2012: 36)

Logical intelligence is the ability to analyze problems logically, use mathematical operations easily, study issues scientifically, and deal with a large series of conclusions, such as scientists, mathematicians, and computer programmers. Logical intelligence can be developed through mathematical problems, deduction, scientific experiments, logical exercises, games and mathematical puzzles. (Mimar, 2006: 90)

Areas of logical intelligence:

Through reviewing the literature and definitions of this variable and consulting a number of specialists in the field of psychology and methods of teaching mathematics, areas of logical intelligence that are commensurate with the scientific level of fifth-grade students and their mental abilities have been identified, and the researchers have relied on the following areas:

1) Numerical sense: It is represented by a general understanding of numbers and arithmetic operations on them, and it also includes ability

To use that understanding in flexible ways to make mathematical judgments, in addition to using cognitive strategies in number processing and operations on them. (Reys & Yang, 1998: 226)

2) Perception of relationships between shapes and patterns: is the ability to recognize and perceive the relationship between ideas

And between the shapes and patterns and knowing the characteristics that help in the process of gathering information for them.

3) Problem Solving: It is a set of sequential steps that an individual goes through in order to reach a solution to the problem he faces, and requires him to use previously learned concepts and rules and generate new concepts to define the problem and search for a solution to it.

(Al-Afoun & Abdel-Saheb, 2012: 48-50)

4) Logical thinking: it is thinking that is based on valid or assumed assumptions and deals with them with a logical analogy that includes the introductions and the consequent results, and it means knowing the reasons behind things and the results of what the individual does in terms of actions while being keen to obtain evidence that proves the validity of the point of view. Specified or denied.

(Attieh, 2015: 126)

5) Solving mathematical puzzles: The riddle is intended: that it is a new situation that the individual is exposed to for the first time, and this position has no ready solution for the individual, so it represents a real problem that requires the individual to perform mental operations and use multiple modes of thinking to reach the solution of the puzzle.

6) Mathematical guessing: It is meant by guessing: that it is the conscious guessing of conclusions from the data, and it is referred to as intuitive thinking, and guessing in mathematics is the procedure or process of obtaining an answer to a situation or problem so that that answer is very close to reality.

(Al-Absi, 2009: 41)

7) Comparison: is the ability to compare numbers and things or put them in mathematical arrangements, which are those that are used to examine two ideas to discover similarities and points of difference. (Al-Ashqar, 2011: 47)

The second axis: previous studies:

First: Previous studies dealing with analytical thinking:

1 (The study of Abu Aqeel, Ibrahim Muhammad (Palestine, 2011):

This study aimed to find out the level of analytical thinking in solving problems among students of Hebron University and its relationship to some variables. The researcher relied on the descriptive approach for its compatibility with the nature of the study.

2) Raja Study, Jinan Ahmad (Iraq, 2019):

The study aimed to find out the effectiveness of the aquarium strategy in the achievement and analytical thinking of the second-year intermediate students in mathematics. The researcher used the experimental method for its suitability to the subject of the study.

3) The study of Khalifa, Rawnaq Kazim (Iraq, 2020):

The study aimed to identify the extent to which analytical thinking skills are included in the third grade textbook Medium The researcher followed the descriptive and analytical method for its relevance to the subject of the study.

Second: Previous studies dealing with logical intelligence:

1) Al-Sheikhly study, Ban Hassan Majeed (Iraq, 2013):

The study aimed to measure logical intelligence and its relationship to the decision-making skill of students of the Faculties of Education in Baghdad governorate. The researcher used the correlational descriptive method for its relevance to the subject of the study.

2) Khalil's Study, Samah Jamal (Palestine, 2016)

The study aimed to measure the level of logical intelligence and its relationship to mathematical anxiety among sixth grade students in the Hebron Education Directorate. The researcher used the relational descriptive approach.

3) Al-Obaidi, Bashar Salah's study (Al-Arak, 2017):

The study aimed to identify the effect of an instructional strategy according to the PQ4R strategy on achievement and logical intelligence of second-grade intermediate students. The researcher used the experimental approach because it is compatible with the nature of the study.

Chapter Three: Research Procedures

First: Research Methodology:

The descriptive approach was relied upon, because it is the most appropriate approach in studying the correlational relationships between variables and revealing the differences between them, as the descriptive approach works by studying the phenomenon as it is in reality and is concerned with describing an accurate description in order to reach the results that

contribute to change and express it in a quantitative and qualitative manner. And to determine the relationship between its elements or between them and another phenomenon (Melhem, 2002: 324)

Second: Research Population:

The current research community is represented by all fifth-grade students studying in all governmental preparatory and secondary schools in the Diwaniyah Education Directorate in the Diwaniyah Governorate for the academic year (2020/2021), as the number of students reached (5382) distributed in (59) middle and high schools.

Third: Sample of Research:

A - sample information (sample clarity of instructions and wording of paragraphs):
The two researchers randomly selected (40) students from the fifth grade of science (biological) in the Directorate of Education of Diwaniyah to represent the sample of information and the purpose of this sample is to apply the two research tools to the individuals of the sample in order to identify the clarity of the items of the two tests as well as to determine the appropriate time for the answer.

B _ Statistical analysis sample:
The statistical analysis sample was chosen by the stratified random method, depending on the formula for determining the sample size for the purpose of making the appropriate statistical adjustments for the research tools . (Afaneh, 1997: 325)
The size of the statistical analysis sample reached (400) of the fifth grade students (biological) in the Diwaniyah Education Directorate.

C- Basic tools application sample:
The sample size of the application of tools was determined based on the equation (Afaneh, 1997) and consisted of (400) students, who were chosen by a stratified randomized method from the schools of the Diwaniyah Education Directorate

Fourth: Research Tools:

In order to achieve the goal of the current research, it is necessary to prepare two tools to measure analytical thinking and the other to measure logical intelligence. The process of building the two tests requires passing through several stages, namely:

1- Determining the purpose of the two tests:
The aim of the two tests is to measure the analytical thinking and logical intelligence of the scientific (biological) fifth grade students in the Diwaniyah Education Directorate.

2- Determining analytical thinking skills, areas of logical intelligence:
In determining the analytical thinking skills and areas of logical intelligence, the two researchers relied on educational literature and consulted with a number of masters in the field of mathematics and methods of teaching it.

3- Presenting the skills and fields to the gentlemen of the arbitrators:
After determining the analytical thinking skills and areas of logical intelligence, they were presented to a group of educators in education and specialization in methods of teaching mathematics, to express their opinions and observations on their suitability for the purpose for which they were prepared. If that was approved by (%91.30) of the opinions of the arbitrators.

4- Drafting of the two test items:
The paragraphs of the two tests were formulated, and the researchers prepared (16) essay paragraphs to test analytical thinking and (16) objective paragraphs with a specific answer to the logical intelligence test.

5- Preparation of instructions for the two tests:

Instructions for two tests were formulated and taken into account to be clear and included how to answer the paragraphs of the two tests and not leave any paragraph unanswered and the time specified for the answer, and to indicate that the test results obtained are for scientific research purposes and are not used for other purposes.

6- Application to sample information:

The analytical thinking test was applied on Wednesday 20/1/2021, and the logical intelligence test was applied on Tuesday 26/1/2021 on the same sample consisting of (40) students from the fifth grade of science (biological) in the Diwaniyah Education Directorate. They were asked to read the instructions and pay attention to the test paragraphs and allow them to inquire about any ambiguities. It became clear that the instructions are clear and that the test items are understandable to all students. As for the time taken to answer the analytical reasoning test, it reached (75) minutes and the logical intelligence test (65) by calculating the mean Arithmetic for the completion time of the first (5) students and the last (5) students during the test time.

7- Application to the statistical analysis sample:

After the researchers verified the possibility of applying the test items through clarity of instructions and specifying the appropriate time for the answer, the two tests were applied to a statistical analysis sample consisting of (400) male and female students who were randomly selected stratified from middle and high schools in the Diwaniyah Education Directorate.

8- Correcting the two tests:

The researchers set the typical answers for all the items of the two tests and determine the degree of the answer for each paragraph. The grades of the two test items differed, and each paragraph was given in proportion to the score and ranged between (2-6) a score in the analytical thinking test and according to the steps for each paragraph, and the total score of the test is (64). The logical intelligence test The correction key was relied on (0, 1) and the total score of the test is (16)

9 - Statistical analysis of the two test items:

The two researchers arranged the students 'answer forms in descending order after completing the correction of the two tests. The percentage of the upper group was (%27) of those who obtained the highest grades and the percentage of the lower group (%27) of those who obtained the lowest grades, and the number of students in each group was (108) students.

The indicators of statistical analysis include the following:

A - The difficulty factor for the test items:

The computation of the difficulty factor is necessary in the statistical analysis of the paragraphs of the two tests, and through it the deletion of the paragraph that is difficult or very easy is determined, and the difficulty coefficients for the analytical thinking test ranged between (0.37 -0.50), and the difficulty coefficients for the logical intelligence test ranged between (0.39-0.63) By extracting the results, it was found that all the test items were acceptable and within the specified range, as indicated by many sources, as (Odeh and Fathi, 1987) indicated that the paragraph that is within the distribution of the difficulty factor whose range ranges between (0.20-0.80) is acceptable.

(Odeh and Fathi, 1987: 128)

B - the discriminatory power of the test items:

Discriminatory power means the ability of the paragraph to distinguish between students with higher levels and lower levels in relation to the characteristic measured by the tool. (Back, 1998: 293)

The two researchers used the appropriate equation for the discrimination coefficient and found that the degree of discrimination for the items of the analytical thinking test ranged between (0.3-0.7), and the discrimination coefficient for the logical intelligence items ranged between (0.4 - 0.6) and all the paragraphs were acceptable, indicating (Al-Zahir and others, 1999) that The paragraph is acceptable if the percentage of the coefficient distinguishes it (%20) or more, and it is weak when it is less than this percentage. (Al-Zahir and others, 1999: 132)

10- Verifying the psychometric properties: These include truthfulness and consistency

A - Validity: The validity of the test was verified in two ways, namely:

1 - Face Validity:
All the paragraphs of the two exams were presented in their preliminary form to the referees in the field of mathematics and the methods of teaching them to verify the extent of the representation and suitability of the paragraphs to the field to be measured and for the test as a whole, and after collecting the opinions of the referees, those opinions and directions that were put forward for the paragraphs of the two tests were taken.

2 - Building validity for the two tests:

The construction validity was verified based on the following methods:

a- The correlation coefficient of the scores of each paragraph with the respective field scores:
This was verified by finding the pearson correlation coefficient between the degree of each paragraph with the degree of its field. * It is a statistically function.

b- The correlation coefficient between the scores of each field and the overall test score:
The pearson correlation coefficient was relied on between the scores of each field with the total score of the test, and it ranged in the analytical reasoning test between (0.588** - 0.724**), and in the logical intelligence test it ranged between (0.512** - 0.671**) Show that all the coefficients are a statistical function.

c- The correlation coefficient between the scores of each paragraph and the overall test score:
It was verified by using the pearson correlation coefficient between the scores of each paragraph with the total test score, and it was found that all the correlation coefficients are statistically significant. The results of the analytical reasoning test ranged between (0.245** -0.580**), while the logical intelligence test ranged between (0.349** - 0.477 **) .

B - Scale Reliability:

Stability means that the test tool will give the same or similar results if it is repeatedly applied again on the same individuals and under the same conditions. (Abbas et al., 2014: 266)

The two researchers relied on the stability of the analytical thinking test on the Alpha-Cronbach equation to find the reliability of the analytical thinking test to the scores of the statistical analysis sample in order to ensure the consistency and consistency of the answers on all the test items. The use of the Koder-Richardson equation 20 to find the stability of the logical intelligence test, and the test reliability coefficient was (%78) based on the Coder-Richardson equation 20 and it is good for the test reliability, as (Al-Assaf, 2003) indicates that the test is stable if its stability value is (%67) And above.
(Al-Assaf, 2003: 237)

Fifth: The final application of tests on the research sample:

The two tests were applied to the research sample consisting of (400) male and female students of the fifth grade of science (biological). The size of the sample on which the test was applied is large commensurate with the size of the research population.

Chapter Four: Findings and Their Interpretation

First: Presenting and Interpreting the Results:

This chapter includes a presentation of the results related to the research objectives by answering the following questions:

1) Do fifth-grade students in the Diwaniyah Education Directorate have analytical thinking?

The following null hypothesis was derived from it: **(There are no statistically significant differences at the level of significance (0.05) between the average real performance and the hypothetical performance of the fifth-grade scientific students in the Diwaniyah Education Directorate in the analytical thinking test).**

A single sample t-test was used to confirm this null hypothesis

The group	average	Standard deviation	t-test	Indication level	Indication
True average	36.80	14.010	6.856	0.000	significance
Hypothesized average	32				

The result was that the arithmetic mean of the real performance of students is (36.80) and the hypothetical average is (32). And by comparison between the true and hypothetical averages, which is called the theoretical average, it was found that the level of significance (0.000) is less than the level of approved significance (0.05). This indicates that the difference is statistically significant between The real and hypothetical averages are in favor of the true mean, and this means that the fifth-grade students have analytical thinking because the theoretical mean is statistically significant.

2) Is there a difference between male and female students in having analytical thinking in the research sample?

The following null hypothesis was derived from it: **(There are no statistically significant differences at the significance level (0.05) between the mean scores of male and female students in analytical thinking).**

The t-test was used for two independent samples to verify the validity of the null hypothesis and to answer the question whether there is a difference between male and female students in analytical thinking.

Sex	average	Standard deviation	t-test	Indication level	Indication
Students	34.34	13.872	3.149	0.663	Non-significant
Female students	38.74	13.843			

The result was that the value of the t-test is (3.149) at the level of significance (0.663), which is greater than the level of significance adopted (0.05). This indicates that there are no differences between male and female students in their possession of analytical thinking.

3) Do fifth-grade students at the Diwaniyah Education Directorate possess logical intelligence?

The following null hypothesis was derived from it: **(There are no statistically significant differences at a significant level (0.05) between the average real performance and the hypothetical performance of fifth-grade students in the directorate Diwaniyah education in the logical intelligence test).**

To test the validity of the hypothesis, the two researchers used the t-test for one sample and reached that

The group	Average	Standard deviation	t-test	Indication level	Indication
True average	6.87	3.288	6.859	0.000	significance
Hypothesized average	8				

The students' real arithmetic mean is (6.87) and the hypothetical average is (8). Through the comparison between the true and hypothetical averages, which is called the theoretical average, it becomes clear to us that the level of significance (0.000) is less than the adopted level of significance (0.05), meaning that the difference is statistically significant between the mean The real and the hypothetical average is in favor of the hypothetical average. This indicates that the fifth-grade students in the Diwaniyah Education Directorate do not possess logical intelligence.

4) Is there a difference between male and female students in having logical intelligence in the research sample?

The following null hypothesis was derived from it: **(There are no statistically significant differences at the significance level (0.05) between the mean scores of male and female students in logical intelligence).**

The researchers used the t-test for two independent samples to verify the validity of the null hypothesis and to answer the question Is there a difference between male and female students in thinking logical intelligence

Sex	average	Standard deviation	t-test	Indication level	Indication
Students	6.34	3.256	2.893	0.216	Non-significant
Female students	7.29	3.259			

The result was that the value of the t-test is (2.893) at the level of significance (0.216), which is greater than the level of significance adopted (0.05). This indicates that there are no differences between male and female students in their possession of logical intelligence.

5) Is there a correlation between analytical thinking and logical intelligence among fifth-grade scientific students in the Diwaniyah Education Directorate? What is its direction?

The following null hypothesis was derived from it**: (There is no statistically significant correlation relationship (0.05) between analytical thinking and logical intelligence among fifth-grade scientific students in the Diwaniyah Education Directorate).**

The researchers used the pearson correlation coefficient to verify the null hypothesis

Variables	Average	Standard deviation	correlation coefficient	Indication level	Indication
Analytical thinking	36.80	14.010	0.635 **	0.000	significance
Logical intelligence	6.87	3.288			

It was found that the average degree of analytical thinking was (36.80) and the standard deviation (14.010), and that the average degree of logical intelligence was (6.87) and the standard deviation (3.288). By using the Pearson correlation coefficient to find the relationship between the research variables, it was found that the correlation coefficient is (0.635 **) at the level of Significance (0.000), which is less than the approved level of significance (0.05), which is statistically significant, and this indicates the existence of a good positive correlation relationship because the value of the correlation coefficient is confined to (0-1) and whenever the value approaches (1), the correlation coefficient is strong, and this indicates The existence of a positive correlation between analytical thinking and logical intelligence among the fifth scientific (biological) students in the Diwaniyah Education Directorate.

This result is considered natural after reviewing the literature on thinking and intelligence, as they are capabilities An overlapping mentality and explain one of the other two are fundamental to the educational process. (Al-Suroor, 2000: 271)

6) Is there a difference between male and female students in the correlation between analytical thinking and logical intelligence in the research sample?

The following two sub-zero hypotheses were derived from it:

1- There is no statistically significant correlational relationship at a significance level (0.05) between analytical thinking and logical intelligence among scientific (biological) fifth-grade students in the Diwaniyah Education Directorate.

The researchers used the pearson correlation coefficient to verify the null hypothesis

Variables	Average	Standard deviation	correlation coefficient	Indication level	Indication
Analytical thinking	34.34	13.872	0.600**	0.000	significance
Logical intelligence	6.34	3.256			

And it became clear to us that the average degree of analytical thinking was (34.34) with a standard deviation (13.872) and that the average score of logical intelligence was (6.34) and a standard deviation (3.256). After using the Pearson correlation coefficient to find the relationship between the research variables among students, it was found that the correlation coefficient was (0.600 **). At the level of significance (0.00), which is less than the approved level of significance (0.05), which is statistically significant, That is, this indicates the existence of a good positive correlation relationship because the value of the correlation coefficient ranges between (0-1) and whenever the value approaches (1), the correlation coefficient is strong and thus a good positive correlation relationship is because the values of the correlation coefficient are strong, and this indicates the existence of a positive correlation between thinking Analytical and logical intelligence of students

2- There is no statistically significant correlational relationship at (0.05) level between analytical thinking and logical intelligence among the scientific (biological) fifth-grade students in the Diwaniyah Education Directorate.

The researchers used the pearson correlation coefficient to confirm the hypothesis

Variables	Average	Standard deviation	correlation coefficient	Indication level	Indication
Analytical thinking	38.74	13.843	0.647 **	0.000	significance
Logical intelligence	7.29	3.259			

It was found that the average degree of analytical thinking was (38.74) and with a standard deviation (13.843), and that the average degree of logical intelligence was (7.29) and a standard deviation (3.259). By using the Pearson correlation coefficient to reveal the relationship between the research variables of the students, it was found that the correlation coefficient was (0.647 **). At the level of significance (0.000), which is statistically significant depending on the level of significance adopted (0.05) Also, there is a good positive correlation relationship because the value of the correlation coefficient ranges between (0-1) and the closer the value is to (1), the correlation coefficient is strong, and this indicates the existence of a relationship between analytical thinking and logical intelligence among students.

Second: Conclusions:

In light of the results that have been reached in the current research, the following can be concluded:
1) Fifth-grade students possessing the scientific (biological) in the Diwaniyah Education Directorate for analytical thinking.
2) There is no difference between male and female students in having analytical thinking.
3) Fifth-grade students do not possess science (biological) in the Diwaniyah Education Directorate for Logical Intelligence.
4) There is no difference between male and female students in having logical intelligence.
5) There is a good positive correlation relationship between analytical thinking and logical intelligence among the scientific (biological) fifth grade students in the Diwaniyah Education Directorate.
6) There is a good positive correlation between analytical thinking and logical intelligence among the scientific (biological) fifth students in the Diwaniyah Education Directorate.
7) There is a good positive correlation between analytical thinking and logical intelligence among the scientific (biological) fifth-grade students in the Diwaniyah Education Directorate.

Third: Recommendations:

In light of the results reached in the current research, the two researchers recommend the following recommendations:
1) Directing the attention of those in charge of preparing the different curricula and for all school levels to present the content in a way that stimulates students to use analytical thinking.
2) Ensure to provide a variety of activities that include analytical thinking skills and areas of logical intelligence in mathematics curricula and for all academic levels and not being limited to information only.

Fourth: Proposals:

In light of the results reached in the current research, the researchers suggest the following proposals:
1) Conducting similar research on other societies and stages of study to find out the extent of their possession of analytical thinking and logical intelligence.
2) Conducting studies and research linking analytical thinking with other types of intelligences and other variables.
3) Considering analytical thinking and logical intelligence as an essential input in the process of teaching mathematics and its curricula.

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