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Level of logical-mathematical intelligence among middle school students

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Abstract :

The study aimed to determine level of logical-mathematical intelligence among middle school students, the study sample consists of (200) student from middle school, and to achieve the objective of the study the researchers use logical-mathematical intelligence scale, after collecting and processing information statistically using the statistical package for social science spss, the researchers reached the following results:

- there are three levels (weak, medium and high) of logical-mathematical intelligence among middle school students.
- there differences in logical-mathematical intelligence among middle school students due to the variable of gender.
- there differences in logical-mathematical intelligences among intermediate school students due to the variable of study level.
- there an interaction between age and gender in logical-mathematical intelligence among middle school students.

Keywords: Logical-mathematical intelligence; intelligence; Middle school; Students

1 - Introduction

Intelligence is a general cognitive ability to solve problems. It's a mental skill that helps with thinking, perceiving relationships, making analogies, and calculating. It aids individuals in confronting and resolving complex challenges and issues, as well as in acquiring new skills and making changes to their surroundings. (Dasarath & all, 2018,79)

The ability to measure, quantify, consider propositions and hypotheses, and perform complete mathematical operations is referred to as logical-mathematical intelligence. Problem solving is a deliberate or purposeful act on the part of a person to accomplish a series of objectives by inventing new strategies or systematically following certain pre-determined steps to eliminate obstacles in the path. (nimmi, 2016, 2296).

In certain ways, logic is the most common form of reasoning used by humans and computers. (vilnis & karkis, 2017, 4)

According to Gardner's theory of multiple intelligences proposes that each individual possesses a unique combination of eight types of intelligences (profile intelligence), all of which interfere with daily life and can be developed in order to achieve justice among people by providing them with different learning options. But there only linguistic and logical-mathematic intelligence have been have been respected and measured in modern secular schools, just as Gardner's analysis confirmed; it's beneficial to think of the language-logic mix as "academic" or "scholarly intellect."

Gardner defined intelligence as "a biopsychological capacity to process knowledge that can be enabled in a cultural setting to solve problems or produce products of cultural value." (Arum & all, 2018, 1)

Gardner developed his hypothesis based on his observations of people with exceptional mental abilities and the fact that he did not achieve a high IQ score, so he based his theory on: Intelligence is made up of a number of different abilities.; people have different strengths and limitations in terms of mental ability; their capacities and concerns vary, so they do not learn in the same way. It is impossible for a student to understand anything.,

As a result, this principle aids in guiding each learner to the type of study that best suits them and their abilities; we cannot trigger any intelligence independently of the others because they all influence each other to varying degrees.; When dealing with a lack of verbal intelligence, you can use logical intelligence; when dealing with a weakness of verbal or logical intelligence, you can use musical and bodily intelligence. (Refat, 2016, 94)

Many students are still having trouble solving math problems today. In reality, students' problem-solving abilities remain poor. (Tasnim, 2020, 1)

Logical-mathematical intelligence consists of the many factors associated with the analytical, synthetic and integration functioning of the mind. When developed well the person becomes a thinker. Traditionally, we expect math provides these capacities.

The logical-mathematical intelligence consider important because it's refer to ability of thinking about solving problems, and learning through numbers and analysis the relationship between cause and effect.

Mathematics is one among the themes that assist within the development of logical-mathematical intelligence. However, to develop reasoning, it shouldn't be taught to young children in its traditional form, i.e. starting at the start of a piece book and browsing this book from cover to hide during the course of the varsity year. Math skills and ideas got to be presented during a concrete form in order that these are often experienced firsthand then integrated with other knowledge. The patterns learned become a part of a reasoning process. When this is often done is little groups, sometimes with children who are on an equivalent level and sometimes with those of various levels, they learn from one another, communicate, are given math problems, find solutions, and learn to assist and inform others. That way, children explore and cultivate a diversity of skills and knowledge that match what they have so as to function successfully. (Annie, w.d, 3-4)

Gardner believed that paying attention to the mathematical and verbal intelligences, and constructing tests to live only these two sorts of intelligences, may face education with problems. Since, the bulk of student's unique talents and capabilities in other areas are overlooked, students majority couldn't develop their unique intelligences; and thus, their schooling experience is accompanied with defeat and failure. (Niroo & all, 2012, 2170)

Abdülkadir PEHLIVAN & Mehmet DURGUT (2017) they found in theme study that the students were "moderately advanced" in "Logical-Mathematical" and "Musical" intelligence types and "advanced" in other intelligence types.

While the study of D P Arum & T A Kusmayadi & I Pramudya (2018) they have found that students' logical-mathematical intelligence was identified in the moderate level. On the other hand, both male and female students' logical-mathematical intelligence is strongly influenced by the indicator of ability to classify and understand patterns and relationships. Furthermore, the ability of comparison is the weakest indicator.

Also there is the study of Samer M. Ayasrah & Abdalrahman H. Aljarrah (2020) it aimed to recognize the differences in multiple intelligences among the students, the result found that the average for all domain of multiple intelligence

was accepted also, there was not any statistically significant differences in the students' results which could be attributed to gender and academic year. Also, there were not statistically significant differences in the students' results for the musical and existential dimension attributed to achievement and there were statistically significant differences for the other dimensions.

The logical-mathematical intelligence can be defined as The ability to use reason, logic and numbers. These learners Conceptual thinking on logic and digital models Links between information. Always curious The world around them, these learners will ask a lot of questions, such as Experiment. Their skills include: problem solving, classification And classify information and use abstract concepts Find out the relationship between each other, deal with the long chain Carry out the cause of local progress, conduct a controlled experiment, Questions and doubts about natural events, performance Complex mathematical calculations can handle geometric shapes. Possible career paths: scientist, engineer, computer programmer, Researcher, accountant, mathematician.(Kurnia, 2018, 165)

Logical-mathematical intelligence is typically characterized as the capacity 'to use numbers effectively and to reason well or the capacity to think logically.(Hajhashemi & all, 2018, 169)

Logical-mathematical intelligence described some conditions that enable one's logical-mathematical intelligence to thrive well as follows: feeling their goals and functions within their environment, recognizing concepts with properties of quantity, time, and causal relationships; using abstract symbols to demonstrate in concrete way, both objects and also concepts; showing logical problem solving skills.(Helmiah & all, 2017, 95)

Based on the previous definition, we conclude that there is a set of indicators that indicate mathematical intelligence: ability to use reason, logic and numbers, curious, ask question, find relationship between information. These indicators enable us to identify the individual with logical mathematical intelligence.

People with mathematical intelligence may have a range of characteristics, including: the order of tendencies, accuracy and methodology, scientific reading tendencies such as mathematics and programming, nature, follow-up of scientific development, the ability to think about abstract concepts, and How easy it is to put things into specific categories, how easy it is to use numbers, shapes, and models, and the ability to use available information to solve problems.

2. Strengths particular to this intelligence

- Enjoys the process of figuring things out

- Is orderly
 - Asks questions
 - Works with numbers, measurements, degrees, dimensions etc.
 - Likes conducting scientific experiments in a logical manner
 - Explores patterns and relationships
 - Good problem-solving skills
 - Enjoys thinking about abstract ideas
 - Good at solving complex situations
 - Organises him/herself by classifying and categorizing information,
 - Questions and wonders about natural events
 - Pursues ideas
 - Fascinated with patterns within different subject knowledge
 - Interested in the how: How does it function, how is it possible, how do we go about it?
 - Has good ability for abstract thought
 - Good intuition, integrates and draws from several areas of the brain.
- (Annie, w.d, 4)

The logical-mathematical intelligence is the ability to calculate, measure, examine, proposition and hypothesis, complete number operation, and its have many abilities like main competency which mean the ability to understand the logic or numerical patterns and the ability to process complex thoughts, competency included numeracy, reasoning, logical thinking, and problem-solving, the individual who have those abilities can understand logic, numbers processes complex issues. the part of brain who are responsible of this type of intelligence is Left frontal lobe and right parietal (Azinar & all, 2020, 2)

So and according to table 1 the logical mathematical intelligence have many abilities the individual who have those abilities can understand logic, numbers processes complex issues.

3. The concept of mathematical:

Lestari, based on the grouping of early childhood that there are several mathematical concepts that should be taught:

3.1 The Concept of Numbers

In mathematical numbers are most basic thing need to be teach to the children it must be done with two stages, in the first stage introduce the concept of numbers and this is done through three steps Spelled out, i.e. mention the number by sequence, Match each number with the object being calculated, Compare between groups of objects one with another group of objects to know the number of objects more, less, or similar. And after the child know what is the concept of number move to develop that concept and this stage two.

3.2 The Concept of Pattern and Relationship

A pattern is an arrangement of objects composed of colors, shapes, numbers, or events. Examples of patterns arranged by size. The patterns arranged according to the colors are red, blue, red, and blue. According to the arrangement of daily activities after eating biscuits every day, I drink milk. In order to develop the ability to recognize patterns and relationships, children need to be given many opportunities to recognize and manipulate objects and record similarities and differences. Some activities that parents can do, such as developing children's patterns and interpersonal relationships, include inviting children to play in a car queue to form a pattern of red, black, red, black, red, and black rows. Children's abilities in patterns and relationships will facilitate the acceptance of series and relationship function courses. In this series, children are required to develop sequential patterns. In the relationship function, children are required to develop relationships.

3.3 The Concept of Geometry and Space

The geometric concept and spatial relationship here is that children recognize geometric shapes such as triangles, rectangles, squares, and the same circle, and their position in space. When children realize that their position is related to the arrangement of surrounding objects, children can understand the sense of space. Children learn locations and locations, such as: above, below, above, inside, and outside. In addition, the children also learned the definition of distance, such as near and far. Introducing the relationship between geometry and space to the child can be accomplished by inviting the child to play while observing various objects around him.

3.4 The Concept of Selecting and Grouping

Selecting and grouping includes the ability to observe and record similarities and differences in objects. Children under three years know the similarities and differences through their five senses when exploring with objects around them. The child learns by watching, hearing, touching, feeling, smelling the objects he or she is playing, to know the same and different things.

3.5 The Concept of Measurements

Children learn measurements from various activities that require creativity. At first step, children do not use tools, but introduce the concept: longer, shorter, lighter, faster, and slower. The next step, children are invited to use non-standard measuring instruments, such as ribbons, shoes, etc. At a higher step, children are invited to use clock, ruler, scale, and thermometer. The example of activities that can be done by parents to develop measurements to children is to invite children to measure the length and width of the toy rack using a strap or ribbon. (Luki Luqmanul Hakim& Revita Yanuarsari, 2017, p p 33-35)

According to the concept of mathematical we have found five concepts The Concept of Numbers, The Concept of Pattern and Relationship, The Concept of Geometry and Space, The Concept of Selecting and Grouping, The Concept of Measurements and each concept have to be developed at childhood stage, because if we developed those concepts at this stage the individual will be more understanding to logic and math problems.

4. How to stimulate mathematical logical thinking according to Gardner:

1. Use various interrogation strategies.
2. Pose problems with an open end for students to solve.
3. Build models for key concepts.
4. Encourage students to construct meanings from their object of study.
5. Link mathematical concepts or processes with other content areas and aspects of everyday life. (Aidee & all, 2019, 25)

As a result, and in accordance with Gardner's theory, this study focused on logical-mathematical intelligence by examining the level of logical-mathematical intelligence among middle school students, so we asked the following question.:

- What are levels of logical-mathematical intelligence (weak, medium and high) among middle school students ?
- Is there differences in logical-mathematical intelligence among middle school student due to the variable of gender ?
- Is there differences in logical-mathematical among intermediate school students due to the variable of the study level ?
- Is there an interaction between age and gender in logical-mathematical intelligence among middle school students ?

5. Hypotheses :

- Is assumed that there are three levels (weak, medium and high) of logical-mathematical intelligence among middle school students.
- Is assumed that there are differences in logical-mathematical intelligence among middle school student due to the variable of gender.
- Is assumed that there are differences in logical-mathematical among intermediate school students due to the variable of the study level.
- Is assumed that there an interaction between age and gender in logical-mathematical intelligence among middle school students.

6. Objectives :

- Determine the level of logical-mathematical intelligence among middle school students.
- Explorer the differences in logical-mathematical intelligence due to the gender.
- Explorer the differences in logical-mathematical intelligence due to the study level.

- Determine the interaction between age and gender in logical-mathematical intelligence.

7. Importance of the study :

- It's focus on logical-mathematical intelligence, where we tried to determine its level.
- This study is a modest contribution to research on mathematical intelligence and its results will be a starting point for other research and studies.

8. procedural definitions :

8.1 Logical-Mathematical intelligence: The ability to solve problems logically and to detect logical and numerical patterns through which good inference, conjecture, conclusion, organization, abbreviations, sequences and implementation of computations is done sufficiently, It is defined *procedural* as the degree to which the examiner has responded to the test applied in the current study.

9. Previous study:

9.1 Cerdal, Gamal & all (2011) : Logical Intelligence Levels and Math Performance: a Study on Primary and Secondary Chilean Students

This article presents and analyses the results of a Superior Logical Intelligence Test (TILS) to a sample (N= 4446) representative of the Chilean primary and secondary school population. Psychometric analysis shows that the TILS is a one-dimensional instrument with adequate internal consistency. The results of the application to Chilean students reveal significant differences in level of administrative support of the institution students attend (a factor related to socio-economic level). The distribution of the national logical intelligence scores was normal, and it was possible to establish the scales of the differential scores according to age and level of administrative support. The study revealed a positive and meaningful correlation between logical intelligence and overall academic performance, especially in the area mathematics. Likewise, the differences between the general population and a group of talented students (N = 493) were examined, and the latter group was shown to possess significantly higher levels of logical intelligence.

9.2 Sümmani Ekici (2011) : Multiple intelligence levels of physical education and sports school students

The purpose of this research is to analyze the multiple intelligence levels of academies of physical education and sports students according to some demographic factors. To obtain data about multiple intelligence levels in the research, the multiple intelligence inventory, developed by Özden (2003), was applied to a total of 1.199 students, of which 541 are girls and 658 are boys. For

resulting evaluation of the data, the frequency in SPSS program was applied, for independent groups the t-test and one-way analysis of variance (ANOVA) was applied and to find the origin group of the differences, Scheffe-F test was applied. According to the multiple intelligence levels results between the sexes in the study, significant differences were found in the subscales of visual ($p=0.000$) and rhythmic intelligence ($p=0.000$). As for the results of the multiple intelligence levels between sections, the averages of multiple intelligences at inter-departmental levels are not statistically significant ($p<0.05$) although there occurred averages in favor of the Department of Physical Education Training in the results obtained from lower dimensions

9.3 Ahmed Mohamed Abd El Zbidi (2011) : Some Intelligence and their relationship to systemic thinking skills Second graders have a middle grade.

It aimed to figure out how much second - graders have an average of some intelligence, and to learn about their organizational thinking skills.

In this research, the researcher used the descriptive method because of its relevance to the nature of the research. The researcher built a scale to measure some intelligence, consisting of 24 item, and also built a test to measure systemic thinking skills, consisting of 21 item.

The research sample consisted of 217 middle-second-grade students in the Qadisiyah Governorate Center, applying the scale of certain intelligence and the test of organizational thinking skills in the first semester of the school year (2010-2011), The researcher have found he following result :

- Students have some brilliance (mathematical logical intelligence-spatial Intelligence)
- Students have poor organizational thinking skills.
- There's a very strong positive relationship between the average grade of students on the sports intelligence scale and their average score.

9.4 Warda Abdel Kader Yahya Yamin (2013) : Mathematical thinking patterns and their relationship to multiple intelligences and the desire for specialization and achievement in basic tenth grade Palestine

This study aimed at learning about mathematical thinking patterns and their relationship to certain intelligence in basic tenth grade students in Tulkarem Prefecture. It also aimed at learning about the relationship between mathematical thinking patterns and both the desire for arity and achievement in mathematics in basic tenth grade students.

To answer the study's questions and test its hypotheses, the researcher used the descriptive method.

Analytics, where the study community is made up of all students in the tenth grade.

Tulkarm Prefecture, the study was applied to the 10-grader sample. In the second quarter of the year (2012/2013), the following tools were applied to the study sample.

- Testing mathematical thinking patterns (visual, evidence, critic, creative) of what was already studied Years ago, it was confirmed that it was stability, and that it was constant (0.73).

- Testing multiple wits (spatial, logical, linguistic, social), the veracity of which has been verified With the arbitrators, his stability was calculated at (0.65)

Identification to determine basic tenth grade students' desire for arity (science, humanities), done Verify its sincerity through arbitrators and its persistence through reap ment where it has reached. Its stability factor (0.820)

The results of the statistical analysis showed the following:

The sample had an equal percentage (40%), and visual thinking had the highest levels of weight thinking. Relative (63%), while creative thinking was lower (5.26%).

The results also showed that the sample of the study possessed the four wits in varying degrees, with social intelligence ranking first with a relative weight of (73%) followed by linguistic intelligence second, logical intelligence third, and spatial intelligence fourth with a relative weight of (44%).

The number of students wishing for the educational branch was (35%) and those wishing for the humanities (65%). The results also indicated a statistically significant relationship between certain types of mathematical thinking and multiple intelligences and between patterns of mathematical thinking and attainment in the subject matter of athletics.

The results of the study also indicated that there are statistically significant differences between multiple intelligences and the desire for arity in favour of the scientific department, and between mathematical thinking patterns and the desire for arity in favour of the scientific section.

9.5 Ghanem Fatma (2014) : Differences in multiple intelligence in a sample of first and fourth year students From intermediate education

The objective of the study was to detect the multiple brilliance of student in the first and fourth grade. The study also sought to identify differences in their estimates of the types of cleverness in terms of gender and level of study. To that end, the review and technical scale of Gardner's multiple intelligence was applied and applied to the basic sample of 342 students.

The results show that the intelligence of the sample members are estimated to be personal intelligence, mathematical logic intelligence. Sensory-motor intelligence, spatial intelligence, social intelligence, natural intelligence, verbal intelligence, and finally musical intelligence.

As for differences, the types of intelligence varied, with gender differences appearing in the following multiple intelligence: verbal intelligence, mathematical logic intelligence, natural intelligence, musical intelligence, sensory-motor intelligence and spatial intelligence; Gender differences in social intelligence and personal intelligence were not shown.

9.6 Samya Mehdawi & Sayfiya Jedwal (2019) : Study of differences in logical / mathematical intelligence in a sample of scientific students in the secondary school according to some variables.

The study aimed to detect differences in logical/mathematical intelligence in a sample of scientific students at the stage. Secondary, according to the gender (male/female) and school level (first secondary/third secondary), the study sample consisted of 94 students. A student of Mujahid High School: Qazi Osman - In Bejaya, the Logical Intelligence/Mathematical Scale was used by the two researchers. And the research found the following result :

There is no statistically significant differences in logical/mathematical intelligence in scientific students at the secondary level for gender (male/female) as well as for school-level (first secondary/third secondary).

9.7 Alwan (2008) :

It aimed to determine Students' Favorite intelligence Basic fourth and eighth according to the Theory of Multiple intelligence and whether it is Student intelligence It varies according to grade and gender, with a sample of 623 students In the schools of the Directorate of Education in Ma'an for the school year 2006/2007.

The results of the study indicated that most of the intelligence are favorite in basic fourth graders Includes linguistic intelligence, mathematical and spatial logic, physical-motor, and results also indicated Eighth graders prefer intelligences: physical-motor, personal-external.

And music and nature, and the results suggest that the least favored intelligence is existential intelligence and personal intelligence, the results of the study suggest that males prefer logical, physical-motor intelligence in When females prefer musical intelligence. (Yamin, 2013, p42)

9.8 EL Yaseri (2010) :

It aimed to identify the multiple intelligences, their relationship to achievement, the trend towards mathematics. The research sample consisted of 400 students in the second grade, average in Baghdad. The researcher built the 76-items multiple intelligences scale, the 32-items attainment test and the 40-items orientation measure. Linguistic, logical, mathematical and spatial intelligence (and attainment, as well as between both) linguistic and logical

intelligence (and the trend towards mathematics. There is a weak correlation between physical and musical intelligence and achievement and the trend towards mathematics. (Yamin, 2013, p43)

Study procedures:

1. Objectives of the exploratory study:

- Collect data and information on the subject.
- Experiment the study tool and ascertain its psychometric properties.
- explore the field to identifying the difficulties that researchers may face in conducting the study.

2. Sample survey: The sample of the study consists of (33) students from middle school selected in a deliberate way.

Table (1):sample composition in terms of gender

Gender	Sample	Percentage
Man	17	51.5%
Women	16	48.5%
Total	33	100%

Source Prepared by the researchers

According to the table, the majority of the participants surveyed were man, with a percentage of 51.5%. The proportion of women is estimated at 48.5%.

Table (2) :sample composition in terms of age

Age	Sample	Percentage
13	8	24.2%
14	15	45.5%
15	7	21.2%
16	2	6.1%
18	1	3%
Total	33	100%

Source Prepared by the researchers

The table 02 show that the most of student there age were 14 with percentage of 45.5%, than 24.2% was for the student who their age were 13, while we recognize that the percentage 21.2% were for rage 15, and 6.1% for age of 16, and Finlay we found that there is only one student his age is 18 with percentage of 3%.

3. Study tools:

3.1 Description of the study tool: The researchers used logical-mathematical intelligence by researchers "Samia Mehdaoui""Safia Djedouali" (2019).

Here are the steps to find the tool:

3.1.1 Determining the goal of the tool: The goal of the tool is to measure logical-mathematical intelligence of middle school student

3.2.1 Sources for the formulation of the items of the scale: The researchers relied on the study by " Samia Mehdaoui""Safia Djedouali" (2019).

The scale in its initial form includes (24) items all positive

3.3.1 Test correction method: Five alternatives have been identified to answer the scale items which are (it applies to me perfectly, it applies to me a lot, it applies to me sometimes, it applies to me a little bit, it never applies to me) by weights (5-4-3-2-1).

3.2 Symmetric characteristics :in order to use the scale first we need to make sure from its psychometric characteristics.

3.1.2 validity:

A. The sincerity of internal consistency: The Pearson correlation coefficient was applied to determine the extent to which each item was associated with the overall score of the scale and the results showed retention (24) item as the values of the Pearson correlation coefficient for these item ranged from (0,467) to (0,809), which indicate the correlations of the item for the total sum, and these results indicate consistency. The remaining items of the scale are consistent, indicating that the scale is characterized by internal consistency.

B. Self-validity: Self-validity was extracted through the stability coefficient where the value of the stability coefficient is (0,946) and after calculating the square root of this value it gives the value (0,972), a high value represents self-validity and therefore the tool has high validity.

C. Stability: The value of the stability coefficient of 'Alpha Kornbach' is (0,946). This is a high value indicating that the tool has high stability, while stability by fragmentation filtering was estimated before correction by (0,819) and corrected by the equation of sperman-brown (0,900) which is an high value that indicates that the tool's stability.

4. Methode: The present study, which level of logical-mathematical intelligence among middle school students, requires the use of the descriptive method, since it is appropriate to its nature, purposes and objectives.

5. The study sample: The sample of the study includes students from middle school.

Table (3):sample composition in terms of gender

Gender	Sample	Percentage
Man	96	48%
Women	104	52%
Total	200	100%

Source Prepared by the researchers

200 individual from middle school in Saida participated in this study, 104 were girls which represent 52%, and 96 were boys with 48%.

Table (4): sample composition in terms of level study

Level study	Sample	Percentage
Third year	125	37.5%
Fourth year	75	62.5%
Total	200	100%

Source Prepared by the researchers

According to the table, the number of student who they are in third year was 125 which represent 37.5%, while the number of fourth year student was 75 with a percentage of 62.5%.

Table (5): sample composition in terms of age

Age	Sample	Percentage
12	13	6.5%
13	81	40.5%
14	59	29.5%
15	41	20.5%
16	6	3%
Total	200	100%

Source Prepared by the researchers

The table 05 show that the most of student there age were 13 with percentage of 40.5%, than 29.5% was for the student who there age were 14, while we recognize that the percentage 20.5% were four age 15, and 6.5% four age of 12, and finally we found that there only six student with age of 16 and percentage of 3%.

6. Application procedures: The study was applied to a sample of 200 students from middle school of Saida during the academic year 2020/2021, and all the forms were retrieved.

7. the results of the study:

7.1 the result of the first hypotheses:

- Is assumed that there are three levels (weak, medium and high) of logical-mathematical intelligence among middle school students.

Table (6): admission scores from the Leicert

Acceptability	It never applies to me	It applies to me a little bit	It applies to me sometimes	It applies to me a lot	It applies to me a lot
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Level	1	2	3	4	5
Time lapse scale	1 – 1,79	1,80 – 2,59	2,60 – 3,39	3,40 – 4,19	4,20 - 5
	24 – 62,16		62,4 – 81,36		81,6 - 120

Source Prepared by the researchers

According to the table logical-mathematical intelligence can be divided into three levels:

- From 24 to 62,16 weak
- From 62,4 to 81,36 medium
- From 81,6 to 120 high

Before determine the level of logical-mathematical intelligence we organizing upward responses. The response range was between (46) and its low value to (120) and its high value, and table show result:

Table (7):level of logical-mathematical intelligence

	Frequency	percentage
Weak	6	3%
Meduim	61	30,5%
High	132	66,5
Total score	100	100%

Source Prepared by the researchers

The result of the table show that there are 66,5% from sample study have high level of logical-mathematical intelligence, than 30,5% have medium level, and only a few members of the sample have low logical intelligence with percentage of 3%

7.2 The result of the second hypothes:

- Is assumed that there are differences in logical-mathematical intelligence among middle school student due to the variable of gender.

Table (8) :group statistics

Statistiques de groupe					
			mean	standard deviation	standard error
	gender	N			
total	Man	96	85,31	12,053	1,230
	Women	104	86,74	12,529	1,229

Source Prepared by the researchers

According to the table the mean value of student boys was 58,31 in a standard deviation estimated at 12,053 the standard error of 1.230 while the girls reached their mean to 56,74 standard deviation 12,529 and standard error 1,229.

Table (9) :Independent Samples Test

t-test for Equality of Means						
t	df	Sig.	Mean	Std. Error	95% Confidence Interval	
			e	Difference	Lower	Upper
-0,820	198	,413	-1,428	1,741	-4,862	2,006

Source Prepared by the researchers

The table shows that the results of t-test reached the value of SIG0,413 and it is high than 0,05. according to this result there are no significant differences in logical-mathematical intelligence attributed to gender.

7.3 The result of the third hypotheses:

- Is assumed that there are differences in logical-mathematical among intermediate school students due to the variable of the study level.

Table (10) :group statistics

Statistiques de groupe					
	Level	N	mean	standard deviation	standard error
total	Thirs year	125	83.23	11.635	1.041
	Fourth year	75	90.76	11.984	1.384

Source Prepared by the researchers

According to the table the mean value of third year student was 83,23 in a standard deviation estimated at 11,635 the standard error of 1,041 while the fourth year student reached their mean to 90,76 standard deviation 11,984 and standard error 1,384.

Table (11) :Independent Samples Test

t-test for Equality of Means						
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t	df	Sig.	Mean Difference	Std. Error of the Difference	95% Confidence Interval	
					Lower	Upper
4,380	198	0,000	7,528	1,719	4,139	10,917

Source Prepared by the researchers

The table shows that the results of t-test reached the value of SIG0,000 and it is less than 0,05. According to this result there are significant differences in logical-mathematical intelligence attributed to study level.

7.4 The result of the fourth hypotheses:

- Is assumed that there an interaction between age and gender in logical-mathematical intelligence among middle school students.

Table (12): Testing of interaction effects

Source	Somme des carrés de type III	ddl	Carré moyen	F	Signification
Corrected template	2689,716 ^a	9	298,857	2,074	0,034
Constant	582858,059	1	582858,059	4044,569	0,000
Gender	1787,814	4	446,954	3,101	0,017
Age	553,426	1	553,426	3,840	0,051
Gender * Age	989,426	4	247,403	1,717	0,148
Error	27380,679	190	144,109		
Total	1511163,000	200			
correctedtotal	30070,395	199			

Source Prepared by the researchers

According to the table It turns out that there is difference in the effect of gender Where we find sig value (0,017) and its less than (0,05) and there also no difference in the effect in age and what sig value show (0,051) its high than (0,05).

The result also show that there is no interaction between age and gender in effect in logical-mathematical intelligence and that what sig confirme it (0,148) its high than (0,05) which mean there is no different in interaction between age and gender in logical-mathematical intelligence.

8. Discussion :

The result of the study shows that there are three levels of logical-mathematical intelligence but the most sample of the study theme level was high and this means that the ability to use reason, logical and numbers, these learners suppose conceptually in logical and numerical patterns creating connections between items. (Kurmia, 2018, 165)

Also the study sample share certain characteristics, such as the age stage of adolescence, and thus students at this stage have similar developmental and mental characteristics, which has resulted in no differences in their logical/mathematical intelligence, and may also be due to the fact that the latter is not affected by the gender variable.

There are for we found the study result of "Abdülkadir PEHLIVAN"&"Mehmet DURGUT" (2017) they determined that the students were "moderately advanced" in "Logical-Mathematical.

"Samer M. Ayasrah"&"Abdalrahman H. Aljarrah" (2020) they showed there was not any statistically significant difference in the students' results which could be attributed to gender and academic year.

People who have high logical-mathematical intelligence are masterful at educative reasoning, detecting, patterns and cerebration. they're conjointly sensible at scientific investigations, distinguishing relationships between different things and understanding advanced and abstract concepts. (Jelisaveta, 2016, 76)

The environmental and cultural factor may play a role in the absence of differences in logical/mathematical intelligence according to the variable sex, and this can be explained by the fact that pupils at this stage of study belong to the same educational environment, that is, they study in the same educational institution, and the same cultural characteristics, which may not be given.

An opportunity for pupils of both sexes to show differences in their logical/mathematical intelligence is natural to contribute to bringing their abilities closer together, so it can be said that the environment plays a role in the emergence of individual intelligence, which can be developed and developed through the opportunities and possibilities offered by this environment.

A higher passage to abstraction is achieved from levels of abstraction already reached, this a synthesis is reached between the hand and head so the scholar will solve issues employing a reasoned approach. (Annie, w.d, 14)

This result can be attributed many factors like the lack of teaching methods and methods used in presenting the content of scientific subjects to students at both levels, which is based on the basis of The theory of multiple intelligence through which logical/mathematical intelligence can be developed in pupils, and

the absence of this factor may be a reason why there are no differences in the study sample depending on the variable. Level of study.

The study of "D P Arum"& all (2018) show that students' logical-mathematical intelligence was identified in the moderate level. In addition, the level of both male and female students are also mostly in the moderate level.

The result of the research may also be that individual differences between pupils are not taken into account through the choice of educational activities and teaching methods adopted at the different levels of study, which are commensurate with the varying mental abilities of the pupils and through which they can be made. Detection of pupils' differences in logical/mathematical intelligence.

The findings also revealed that there were no differences in mathematic intelligence levels between males and females, which could be explained by the fact that both genders were exposed to the same environmental factors, including an educational environment and teaching materials, curriculum teaching methods, and nearly identical tests.

This type of intelligence is concerned with a person's ability to think logically, extrapolate and conclude, recognize geometric and numerical patterns, and see and work with abstract concepts. People with this type of intelligence are likely to be inquisitive, familiar with games that require thought skills such as chess, and may devise experimental forms to test their ideas, , or are drawn into computers or computers.

It could be because students develop mathematicak-logical intelligence in a subtle way as a result of coping with computational difficulties and real-life events that lead to mathematical processes like sales and purchases.

High-intelligence students can deal successfully with numbers, solve diverse difficulties, notably in sports, and construct connected and ordered mental schemes of concepts and subjects, especially in mathematics.

The ability of students to cope with mathematical content as well as possess mathematical skills and knowledge that enable them to handle problems in many ways and invent new techniques can be stated as the cause for their high level of mathematical intelligence, as well as to have skills in preparation recruitment and skills in engineering, to appreciate concepts that reflect figurines, to structure and build mathematical trends and generalizations in shapes and drawings and to understand and read schemes.

Students at this stage have the ability to think abstractly, enabling them to create relationships, link cause and effect, and can solve mathematical issues mentally, which explains their great interest in mathematics.

Mathematical logic intelligence is the father's intelligence and the model of intelligence. Through the use of proper thinking tools such as generalization, inference and other logical processes, an mathematical intelligence is able to come to sound thinking, and this type of mathematical intelligence is characterized by the fact that it usually does not require verbal expressions; An athlete can handle a mathematical issue in his or her mind without showing it verbally or linguistically.

Athletes with high computational capabilities can address issues that depend on the power of logic. Mathematical logical intelligence is a pattern of logical learning, which refers to the ability of an athlete to think and learn through the use of numbers, and by analyzing the relationships between causes and outcomes, athletes with such intelligence are characterized as systemic people who think logically, are skilled at solving mathematics problems and have the ability to solve puzzles.

The intermediate mathematics curriculum includes mathematical positions that excite and develop students' mathematical intelligence, as well as instructional approaches that stimulate and grow students' mathematical intelligence.

People with high logical-mathematical intelligence learn by sorting objects into categories, digitizing and calculating specific aspects of the objects, and reasoning about abstract relationships between things, A high level of logical-mathematical intelligence raises a lot of inquiries about how things are made and work. .(Sümmmani, 2011, 1019)

Conclusion :

In end of the research, based on the results of the study and the statistical analyse for data obtained then according to the objective of the study, the study was based on a set of hypotheses from which researchers drew the following conclusions:

- the level of logical-mathematical intelligence among middle school students is high.
- there are no significant differences in logical-mathematical intelligence attributed to gender.
- there are significant differences in logical-mathematical intelligence attributed to study level.
- there is no difference in interaction between age and gender in logical-mathematical intelligence.

The researchers also recommend the following:

- Avoid focusing when teaching mathematics on knowledge and concepts only.

- Using intelligence tests to detect talented and talented students in mathematics and in different educational stages.
- Develop educational programs for outstanding students in mathematics in proportion to their abilities.

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