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## Mathematical competence to Students middle School in Iraq

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### Abstract

The aim of the research is to identify knowing the extent to which middle school students possess mathematical competence in mathematics, and to choose the descriptive method. The research community is class students in the middle and secondary schools of the Directorate of Education Baghdad/First Rusafa. Research sample (389) Male and female students (163) students, and (226) freshman. And confirmation of achieving the goal of the research and its hypothesis that by analyzing the mathematics book for the fourth scientific grade (the first four chapters) according to the components of mathematical competence, and making a test map, the two research tools were built, the mathematical aptitude test, which consisted of (26) items of multiple choice type, and the scale (productive tendency) consisted of (20) items. And yet statistical analyzes and psychometric characteristics appropriate to paragraphs unless stand scale It was applied to the main sample of the research. showed research Class ownership the fourth Scientific for athletic competence, There is also a difference between male and female students in their possession of the components of mathematical competence This in turn makes a set of conclusions, and recommendations, And proposals for use in the field of education, and education.

### Keywords

Mathematical competence - middle school students - mathematics.

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**Introduction:**

Research problem From the reality that the world and the country went through in previous years, As education shifted to e-learning, which made it difficult for students to receive information well, which led students to memorize without understanding (Al-Uqapi & Al-Kazemi, 2023, p. 392)). Besides The researcher showed the students' scores in the previous stages of the class middle third, Found that There is weakness and low MST-Wei Tahs Paint it B, As a result, their mathematical competence is weak, because achievement is closely related to mathematical competence It is one of the cognitive mental factors that have a role a Sassy in the level of mental activity of the individual. In order to reinforce the research problem, the researcher prepared a questionnaire that included the definition of the research variables and was distributed to a group of mathematics teachers for the fourth scientific grade, whose number is (8) teachers, and their service is not less than (18) years, and (75%) of the teachers' responses indicated that there is weakness in students in the components of mathematical competence, and they indicated that students resort to memorizing information and memorizing it without operating their thinking, and this indicates that there is a problem in mathematical competence among students.

A problem emerges-Search Present By answering the following question:

So specify The research problem by answering the following question: - "What is the extent of students' possession fourth grade Scientific for athletic competence in Mathematics?"

### research importance

- 1- It represents a new addition to the Iraqi and Arab studies in the field of mathematics teaching methods, as the components of mathematical competence are linked with other variables.
- 2- may be components of mathematical competence, direct target, and the head of the teacher and an introduction to learning-s, and it can be developed a to for bite them all. According to Q-I cycled, tendencies and trends, and make an irrigation environment-go on-came-A p-n his way-do not make to the for pulp mind and mind. They are active and have a positive attitude towards mathematics say feel its aesthetics and value-a.
- 3- Provides a test and measure of mathematical aptitude.
- 4- It helps everyone who is related to the educational process, including teachers, supervisors, and educational officials, to discover the mental capabilities of students by identifying mathematical competence..

**Research goal:** knowledge Mathematical competence for students of the fourth Science in mathematics.

**Research hypothesis:** There is no statistically significant difference at the level of (0.05) between the mean scores of the real performance and the hypothetical mean of the class students the fourth scientific test and scale Mathematical competence.

### search limits

- 1- Students the line the fourth Science in schools affiliated to the province Baghdad/First Rusafa For the academic year 2022-2023.

2- components of mathematical competence (Conceptual understanding, procedural fluency, adaptive reasoning, strategic competence, productive inclination)

### Search terms

#### Mathematical competence Everyone knew her

- **He Knows Her (2001)** (Kilpatrick et al., **that it** Integrated access to conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and a flair for reasoning.

(Kilpatrick et al. 2001, p. 313)

- **as he knew it Seven (2016) that she** The learner's ability to comprehend mathematical concepts and operations and the skill to implement mathematical procedures with high efficiency and accuracy, The ability to formulate, represent and solve problems, The ability to think logically, Explanation, justification and interpretation, So that the learner reaches the vision of mathematics as a useful and valuable subject and gains confidence in its adoption, It includes five ingredients (conceptual understanding, Procedural fluency, strategic competence, adaptive inference, product slope).

(Seven, 2016, p. 174).

### theoretical background

#### **First: - the concept of mathematical competence**

pointed out (Boaler & Greeno, 2000) That the mathematical competence of students represents the understanding of mathematical concepts and operations, and their skill in implementing procedures with flexibility and high accuracy, while formulating, representing, and solving mathematical problems, so that students can see mathematics as a useful subject, and that many students do not possess mathematical competence,

and that traditional teaching reinforces the idea That mathematical competence is only for a distinguished class of students (Boaler & Greeno, 2000, 173).

As you look (Jawad, et al. 2021) Mathematical competence is the types of mathematical knowledge of content, processes, thinking, and tendencies required to teach and learn mathematics, and it must be viewed by means of five components (conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, productive tendency), and these components are intertwined, overlapping, and The acquisition of mental abilities by students allows them to link concepts and use understanding in solving mathematical problems, and the development of these overlapping components encourages remembering, understanding, analysis, and creative thinking. (Jawad, et al, 2021, 3299) .

### **secondly: components of mathematical competence**

require efficiency Mathematics has five intertwined and mutually influencing elements:

#### **The first component Conceptual understanding**

Male (Saleh, 2013) a learner who understands mathematical concepts and knowledge, This leads to the development of his mental skills such as linking, and organization, And the traffic-Dr, And excellence, and identify common characteristics, It also helps him in interpretation and application, which makes him able to interpret situations, Ahhh- The death you encounter, whether new or not familiar, It also helps him plan, and tawji- H, and prediction of any activity, When the learner understands an arithmetic problem, he is able to predict what the outcome of this problem will lead to.; This is after he organizes it, and linking them, Develop and test hypotheses, From what y-lead to a solution The Meaning of the problem encountered (fit, 2013, s ( 19-18

Conceptual understanding helps students avoid mistakes in solving math problems and see deeper similarities between seemingly unrelated cases and situations, according to the National Council of Teachers of Mathematics. (NCTM, 1989) Conceptual understanding reflects students' ability to reason about concepts, their applications, and their representations. Students with conceptual understanding are more able to remember procedures and avoid mistakes in solving mathematical problems. (Sevin, 2016, p. 182–183)

#### **The second component Procedural fluency**

Procedural fluency refers to knowing procedures and knowing when, and how it is used Ha To solve mathematical problems, and the skill to perform flexibly, accurately and efficiently, And Procedural fluency appears with the Students on The way the learner writes the mental procedures and methods (Majeed, 2018, 13), And Its use of some algorithms in testing the validity of concepts, And Solution a For multiple problems

depending on the procedures, AndHave structured, pattern-filled, and predictable mathematics, AnddoneOfRoutine tasks efficiently,There is an overlapping and interdependent relationship between each of the conceptual understanding and procedural fluency, as it makes familiarity-m concepts-May learn-m skills ace-l & q-l is prone to common mistakes and forgetfulness, and in order for l to learnStudentsHe must have a certain level of skill to learn many concepts-m athlete-bff-M, and the use of procedures helps to enhance and develop this understanding.

(121-122, p2001, NRC)

### **The third componentStrategic competence**

It is the ability to formulate, represent, and solve mathematical problems, and the representation is numerical, symbolic, verbal, or graphic. This dimension is similar to solving problems. In school, learners are often presented with mathematical problems with a specific solution. Outside the school, learners face situations that contain difficulty in knowing what the problem is. , with their need to reformulate it mathematically to find a solution, so they need experience and practice in formulating the problem and solving it. It can show conceptual understanding of theStudentsby formulating mathematical problems,actingHanumerically,or symbolically,or verbally,or drawing and solving it.AndKnow a number of strategies for solving problems, and thenAvoid complex data and numbers, Add toIdentify important data and discard unimportant information. 124p,2001,al. et Kilpatrick).

It includes-Solving mathematical problems is engaging in tasks whose solution is not known in advance, but learners depend on their knowledge, and through that they develop their understanding of mathematics. Solving the problem is not only a goal of learning mathematics; Rather, it is a main means to achieve this. By solving problems, learners acquire ways of thinking, habits of perseverance, curiosity, and self-confidence, which will benefit them outside the classroom (Abu Zina and Ababneh,2010, p. 46)

### **Fourth component: adaptive inference**

AndDespite the importance of componentsefficiencysports,and their mutual influence with each other,But adaptive reasoning is the glue that holds all branches together,It allows concepts,And the procedures are interdependent with each other in reasonable ways,It proposes special solutions,possible to solve the problem,Allow for differences, but in an appropriate way,The center of adaptive reasoning is the justification and interpretation of claims

(Purdy(2018, p. 36).

male (Hassan, 2018)BIt's susceptibilityStudentsOn logical thinking, and justification using logical relationships between situationsssports, and concepts for solution analysis,And explain it,And justify it,and the performance of sports tasks after training in extra-cognitive

skills (Hassan, 2018, p. 23). And promise Adaptive reasoning is a way to convince others of ideas, and solutions to mathematical problems; So that everyone realizes that mathematics is meaningful, It can be understood and implemented (Hassan & et al, 2023, p. 105).

#### **Fifth component The tendency to produce (productive desire)**

the Students Those who see themselves as incapable of practicing thinking, Or they don't believe that mathematics has meaning, They will not make any attempt to solve mathematical problems, And they do not believe that they can achieve success, So they are not ready to fight because they think the issue is difficult, They will soon abandon the solution, As for the Students Those who possess the productive inclination, they will achieve great superiority, due to their tireless attempts to solve the mathematical issue, Even if they were not able to solve it completely, Their serious efforts, And persistent they will build component efficiency based on cognitive processes, and strengthen it, Thus, they confirm to themselves the importance of exerting effort in the solution, And dealing with difficult mathematical tasks that enhance the ability to think, Thus, productive tendency can be seen as a characteristic of you-n change it; By interacting with the new mathematical tasks, and not as a fixed feature, It is closer to being a habit of thinking that can be learned and studied. (siegfried, 2012, p18-19)

#### **Previous studies :**

#### **Studies dealing with athletic competence**

- 1) **study (Samuelson, 2010)** :-conducted in Sweden, and used the experimental method Its aim is to identify the effect of two different traditional teaching methods and problem-solving in teaching mathematics on students in the first five years of school, in addition to the gender variable, on the development of the five components of mathematical competence., was the sample size (105) of the students, and the mathematical aptitude test tool was used to measure it among the students, The results showed that there were no statistically significant differences between the two schools in procedural fluency, but the growth of conceptual understanding, strategic competence, and adaptive reasoning was better with regard to the problem-solving approach in teaching, and there were no differences between the performance of males and females..
- 2) **Abu Al Rayat Study (2014)**: conducted in Egypt I followed the experimental method Its goal is to know The effectiveness of using Marzano's learning dimensions model in teaching mathematics on the development of mathematical competence among middle school students. The sample size was (134) students, and the test of the first four components of mathematical aptitude was used with a measure of productive

inclination, and the results showed There is a statistically significant effect when significance level(0.01) In favor of the experimental group that was studied using Marzano's learning dimensions model, while the results did not reveal a difference in the performance between boys and girls on the mathematical aptitude test ingredients Procedural fluency, conceptual understanding, productive and gross mathematical flair ingredients Cognitive competence, while there were statistically significant differences in favor of girls in the dimensions of strategic competence and adaptive reasoning.

## **Research methodology and procedures**

**Research Methodology:-** I depend T researcher T In their current research, the descriptive research method is used to ensure the description and analysis of the studied case (Majeed, 2018).

**research community :-** Research community corrupted from class students fourth Scientific in schools affiliated to the Directorate of Education Baghdad/First Rusafa For the academic year (2022-2023), which numbered (14050 (male and female students, among them) 8192 (student, and) 5858) freshman.

**The research sample:-** Was selected the sampler randomly, soreached (389) Male and female students, with (163) students and (226)

**Search tool:-** jPassed build test and a measure of mathematical competence B group Steps as follows:-

### **1. Determine the goal of the test:**

Aim to the test to measurement Mathematical competence I have Fourth-grade students in the General Directorate of Education Baghdad/First Rusafa.

### **2. Define a concept Mathematical competence:**

Locate Concept Mathematical competence according to what was proposed In



the background theory, review definitions Theoretical and procedural of mathematical competence f Authorized H In this research .

### 3. to set components of mathematical competence:

I looked Researcher on many man research, and previous studies that dealt with this concept Mathematical competence Walling ingredients included in it, like that On some sources (Arabic, And the foreigner-H), And This has been determined the components (5) ingredients and wpm-achimes with nature-Search.

### 4. an offer components of mathematical competence on the arbitrators:

The two researchers presented the ingredients On a group of arbitrators of specialization modalities Teaching mathematics, in order to know its validity and suitability for the purpose for which prepared for it.

### 5. Analysis of the fourth grade scientific book (four chapters) according to the components of mathematical competence

The mathematics book for the fourth grade of science, the first four chapters, was analyzed (Mathematical logic, Equations and inequalities, Foundations and roots, Trigonometry)

It was analyzed according to the components of mathematical competence (conceptual understanding, procedural fluency, strategic competence, adaptive reasoning).

### 6. Drafting test items and scale:

The overall test is 26 (paragraph, by) 16 (a paragraph of the type of objective questions multiple choice, and) 10 of the essay questions Distributed into four chapters according to the test map as in Table (1). The items of the scale that measure the fifth dimension (productive inclination) amounted to (20 items):

table(1)

The test map for the mathematical aptitude test items

the total	strategic competence	adaptive inference	Procedural fluency	conceptual understanding	Content percent age (importance)	Number of shares	the chapter
255	39	32	59	125			
100%	the weight relative 15%	relative weight 13%	relative weight 23%	relative weight 49%			

5	1	1	1	2	18%	8	the first
7	1	1	2	3	27%	12	the second
6	1	1	1	3	22%	10	the third
8	1	1	2	4	33%	15	the fourth
26	4	4	6	12	100%	45	the total

#### 7. View test items and scale:

offered Researcher The test paragraphs on a group of arbitrators and specialists in the field of mathematics and methods of teaching it as an appendix in order to verify the correctness a Ring virtual for testing Judging the validity of each paragraph in measuring the indicator for the field designated for its measurement and its suitability.

#### 8. Preparation of test instructions:

developed by the researcher Special instructions Mathematical aptitude test and scale And I took care of it Clarity of horizon-she saw, like that How the answer on vertebrae the test and the specified degree for testing Do not leave any paragraph without an answer.

#### 9. Application to the sample-for statistical (second poll):

The two researchers applied the test and the scale on a sample of (100) male and female students to find out the difficulty and ease and the correlation and stability of the test items and the measures.

#### 10. Test correction:

Which means that he Score for representation response that intuitive-a ipul on vertebrae the test and scale, after finish from ad-Dad hiding R The researcher developed the typical answers for all paragraphs mathematical aptitude test, united ddt degree the answer for each paragraph and that the total score of the test is (86) And the scale is (80) degrees.

#### 11. Statistical analysis of the test items:

The following has been calculated

##### a. Difficulty index for paragraphs at test Mathematical competence:

ranged transactions The difficulty is between (0.46)-0.67) for paragraphs the test, any That's it-she saw the test be m-Acceptance, so its difficulty ranged-A and ease between (0.20 - 0.80). (Jawad, 2022, p. 423).

#### B. The discriminatory power of the test items and scale:

is found that it ranged between (0.60 -0.30) as shown, Also, the t-values of the scale were found, all of which are statistically significant and be horizon-Rah accepted-And if it is t ratio m-Factor her discrimination (20%) so what above.

(Hassan, 2017, p6).

### **C - the effectiveness of wrong alternatives for thematic paragraphs:**

The researcher found value Effectiveness of alternatives to thematic paragraphs using its own equation, and she was Results negative and this is guide on it is active-H (Majeed, et al, 2023, 210).

#### **12- Al-Khus-The sycophant-And metric: and smell—For honesty and perseverance-at:-**

**1-12-. p-Knock:** j been enrolled-s of sincerity Mathematical aptitude test in two ways:

**A- p-Dras Alz-Yes irrigation :-**

The researcher presented the mathematical aptitude test item on the arbitrator-n in m-Mathematics major and teaching methods-ato be sure that paragraphs represent and fit the Mg-the who j-rad measured, And for the test kk-For, and after collecting the opinions from Messrs. arbitrator-n And taking into account with those opinions, and guide-at theyt-j posed around The hiding vertebrae-Rm-n side-Amending some paragraphs.

### **B - the truth of the building:**

been enrolled-s from p-The building is as follows:

#### **1. Factorengagement Staircase-at ka For a paragraph with grades of after His affiliate:**

And ranged-Tlink transactions with me-n (0.278\*\* - \*\*0.853) For Proficiency Test (First Four Components) which is D-Statistical-a, And Indicates that to consistency dizzy-me fabricated-she saw The test is either for the product propensity scale (0.354\*\* - 0.798\*\*).

#### **2. public-tolink with me-n drawer-at k-to after and degreethe test Total:-**

has been calculated value B correlation coefficient-Rson among the degrees of each after M-On the stairs-the kidneys-for testing-arr, soranged-she wants-n (0.798\*\* - \*\*0.911), So prepare all m-salary workers-I function statistically, As for the scale, it ranged between (\*\* 0.927 - \*\* 0.940), which is statistically significant.

### **3. Rank coefficient-I am between the degrees of each level-Ra and drawer-Hiding-R kidneyH :**

Maam was adopted-l link pierce-wen (Pearson) between drawer-Each paragraph comes with a drawer-e testMathematical competencetotal,It turns out that Maam-The correlation is not statistically significantfor all paragraphs, soranged between (\*\*0.323–\*\*0.864)As for the size, it ranged between(\*\*0.348 - \*\*0.690).

#### **12-2- Test stability:**

alpha method **Cronbach:**

The stability coefficient of the test (86%)But the scale is stable(0.941)It is an indicator-R is good to bounce-come the test,becauseThe test is characterized by stability if the value of stability-H (67%) or not-S.

(Assaf,2003, s237)

SoBecome the hider-arrand scalereadyyenapplication and its final form-to be able to measureMathematical competenceon the research sample

### **Presentation and interpretation of results**

for related resultsMathematical competenceThe students of the classthe fourthIn mathematics, the validity of the hypothesis was testedHzero thaSwagger: "There is no statistically significant difference at the level of (0.05) between the mean scores of the real performance and the hypothetical mean of the class studentsthe fourthscientific testand a measure of mathematical competence.

The researcher conducted the normal distribution test (Kolmgrov-Smirnov) for the students' scores in the variable of mathematical competence and found that they are distributed normally because the level of significance (0.200), which is greater than the level of significance adopted (0.05).

Since the data is distributed normally, soaI will workpost-test researcher (t-test) for one sampleTo find outHypothesis validity-, as the true arithmetic meanfor studentsin a variableMathematical competencehe (111,738), and the standard deviation was (13,613), and with an error standard hit(0.690),The hypothetical average was (93),The

students' scores were averaged in each component of mathematical proficiency how much in table (22):

**Schedule (22)**  
**One-sample t-test results (t-test) To identify the extent to which students possess mathematical competence**

Statistical significance	a test-t-test		standard error	standard deviation	true average	Hypothetical	The number of	Paragraphs of mathematical competence	components of efficiency
	value Tabular	value calculated							
function	1,960	18,961	0.121	2,391	8,298	6	389	Q1,Q2,Q3,Q7, Q8,Q13,Q14,Q15 Q19,Q20,Q21, Q22	conceptual understanding
function	1,960	24,116	0.223	4,408	18,889	13.5	389	Q3,Q9, Q10,Q16,Q23, Q24	Procedural fluency
function	1,960	29,409	0.098	1,929	8,877	6	389	Q4,Q11, Q17,Q25	adaptive inference
function	1,960	10,475	0.223	4,393	19,833	17.5	389	Q5,Q18,Q12,Q26,	strategic competence
function	1,960	13,478	0.433	8,547	55,841	50	389	<b>20 paragraph</b>	product tilt

function	1,960	27,149	0.690	13,613	111,738	93	389		athletic competence as a whole
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The results in the above table show that there are differences between the real arithmetic average of the scores and the hypothetical average of the mathematical aptitude test as a whole, as the t-value calculated using the test for one sample appeared (t-test), which is (27.149), which is higher than the tabular t-value of (1.960) and that the level of statistical significance is (0.000), which is less than the approved level of statistical significance (0.05). Also, the t-values were found to indicate the differences between the arithmetic mean and the hypothetical averages of the five components of mathematical competence separately, and it was found that the calculated t-values are higher than the tabular t-value which amounts to (1.960), as well as the level of statistical significance which amounts to (0.000) is less than the level of statistical significance approved and amounting to (0.05), and this indicates that students possess the five components of mathematical competence.

Also, according to gender, students have all five components of mathematical competence, compared with the assumed averages of the components And as illustrated in the table ( 23).

## Schedule ( 23)

**Descriptive statistics and significant tests for the values of students' results in  
general on the mathematical aptitude test items**

the decision	Moral level	t-test		standard deviation	true average	Hypothetical average	the sample	sex	components of efficiency
		df	T						
function	0.000	162	11.290	2,525	8,233	6	163	males	conceptual understanding
function	0.000	225	15.375	2,293	8,345		226	females	
function	0.000	162	13,516	4,107	18,166	13.5	163	males	Procedural fluency
function	0.000	225	20,461	4,343	19,412		226	females	
function	0.000	162	19.376	1,899	8,883	6	163	males	adaptive inference
function	0.000	225	22,091	1,954	8,872		226	females	
function	0.000	162	5,678	4,187	19,362	17.5	163	males	strategic competence
function	0.000	225	8,901	4,513	20,173		226	females	
function	0.000	162	15,838	7,358	59,129	50	163	males	product tilt
function	0.000	225	6,083	8,573	53,469		226	females	

n	0	5							
function	0.00	16	19,32	13,725	113,77	93	163	males	efficiency sports As a whole
function	0.00	22	19,41	13,369	110,26		226	females	

Turns out The respondents' levels achieved a significant difference between the two average indicators real arithmetic and Hypothetical average.

The following hypotheses branch out from the main hypothesis:

- 1) not significant when touched by auctioneer-e (0.05) b-n died-Wes-i imposition-J and mean-t laacetabular disease-s-j for degrees the students F-J hid-arr Mathematical efficiency.

It appears from Table (23) that the real average of the students' scores in the proficiency test as a whole was (113.773), which is higher than the hypothetical average (93), meaning that the students have mathematical competence and confirmation of this, and to find out the direction of the differences between the two averages, the t-value was found (t for one group and amounted to (19.323), which is higher than the value of t (Tabular) (1.960) and a significant level (0.000), which is less than the level of intentional significance (0.05), so we reject the null hypothesis and accept the alternative hypothesis, that is, there is a statistically significant difference between the real average and the hypothetical average, and in favor of the real average in the mathematical aptitude test, as the value was found. The t-test was used to indicate the differences between the true mean scores and the hypothetical mean for each dimension of the mathematical competency components. That is, students possess mathematical competence with its five components.



2) not yog-d f-Significant parchment-Statistical-when touched-Wii auctioneer-e (0.05) b-n died-Wes-i imposition-J and mean-t laacetabular disease-s-jfor degrees female studentsF-J hid-arrMathematical efficiency.

Table (23) shows that the real arithmetic mean of the students' scores in the proficiency test as a whole was (110.269), which is higher than the hypothetical mean (93), meaning that the students have mathematical competence. (t(for one group, and it amounted to (19.419), which is higher than the value of t(tabular)01.96) and at a significant level (0.000), which is less than the level of intentional significance (0.05), so we reject the null hypothesis, and accept the alternative hypothesis, that is, there is a statistically significant difference between the real mean and the hypothetical mean. Between the true mean scores and the hypothetical mean for each dimension of the mathematical proficiency components, all of which were significant, meaning that the female students possessed the mathematical proficiency and its five components.

3) not yog-d f-rq yjDalal-Statistical-when touched-Wii auctioneer-e (0.05) b-I slept-Wes-ij degrees Male and female studentsF-J hid-arrMathematical efficiency.

The researcher used a testLevine's Testfor a statementSample homogeneity(male and female),And it was valuableLevin's statistic(0.954) at the level of significance (0.329) which is higher than the level of significance (0.05), so the two groups(male and female)homogeneousfigie no There are statistically significant differences between male and female students' scores.

Compared toaveragesfor degrees aFor male and female students, It turns out aStudent diseaseand female students Equal in variable of mathematical competence as a wholeand table (24) shows the statistical description of an eye-Search.

## Schedule (24)

**Results of the t-test for two independent samples to find out the significance of differences in sports aptitude and its components according to gender**

the decision	Levin's statistic		valuet-test calculated		standard deviation	Arithmetic mean	Number of individuals	group gender	components of mathematical competence
	significance level	F	Statistical significance level	T					
non function	0.085	2,961	0.649	0.455	2,525	8,233	163	males	conceptual understanding
					2,293	8,345	226	females	
function	0.559	0.342	0.006	2,774	4,407	18,166	163	males	Procedural fluency
					4,343	19,412	226	females	
non function	0.612	0.257	0.953	0.59	1,899	8,883	163	males	adaptive inference
					3,319	8,872	226	females	
non function	0.345	0.893	0.072	1,801	4,187	19,362	163	males	strategic competence
					4,514	20,173	226	females	
function	0.207	1,595	0.000	6,811	7,354	59,129	163	males	product tilt
					8,573	53,469	226	females	

non functi on	0.329	0.954	0.012	2,522	13,725	113,773	163	males	athletic competen ce as a whole
					13,369	110,269	226	females	

To find out the direction of the differences between the averages, it was found Post-test for two independent sample equal. The results were as shown in the table (24), a. The researcher noticed a value "t" calculated (2.522) f. Significance level (0.012), which is less than significance level approved (0.05), And on it We refuse null hypothesis any that it. The found a difference Statistically significant between a Student disease. In the mathematical aptitude test as a whole, in favor of males.

It is shown by means of table (24) the values of (t) calculated to find out the trend of differences between the mean scores of male and female students in each dimension of the mathematical competency components, as follows:

- Conceptual understanding: The calculated t-value (0.455) at a significant level (0.649), which is higher than the level of significance (0.05), so we accept the null hypothesis, meaning that there is no statistically significant difference between the mean scores of male students and the average scores of female students in the conceptual understanding test.
- Procedural fluency: -: The calculated t-value reached (2.774) at a significant level (0.006), which is less than the level of significance (0.05). Therefore, we reject the null hypothesis and accept the alternative hypothesis, meaning that there is a statistically significant difference between the average scores of male students and the average scores of

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female students in the procedural fluency test, in favor of female students.

- Adaptive inference: - The calculated t-value reached (0.059) at a significant level (0.953), which is greater than the level of significance (0.05). Therefore, we accept the null hypothesis, meaning that there is no statistically significant difference between the mean scores of male students and the average scores of female students in the adaptive inference test.
- Strategic competence: - The calculated t-value reached (1.801) at a significant level (0.072), which is higher than the level of significance (0.05). Therefore, we accept the null hypothesis, meaning that there is no statistically significant difference between the average scores of male students and the average scores of female students in the strategic aptitude test.
- Productive Inclination: - The calculated t-value reached (2.522) at a significant level (0.012), which is less than the level of significance (0.05). Therefore, we reject the null hypothesis, and accept the alternative hypothesis, meaning that there is a statistically significant difference between the average scores of male students and the average scores of female students in the Productive Inclination Scale. And for the benefit of the students.

See the researcher through this result-H To interpret the results of the mathematical competence that the students of the fourth scientific grade possess. The reason may be due to the development in the mathematics curricula of the previous stages. And the

fourth scientific stage as well which keep pace with the developments and requirements of the contemporary time, As it was found through the analysis of the mathematics book for the fourth scientific grade according to the components of mathematical competence (conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and productive inclination) that the textbook contained these components in varying proportions, meaning that the mathematics curricula in the previous grades contained them that you need to Remember and then comprehend (understanding), and have a high skill in solving mathematical issues (mathematical problems), that is, they need (procedural fluency), and there are some mathematical topics that need more than that that may reach the use of strategic competence and adaptive reasoning, including issues in which there is a challenge And justification, deduction and extrapolation, as well as the presence of life issues that link mathematics with the reality of life and with other sciences such as physics, chemistry, medicine and others, which prompted students to have a productive desire to solve such issues.

### **Second: conclusions**

- 1- Class ownership the fourth Scientific Mathematical competence in Mathematics.
- 2- to have Male students have more mathematical competency components than female students.

### **Third: Recommendations**

- 1) Providing developmental sports activities Mathematical competence.
- 2) training and teach pupil on How use their athletic competencethere is a solution Problems containing mathematical problems.
- 3) Set up episodes, And Seminars Social for the teaching staff and direct them on How Employment use components of mathematical competence in daily school activities.

#### **Fourthly : proposals**

- 1- Conducting research on other academic levels to find out the extent of students' possession components of mathematical competence.
- 2- Carry out experimental studies by following the strategies, and modern teaching methods that work to develop mathematical competence for students and all academic levels.

#### **Sources**

- 1- Abdul Wahid Qassim Saleh Al-Saadi, . Hassan Kamil Risen Al-Kinani (2021) , Analysis Of Mathematics Books In The Basic Education Stage According To TIMSS Standards , Turkish Journal of Computer and Mathematics Education , Vol.12 No. pp. 3051-3059
- 2- Adass, Muhammad Abdel-Rahim (2000), School and Teaching Thinking, 1st edition, Amman, Jordan, Dar Al-Fikr for publication and distribution.
- 3- Afaf Ziyad Wadi Al-Khafaji, Muda'i Muhamad Al-Bayati Inaam Abdul-Jabbar Rashid Al-Obaidi, The Effect of the Self-Questioning Strategy on the Achievement of the Fourth Grade and Their Reflective Thinking in Physics. Journal Of Educational and Psychological Researches, 2023, Volume 20, Issue 76, Pages 336-362
- 4- Afaf Ziyad Wadi' 2018, The Perceptible Speed and Its Relation to Metamemory among Students of College Of Education for Pure Sciences\ Ibn Al-Haytham, Vol. 15 No. 57
- 5- Al-Surour, Nadia Hail (2005), Teaching Thinking in the School Curriculum, 1st edition, Amman, Jordan, Dar Wael for printing and publishing.
- 6- Al-Uqabi, A.Kh. J.; Al-Kazemi, HMJ (2023), The Effect of Proposed Strategy According to the Realistic Mathematics Theory on the Achievement and Mathematical Interrelation of Third Intermediate Students, Journal of Educational and Psychological Researches, 20(77), pp.391-415.

- 7- Arthur, L. Costa & Bena, K. (2009) Habits of Mind Across the Curriculum Practical and Creative Strategies for Teachers.
- 8- Costa, & Kalick (2005): Describing (16) Habits of mind Retrieved August , from , <http://www.habitofmind.net/whatare.htm> , California , Books Locale publishing company . Expression Predicts Long Term Adjustment , Clinical Psychology Program , Teachers College , Columbia University , USA
- 9- Costa, & Kilek (2000), Discovering and Exploring Habits of Mind, ASCD. Alexandria victoria. USA
- 10- Hassan, A.Kh., Hammadi, SS, Majeed, BH (2023). “The Impact of a Scenario-Based Learning Model in Mathematics Achievement and Mental Motivation for High School Students”, International Journal of Emerging Technologies in Learning (iJET), 18(07), pp. pp. 103–115. doi: 10.3991/ijet.v18i07.39263.
- 11- Hassan, AK (2017). The effective of the suggested instructional design that based on the teaching strategy for understanding in achievement for students of mathematics in the fifth grads. Journal of Educational and Psychological Researches, 14, pp. 1-22.
- 12- Hassan, DAK (2018). Effect of the Fink model of active learning in lateral thinking and the achievement of mathematics students in mathematics. ALUSTATH JOURNAL FOR HUMAN AND SOCIAL SCIENCES, 224(3), 63–88.
- 13- Hassan, Istiqlal Faleh and Fares, Elham Jabbar (2019), The effect of an instructional design–Learn from Keegan's structures.Kagan) in the skills of generating information for first-grade intermediate students in mathematics, Journal of Educational and Psychological Research, Volume (16) University of Baghdad.
- 14- Ibrahim, Muhammad, and others (2013), thinking, teaching him his skills, his habits, Baghdad, Iraq, Dar Al-Farahidi for publication and distribution.
- 15- Jarwan, Fathi Abdel-Rahman (2007), Teaching Thinking, Concepts and Applications, 3rd Edition, Amman, Jordan, Dar Al-Fikr.
- 16- Jawad, L.F. (2022). Mathematical connection skills and their relationship with productive thinking among secondary school students. Periodicals of Engineering and Natural Sciences, 10(1), 421-430.

- 
- 17- Jawad, L.F.; Majeed, BH; and ALRikabi, HTS (2021). “The Impact of Teaching by Using STEM Approach in The Development of Creative Thinking and Mathematical Achievement Among the Students of The Fourth Scientific Class”, *International Journal of Interactive Mobile Technologies (iJIM)*, 15(13), pp. pp. 172–188. doi: 10.3991/ijim.v15i13.24185 .
  - 18- Majeed, BH (2018), Mathematical-procedural Knowledge is its relation to logical-mathematical intelligence among students at the third stage in mathematics department. *Journal of Educational and Psychological Researches*, 15 (58), pp. pp. 478-498.
  - 19- Majeed, BH, Hassan, AK, Hammadi, SS (2023). The Effect of Cognitive Modeling in Mathematics Achievement and Creative Intelligence for High School Students. *International Journal of Emerging Technologies in Learning*, 18(9), pp. 203–215.
  - 20- Matthew, A, (2004) *Smart thinking; skills for critical understanding and writing*. Oxford, united Kingdom; Oxford university press.
  - 21- Nofal, Muhammad Bakr (2008), *Practical Applications in Developing Thinking Using Habits of Mind*, 1st Edition, Dar Al Masirah for Publishing and Distribution, Amman, Jordan.
  - 22- Trad, Haider Abdel-Reza (2012), The effect of the (Costa and Kalik) program on developing creative thinking using habits of mind among third-stage students in the College of Physical Education, *Journal of Physical Education Sciences*, Issue 1. University of Babylon.