

ILLUSORY CORRELATION AND ITS RELATIONSHIP TO MATHEMATICAL COMPETENCE AMONG STUDENTS OF THE MATHEMATICS DEPARTMENT AT THE COLLEGE OF EDUCATION

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Abstract

The current research aimed to study the correlational relationship between imaginative coherence and mathematical efficiency. To achieve this goal, the researcher followed the descriptive, correlational approach, the study population was determined to be students of the College of Education at Al-Qadisiyah University, the study sample included (100) male and female students. The researcher designed research tools to collect data, which was represented by the Illusory Correlation test consisting of (24) items, in addition to the mathematical proficiency test and scale which includes (30-2-scale) items. Appropriate statistical analyses were performed for both tests, while verifying their psychometric properties, and after using statistical tools to analyze the results of applying the two tests, the results showed the following:

1. The presence of Illusory Correlation among sample members.
 2. The sample members possess mathematical competence.
 3. There is an average correlation between Illusory correlation and mathematical efficiency.
- In light of these findings, a set of recommendations and suggestions were presented to specialists in the fields of research and education.

Keywords: Illusory Correlation; Mathematical Efficiency; Mathematical Proficiency; Descriptive Correlational Approach; University Students.

Introduction

Research Problem:

University education in the current era witnesses' major challenges in developing students' mental skills, this imposes the need to improve educational methods to meet the requirements of the twenty-first century. Illusory Correlation is one of the basic mental patterns that contribute to improving students' ability to link mathematical concepts and understand the relationships between them, which enhances their ability to solve problems in innovative ways. Mathematical proficiency also requires students to possess complex

intellectual skills, such as logical reasoning, critical analysis, applying mathematical models in multiple contexts, despite the great importance of both imaginative coherence and mathematical efficiency in university education, some studies indicate that students' poor ability to connect mathematical ideas in innovative ways reduces their mathematical proficiency, the results of some questionnaires and interviews with university professors showed that students lack the ability to visualize mathematically, which affects their performance in solving problems efficiently and making thoughtful scientific decisions. Based on this, the research problem is determined in the following question:

What is the relationship between Illusory interdependence and mathematical competence among students of the College of Education?

Research Importance:

1. This study is a qualitative addition to the Iraqi and Arab educational literature in the field of mathematics teaching methods, it seeks to link the components of mathematical competence with a set of other related variables, thus enriching theoretical and applied understanding of the concept of competence in diverse educational contexts.
2. Components of mathematical competence are direct and essential educational goals for the teacher, and represent an effective input into the teaching process, this competence can be developed among all students in a way that suits their abilities, inclinations and trends, by providing a stimulating mathematical learning environment that contributes to activating the mind and intellect, it enhances positive attitudes towards mathematics, so that the student discovers the beauty of the material and its intellectual and practical value.
3. This work provides a test and scale for measuring athletic proficiency, which can be used to diagnose students' levels and identify strengths and weaknesses in their athletic performance.
4. The results and tools of the study contribute to supporting those concerned with the educational process, including teachers, educational supervisors and administrators, by enabling them to discover students' mental and cognitive abilities by assessing their level of mathematical competence, which helps to develop more effective educational strategies.
5. Illusory Correlation is an essential source for producing new ideas, while critical thinking undertakes the process of deeply sifting through and analyzing these ideas, thus, both contribute to enhancing the individual's ability to self-learn, stimulating creativity, and developing problem-solving skills, in addition to enabling him to make effective decisions supported by understanding and analysis.
6. Illusory Correlation enhances cognitive efficiency by generating new ideas, while critical thinking helps analyze them in depth. together, they contribute to improved self-learning, creativity, and problem solving, enhancing an individual's ability to make effective decisions.
7. The general and basic goal of these educational institutions is to prepare competent learners and teachers in the future who have mental abilities and skills that help them think and imagine and enhance their level of knowledge. (Ghanem and Jassim, 2022: 408)

Research Objectives: The current research aims to identify the level of:

1. Illusory Correlation among mathematics students.
2. Mathematical proficiency among mathematics students
3. The correlational relationship between imaginative interdependence and mathematical competence among research sample students.

Research Hypothesis:

1. There is no statistically significant difference at the significance level (0.05) between the average real performance and the average hypothetical performance among students of the College of Education (as a whole) in the Illusory correlation test prepared for the aforementioned purpose.
2. There is no statistically significant difference at the significance level (0.05) between the average real performance and the average hypothetical performance of students of the College of Education (as a whole) in the sports proficiency test prepared for the aforementioned purpose.
3. There is no correlation at the significance level (0.05) between the Illusory correlation and the mathematical competence of the students of the College of Education (as a whole).

Research Limitations:

1. Students of the Mathematics Department in the Colleges of Education (for pure sciences, Ibn Al-Haytham, College of Education, University of Babylon, College of Education, Al-Qadisiyah University, College of Education, Tikrit University) affiliated with Diwaniyah Governorate for the academic year 2024-2025.
2. Components of mathematical competence (conceptual understanding, procedural fluency, adaptive reasoning, strategic competence, productive tendency).

Search terms:

A. Illusory Coherence: (Wilensky, 1993) defined mathematics as the process that transforms mathematics into an interconnected and integrated structure, it helps students explore mathematical concepts, and helps them build relationships between mathematical knowledge and its applications in reality. (Wilensky, 1993: 3361)

The researcher agrees with the theoretical definition provided by Wilensky, 1993)), as she sees in it a precise explanation that shows how to transform mathematics into an integrated structure that contributes to developing the student's understanding of mathematical concepts and their relationship to the real world.

Procedural definition: It is defined as a set of mental skills that demonstrate the learner's ability to link mathematical concepts and understand the functions of mathematics, applying mathematical modeling in other academic subjects, in addition to linking mathematical knowledge to life practices, is measured by the score students obtain on this test.

B. Mathematical Competence:

Define (Kilpatrick et al., 2001): It is the integrated access to conceptual understanding, procedural fluency, strategic competence, adaptive reasoning, and tendency to produce (Kilpatrick et al., 2001, p. 313).

Theoretical definition: The researcher adopts the definition (Kilpatrick et al., 2001) as her theoretical definition, procedural definition: Mathematical competence is the student's ability to integrate cognitive and practical skills into mathematics, which includes a conceptual understanding of mathematical concepts, the ability to use mathematical procedures flexibly and accurately, and choosing appropriate strategies for solving problems, it also includes the ability to adapt to new mathematical situations and apply logical thinking to solve problems, this requires the ability to link mathematical knowledge with practical practices and the effective evaluation of results, as measured by the grade received by the mathematics department.

THEORETICAL BACKGROUND

The first axis: theoretical background

First: Illusory correlation (Illusory Correlation)

The concept of Illusory correlation refers to the cognitive tendency of individuals to perceive the existence of a relationship or association between two variables, despite the absence of any real relationship between them, this type of correlation arises as a result of the influence of cognitive biases or preconceived expectations, which lead individuals to infer patterns, relationships, and significance between phenomena or events, even when available data do not support these conclusions, this pattern of thinking is evident in a number of contexts, particularly in social cognition, where certain groups may be thought to possess special traits or behaviors without empirical evidence to support it (Hamilton & Gifford, 1976, p. 394).

The Importance of Illusory Correlation in Scientific Research

Awareness of the existence of Illusory connections represents a crucial step in enhancing the credibility of scientific research, especially in the fields of psychology and social sciences, researchers' awareness of the possibility of making such cognitive errors contributes to avoiding false conclusions and achieving a more accurate scientific analysis, the ability to detect this spontaneous tendency helps reduce biases in interpreting results, and enhances the objectivity of scientific conclusions (Hamilton & Gifford, 1976, p. 395).

Illusory Correlation skills

To effectively deal with this type of thinking, a set of cognitive and rational skills emerge, the most prominent of which are:

1. Critical analysis: This skill involves systematically evaluating information and data to avoid jumping toward unsupported results. It also includes verifying the credibility of evidence and avoiding the influence of personal or cultural biases.

2. Distinguishing between real and Illusory connections: This is a cognitive skill that enables an individual to separate relationships based on empirical data from those based on previous beliefs or experiences that are not based on scientific facts.
3. Logical thinking: involves using the principles of rational reasoning in analyzing phenomena to determine whether there is a true causal relationship between variables, far from random or simultaneous linking.
4. Awareness of cognitive biases: The ability to recognize the influence of psychological factors, such as confirmation bias or preconceptions, on the process of analyzing data and inferring relationships. This requires training in techniques for controlling attention and critical thinking (Abbas, 2020: 465).

Dimensions of the importance of Illusory Correlation

1. Improving the quality of decision making: Avoiding Illusory connections enhances the accuracy of decisions, whether in a research or professional setting, by being based on realistic and reliable data.
2. Reducing behavioral and cognitive biases: Individuals' awareness of the possibility of falling into illusory associations helps them correct their behavior and thinking, and reduces the possibility of making prejudices.
3. Enhancing the credibility of scientific research: Distinguishing between real and Illusory correlation contributes to providing more reliable scientific results, which enhances the sobriety of scientific research and its effectiveness in addressing real-world problems.
4. Improving social relationships: A conscious understanding of this cognitive pattern can improve social interaction, by avoiding unjustified generalizations and adopting more just and equitable attitudes toward others.

Second: Mathematical Efficiency

At the turn of the twenty-first century, the Mathematics Learning Committee of the US National Research Council (NRC) concluded that it had identified a set of foundations that would ensure effective mathematics learning, in line with the desired educational goals. The committee called this vision "mathematical competence," a comprehensive term that covers various dimensions of mathematical knowledge, including understanding, ability, and experience, it aims to highlight the requirements for success in learning mathematics. The committee confirmed in its report that all learners take the path to acquiring mathematical proficiency starting from the pre-school stage, this makes this competency one of the most important mathematics learning outcomes recommended by the US National Research Council (NRC, 2001, p. 116).

In the same context, there was an important report by the National Mathematics Advisory Panel (NMAP) in the United States, in which it called for adopting mathematical proficiency components as a means of preparing students for the requirements of the twenty-first century, this report included a set of main recommendations in several basic areas, most notably: curriculum content, learning processes, teacher performance,

educational materials and tools, evaluation methods, and scientific research mechanisms (National Mathematics Advisory Panel, 2008, p. xvi).

From a contemporary perspective, Philipp et al. (Philipp et al., 2010) see mathematical competence as a modern entry point for the development of mathematics education, as it is linked to three central axes: first, the competence of scientific content and the extent to which it relates to students' experiences; second, the teacher's competence and ability to process this content effectively; and third, the components of competence themselves that can be measured and developed in learners (Philipp et al., 2010, p. 11).

In the same context, Groves (2012) points out that mathematical competence is embodied in the learner's ability to implement mathematical procedures accurately and flexibly, in addition to a deep understanding of concepts and processes while practicing thinking, reflection and justification skills, competence also includes the ability to represent and formulate mathematical problems in a way that helps the learner realize the value of mathematics in real life and enhance his confidence in its use (Groves, 2012, p. 122).

Salama (2014) points out that mathematical competence is not limited to a student's possession of the types of mathematical knowledge related to content, processes, and thinking, but also includes the tendencies and attitudes necessary to teach and learn mathematics effectively. She believes that this efficiency should be understood through five interconnected and integrated dimensions:

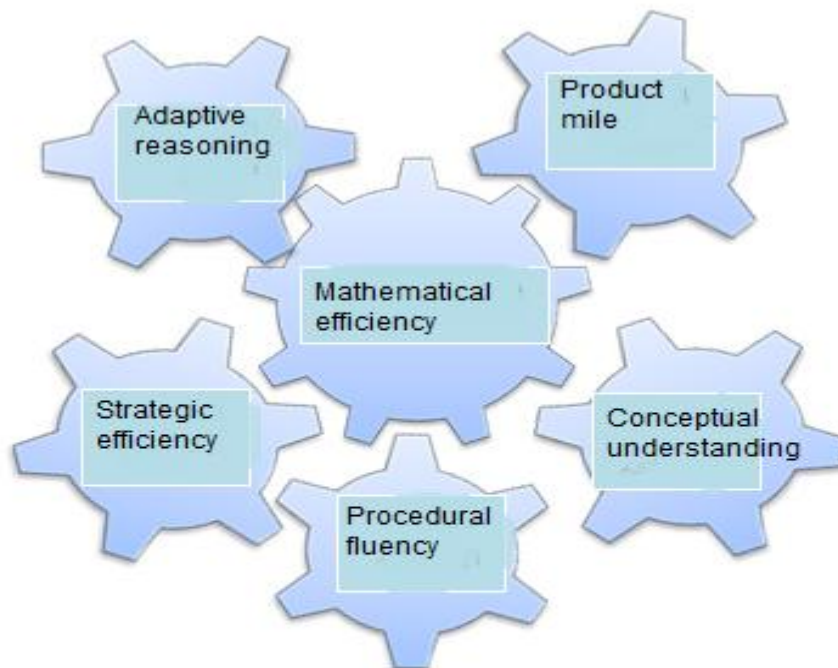


Figure (1)

Components of mathematical competence
(prepared by the researcher)

And emphasizes that these dimensions do not operate separately, but rather overlap to form an integrated cognitive system, the development of which enables students to acquire higher mental skills that help them connect mathematical concepts to each other and employ their understanding in solving problems, enhancing these dimensions also contributes to supporting memory processes, deep understanding, logical analysis, and creative thinking, which enhances the quality of mathematical learning (Salama, 2014: 25).

Components of mathematical competence:

1. **Conceptual understanding:** Conceptual understanding contributes to the development of mental skills such as linking, organizing, and abstraction, and helps students interpret events and solve mathematical problems effectively, it also enhances students' ability to avoid mistakes and understand similarities between seemingly unrelated cases (Saleh, 2013: 18-19).
2. **Procedural fluency:** refers to knowing mathematical procedures and using them flexibly and accurately, which helps students solve mathematical problems effectively, procedural fluency enhances conceptual understanding and reduces common errors.
3. **Strategic competence:** relates to the student's ability to formulate, represent, and solve mathematical problems in a variety of ways, it includes the ability to identify important data and avoid unnecessary data, which promotes critical thinking and problem solving in new contexts (Kilpatrick et al., 2001, p. 124).
4. **Adaptive reasoning:** Adaptive reasoning allows concepts and procedures to be linked in a reasonable way, and is fundamental to mathematical thinking and rationale, it helps students justify mathematical solutions and convince others of the meaning of mathematics.
5. **Tendency to produce:** expresses the desire to face mathematical challenges and think seriously to solve problems, this enhances students' ability to deal with difficult mathematical tasks and emphasizes the importance of continuous effort in achieving success (Siegfried, 2012, p. 18-19).

Second Axis: Previous Studies:

A. Studies on Illusory Correlation

1. **Hamilton and Gifford study (1976):** Title: "Illusory interdependence in cognition between individuals: the cognitive basis of stereotypical judgments". Sample size: The study included 104 participants. Method used: The researchers used the experimental method where information was provided about two groups of individuals, one group received equal proportions of positive and negative behaviors, while the other group received information containing more negative behaviors, how participants related to different behavioral patterns and target groups was measured.

Results: The study showed that participants showed imaginative association, they tended to perceive the group that received negative behaviors as more negative, even though the percentages were equal with the other group.

2. **Study by Sherif et al. (1981):** Title: "The effect of cognitive biases on Illusory interdependence in social interactions". Sample size: The study included 75 participants.

Method used: The researchers used the experimental method, where a series of situations and events were presented to the participants, it was assessed whether participants would see relationships between these events based on their initial expectations. The data were analyzed using statistical analysis to verify the presence of Illusory correlation.

Results: The study confirmed that cognitive biases play a major role in shaping imaginative coherence in social interactions, participants tended to see patterns and relationships that did not exist between social groups based on their initial perceptions.

B. Studies on mathematical competence

Samuelson (2010) study: This study was conducted in Sweden, and used the experimental approach to study the effect of two different teaching methods on the development of students' mathematical proficiency in the first five years of school, the sample consisted of 105 students. Emphasis was placed on the five components of mathematical competence: conceptual understanding, procedural fluency, adaptive reasoning, strategic competence, and productive tendency.

The results showed that the problem-solving method was more effective in enhancing conceptual understanding, strategic competence, and adaptive reasoning than the traditional method, the study also showed that there were no statistically significant differences between males and females in the various components of athletic competence, these results support the idea that a problem-oriented approach helps develop mathematical thinking skills in general, opening the way for the development of new teaching methods that focus on developing critical and analytical thinking skills.

Abu Al-Rayyat Study (2014): This study was conducted in Egypt, where the researcher used the experimental method to study the effectiveness of using Marzano's learning dimensions model in teaching mathematics to middle school students. The study sample consisted of 134 students, the Mathematical Proficiency Test was used to measure the development of the first four components of mathematical proficiency (conceptual comprehension, procedural fluency, strategic proficiency, and adaptive reasoning), in addition to the produced inclinometer, which assesses students' willingness to put in effort to solve mathematical problems.

The results showed a statistically significant effect at the significance level (0.01) in favor of the experimental group taught using Marzano's learning dimensions model, as for the mathematical proficiency test, the study showed no significant differences between males and females in the components of conceptual understanding, procedural fluency, and productive tendency, however, there were significant differences in favor of girls in two components: strategic competence and adaptive reasoning, these results demonstrate that educational methods directed towards the comprehensive dimensions of learning, such as the Marzano model, may contribute to significantly improving mathematical proficiency, especially in the early educational stages.

Chapter Three: Research Procedures

First: Research method: The descriptive method was used in this research, in order to suit the nature of the problem and the objectives of the current research, this approach is suitable for analyzing field data and reaching conclusions related to students' mathematical competence and imaginative coherence.

Second: Research community: The research community consists of male and female students of the Mathematics Department in the Colleges of Education (Baghdad University, College of Education for Pure Sciences, Ibn Al-Haytham University, Al-Qadisiyah University/College of Education, Tikrit University/College of Education) from morning and evening studies. The total population was:

First stage: 268 male and female students, second stage: 216 male and female students. Table (1) explains this:

Table (1) Research community - stage and gender

Stage	Male	Female	Total
First	138	130	268
Second	97	119	216
Total	235	249	484

Third: Research Sample:

The sample was selected in a simple random manner from students of the College of Education, Al-Qadisiyah University / Department of Mathematics for morning and evening studies, with 100 students, where 30 male and 20 female students were selected from the first stage, and 24 male and 26 female students from the second stage, the method of extracting the sample, as indicated by the sources, was such that the number of sample members, as indicated by this type of research, was (20%) of the original community if the community consisted of some hundreds (Melhem, 2006: 155).

Fourth: Research Tools:

A. Illusory Correlation test: Steps to prepare an Illusory Correlation test:

1. Determine the purpose of the test: The Illusory Correlation test aims to measure the ability of first and second stage students to use this type of mental coherence, this is done by determining their level of ability to link mathematical concepts in various situations.
2. Review of previous studies: Relevant literature and previous studies were reviewed to identify different patterns of imaginative association, and these patterns have been explained in detail previously.
3. Formulating test paragraphs: 16 paragraphs were prepared and formulated for the Illusory Correlation test, which included 8 thematic paragraphs and 8 essay paragraphs, clarity of

language was taken into account in drafting the paragraphs, and ensuring their suitability for students in the first and second stages.

4. Preparing test instructions: The instructions included explaining the nature of the test, its objectives, and how to answer it, in addition to determining the number of paragraphs and the final score for the test, which amounted to (32 points), with 3 points for each essay paragraph, that (24) points and (8) points for the thematic paragraphs.

5. Presenting the test to the judges: The test was presented to a group of judges specialized in the field of mathematics and its teaching methods to evaluate the suitability of the paragraphs. Their comments were taken into consideration in developing the final version of the test.

6. Initial application (first survey sample): The test was applied to a first survey sample of 27 male and female students to test the clarity of instructions and paragraphs, in addition to specifying the time required for the answer. Time analysis showed that the average time taken to answer was 40 minutes.

7. Second application (second survey sample): The test was applied to a second survey sample of 100 male and female students, performance was analyzed to evaluate the quality of the test and its validity in measuring Illusory correlation. The results showed that the test measures this ability well.

8. Statistical analysis of test items: Statistical analyses were performed for the Illusory Correlation test items, where difficulty and discrimination coefficients were calculated. Difficulty coefficients ranged between (0.38–0.79), while the discrimination coefficients ranged between (0.35–0.70), which indicates the balance and quality of the paragraphs, (Mohsen, 2025) also indicated that the paragraphs are good if within (0.30) what is above (Mohsen, 2025: 17)

First: Validity: The validity of the test was verified using two methods:

Apparent validity: The validity of the paragraphs was verified by presenting them to a group of judges specializing in mathematics and its teaching methods. The paragraphs were approved by more than 80% of the arbitrators.

Construct validity: The validity of the test was confirmed by calculating the correlation between paragraph scores and relevant dimensional scores. The values ranged between (0.32-0.89), and the results showed statistically significant correlations.

Second: Stability:

The stability coefficient was calculated using Cronbach's alpha equation, where the stability coefficient was (0.84), which is a good indicator of the consistency and stability of the test.

Final Test Application:

After verifying the validity and reliability of the test, the final version was approved and applied to the target sample. One of the department's professors was also used to apply the test.

B. Steps to build a mathematical proficiency test and scale:

1. Determine the purpose of the test: The test aims to measure the level of mathematical proficiency among students of the College of Education in the Department of Mathematics.
2. Defining the concept of mathematical competence: The concept of mathematical competence was defined based on what was presented in the theoretical background, reviewing the theoretical and procedural definitions adopted in this research.
3. Identifying the components of mathematical competence: The researcher reviewed numerous previous studies, as well as some Arab and foreign sources, to identify the five components of mathematical competence in line with the nature of the research.
4. Presenting the components of mathematical competence to judges: The researcher presented the components to a group of judges specialized in mathematics teaching methods to verify their validity and suitability for the purpose for which they were prepared.
5. Analysis of the mathematics book according to the components of mathematical competence: The mathematics book for students of the College of Education in the Department of Mathematics (the first four semesters) was analyzed according to the components of mathematical competence, which include conceptual understanding, procedural fluency, strategic competence, and adaptive reasoning
6. Formulation of test items and scale: The test consists of 30 items of the objective question type (multiple choice), distributed into four chapters according to the test map. The scale items that measure the fifth dimension (productive slope) also contain 20 score items for the college test (90) scores.
7. Presentation of the test items and scale: The researcher presented the test items to a group of judges specialized in the field of mathematics and its teaching methods to verify the apparent validity of the test and the validity of each item in measuring the indicator assigned to it.
8. Preparing instructions for the test: The researcher developed instructions for the test and scale, taking into account the clarity of the paragraphs, how to answer the questions, and the specific score for each paragraph, emphasizing the necessity of answering all paragraphs.
9. Applying the test to the statistical analysis sample (the second survey sample): The test and scale were applied to a sample of 100 male and female students to determine the difficulty of the questions and the relevance and stability of the test items.
10. Test correction: The answer scores for each paragraph were determined based on the typical answers, where the total score for the test was 30 points, and for the scale it was 60 points because it was a triple (I agree, I somewhat disagree) total score (90) points.
11. Statistical analysis of test items: Difficulty and discriminatory power criteria were calculated for the test and scale items. Difficulty coefficients ranged between (0.37 and 0.70), indicating acceptance of the test items. Discriminatory values also ranged between (0.33 and 0.79) All values were statistically significant and the distinguishing power of the scale was extracted. All of them were statistically significant (2.34-5.45) greater than the tabular value (2).
12. Psychometric properties:
 - 12-1. Validity: The validity of the test has been verified using:

A. Apparent validity: The test items and the scale were presented to a group of specialists for feedback on the test and scale.

B. Construct validity: Pearson's equation was checked for internal consistency of the test and scale and they were all statistically significant.

12-2. Stability: The stability coefficient was calculated using Cronbach's alpha equation, where the test stability coefficient was 85% and the scale stability score was 97.2%, indicating good stability of the test. Through these steps, the test and scale are ready for final application to measure students' mathematical proficiency.

Chapter Four: Interpretation and Discussion of the Results

First: Presenting, Interpreting and Discussing the Results

This chapter includes a presentation of the results reached based on the specified objectives, with these results interpreted and discussed within the theoretical framework and previous studies. Below is a presentation of the results as follows:

First Objective: To identify the level of imaginative coherence among mathematics students To achieve this goal, the researcher applied the Illusory correlation test to the research sample that included (100) male and female students, the research results showed that the arithmetic mean of the sample scores in the test was (24.06) points, with a standard deviation of (5.11449) points. To confirm the significance of the difference between the arithmetic mean and the hypothetical mean, which amounted to (16) degrees, the researcher used a T test for one sample, the results showed that the difference was statistically significant at a significance level of (0.05), with the calculated T value being (15.759), which is greater than the tabular T value (1.96) with a degree of freedom (99), this indicates that the research sample possesses a high level of Illusory correlation as shown in Table (2).

Table (2) Arithmetic mean, standard deviation, and T-value for the Illusory correlation test

Variable	Sample	Arithmetic mean	standard deviation	Hypothesis mean	T-value		Significance
					calculation	Tabular	
Illusory Correlation	100	24.06	5.11449	16	15.759	1,96	Significant

Second Objective: To identify the level of mathematical proficiency among mathematics department students, to achieve this goal, the researcher applied the mathematical proficiency scale to a research sample of (100) male and female students, the research results showed that the arithmetic mean of the sample scores on the scale was (49.5000) scores, with a standard deviation of (20.85375) scores, in order to know the significance of the difference between the arithmetic mean and the hypothetical mean, which amounted to (45) degrees, the researcher used the T for one sample, it was found that the difference was statistically significant at the significance level of (0.05), as the calculated T value reached

(2.158), which is greater than the tabular T value of (1.96), this means that the research sample possesses a good level of mathematical proficiency as shown in Table (3).

Table (3) Arithmetic mean, standard deviation, and T value of the mathematical proficiency scale

Variable	Sample	Arithmetic mean	Standard deviation	Hypothesis mean	T-value		Significance
					calculation	Tabular	
Illusory Correlation	100	49.5	20.854	45	2.158	1,96	Significant

Third Objective: To identify the correlation between Illusory correlation and mathematical efficiency among students in the research sample.

Correlation coefficient (Pearson cor.) was adopted in calculating the correlation coefficient between female students' scores on the Illusory correlation test and the mathematical proficiency scale, to show the significance of the correlation coefficients, then the T-test for the significance of the correlation was adopted to test the validity of the previous hypothesis. The results were as shown in Table (4) as follows: -

Table (4) Correlation coefficient between Illusory correlation and clever thinking among female students of the College of Education and the significance of correlation among the research sample

Sample of female students	Number of students	Arithmetic mean	Standard deviation	Correlation coefficient value	T value for correlation significance	Level of significance
Illusory Correlation	100	24.0600	5.11449	0.206	2.094	significant
Mathematical efficiency	100	49.5000	20.8538			

Note that 1.98 is the tabular T value at a significance level of (0.05) and a degree of freedom of (99)

From the table above, the calculated correlation coefficient between the Illusory correlation and the mathematical efficiency of students of the College of Education/Al-Qadisiyah University appears (0.206), this is a positive and strong correlation coefficient because its positive value approached (1) and the T value for the correlation coefficient was (2.094), which is greater than the tabular T value of (1.98), therefore, we reject the previous null hypothesis and accept the alternative hypothesis, meaning that there is a strong correlation between the two variables and the direction of the relationship is direct.

Interpretation:

Illusory Correlation refers to the ability to connect ideas, mental images, or situations that may seem distant or unfamiliar in a new and innovative way, this type of interconnectedness can manifest itself in individuals' ability to come up with unconventional solutions and

ideas, mathematical competence refers to an individual's ability to apply mathematical skills effectively, including a deep understanding of mathematical concepts and the ability to use them to solve complex problems. The relationship between imaginative coherence and mathematical efficiency lies in the following points:

1. **Mathematical Creativity:** Mathematical competence requires creative abilities in applying mathematical concepts. Illusory Correlation enhances this ability by helping individuals see solutions from multiple angles. Conceptual knowledge helps them understand concepts and ideas (Jasim et al., 2023: 66)
2. **Expanding the applications of mathematics:** Illusory Correlation contributes to developing the ability to link mathematical ideas with other concepts, which expands mathematical thinking and enhances the ability to think critically.
3. **Flexibility of mathematical thinking:** Individuals who possess imaginative association skills show flexibility in mathematical thinking, giving them the ability to adapt to unconventional mathematical problems.
4. **Mathematical Problem Solving:** Illusory Correlation helps individuals use their mathematical proficiency skills to solve complex problems in innovative ways

Supporting studies: Studies such as (Paivio, 1971) confirm that imaginative interdependence enhances individuals' ability to produce new ideas, reflecting the importance of this type of thinking in improving mathematical competence.

Conclusions

1. The clear influence of cultural and creative factors on students in developing their mathematical skills, which contributed to the formation of positive attitudes towards the educational material.
2. The direct relationship between imaginative coherence and mathematical competence is statistically significant, as students who possessed a high level of imaginative coherence showed a high level of mathematical competence.

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