Creative Thinking Among a Sample of High School Students
التفكير الابداعي لدى عينة من تلاميذ المرحلة الثانوية

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Abstract *:*

Creative thinking is one of the most valuable goals that educational systems currently strive to achieve, to the extent that national economies have come to rely on innovative and original ideas across various fields. Algeria is no exception to this trend, as it continuously seeks to encourage authentic and beneficial ideas. This study aims to explore the level of creative thinking among high school students by defining creative thinking, its skills, and the factors that either promote or hinder it. The study also examines some modern models and programs designed to teach this type of thinking. To assess creative thinking, the study applied Torrance's Creativity Battery, Form A, in both its figural and verbal components, to a sample of students from Ibn Khaldoun High School in Balarhal. The findings indicate that the overall level of creative thinking across its four skills is moderate.

Keywords: *Creative Thinking, Creative Skills, Torrance Test.*

الملخـص :

التفكير الإبداعي أثمن ما يمكن أن يهدف اليه النظام التربوي في المجتمعات حاليا، إلى درجة أن اقتصادات الدول أصبحت تعتمد على الأفكار الجديدة والإبداعية في كل المجالات والجزائر لا تشد عن هذه القاعدة حيث تسعى دائما لتشجيع الأفكار الأصيلة والمفيدة، وهذه الدراسة أرادت تقصي مستوى التفكير الإبداعي لدى تلاميذ المرحلة الثانوية، من خلال التعريف بالتفكير الإبداعي ومهاراته وبعض العوامل المشجعة والمعيقة، تتناول الدراسة أيضا بعض النماذج الحديث والبرامج لتعليم هذا النوع من التفكير عمدت إلى قياس التفكير الإبداعي لدى تلاميذ ثانوية بن خلدون ببالرحال كعينة مستخدمة بطارية تونرس لقياس الأبداع الصورة (أ) بشقيها الشكلية واللفظية، وتوصلت الدراسة إلى أن مستوى التفكير الإبداعي بمهاراته الأربعة في العموم مستوى متوسط.

الكلمات المفتاحية: التفكير الإبداعي، المهارات الإبداعية، اختبار تورانس.

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1. Introduction

The Algerian school system follows the global trend of educational reforms aimed at keeping pace with worldwide developments in job opportunities and societal advancement across various fields. Creative ideas have become among the most sought-after outcomes in the present era. Recently, we have observed remarkable creativity among Algerian youth, as evidenced by their success in innovation and creativity competitions worldwide—all of whom are products of the Algerian educational system.

In an effort to shed light on these skills among Algerian youth, particularly before entering university, this study focuses on measuring creativity among high school students, specifically second-year high school students.

The research problem is summarized in the following question:

What is the level of creative thinking among second-year high school students?

This question was further divided into the following sub-questions to measure the dimensions of creative thinking:

- What is the level of fluency among second-year high school students?
- What is level of flexibility among second-year high school students?
- What is the level of originality among second-year high school students?
- What is the level of elaboration among second-year high school students?

The study aims to assess the level of creative thinking among high school students and evaluate the proficiency of each of its skills. This is conducted using a descriptive approach through the measurement of creative thinking dimensions, as well as the analysis and interpretation of the obtained results.

2. Creative Thinking

In his speech to the Islamic world in Cairo, former U.S. President Barack Obama emphasized the importance of creativity, stating: *The challenge today is to encourage education and creativity.*

In reality, humanity has never abandoned creativity since its existence on this planet. Not a day has passed without new contributions in various

fields that improve human conditions. However, the need for creativity has become more urgent with the increasing complexity of civilization in the modern era.

The intense competition among nations today revolves around finding alternatives, innovating solutions, and maximizing the use of knowledge resources. Creativity has become the primary field of investment. The historian Arnold Toynbee describes creative individuals as the essential source of a society's progress.

2.1 Definition of Creative Thinking

2.1.1 Modern Definition

In its modern sense, creativity (Creativity) emerged during the European Renaissance, referring to something original, innovative, and productive. Over time, the term became widely used in psychology, particularly in studying how creativity occurs, the characteristics of creative individuals, and the conditions that foster creativity, along with the study of creative products.

A review of literary sources reveals no consensus among researchers on a single definition of creativity or creative thinking. Abu Jadu and Noufal cite Donald Treffinger (1996), who describes creativity as a complex concept with no universally accepted definition in psychology. Treffinger identified 100 different definitions of creativity and creative thinking (Mahmoud, 2005, p. 16).

Despite the varying definitions, most scholars agree on certain characteristics of creative thinking. It is described as open-ended thinking that goes beyond conventional norms, resulting in purposeful, diverse, novel, and original production that is feasible and applicable.

2.1.2 Creative Thinking in Psychology

Among the first modern scholars to define creative thinking in detail were Newell, Shaw, and Simon. They stated that creative thinking is a high-level cognitive process that manifests clearly in problem-solving. They identified three essential criteria for a problem-solving process to be considered creative (Jarwan, 1999, p. 82).

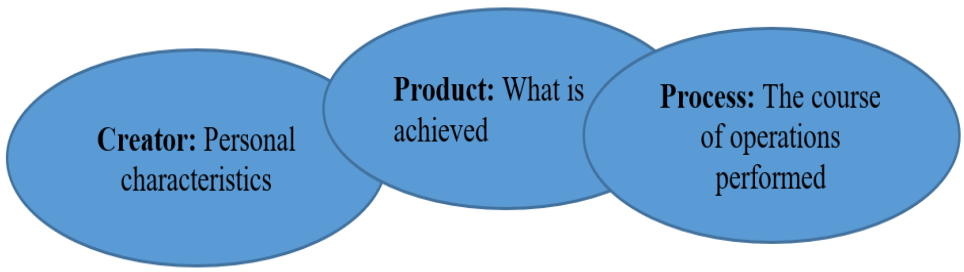
- The thinking must be novel and valuable to the individual, society, and general culture.
- The thinking must lead to positive change, challenging preconceived ideas and outdated perspectives.
- The thinking must demonstrate motivation, perseverance, and continuity.

Paul Torrance (1993): Defines creativity as a process of sensing problems, recognizing inconsistencies, identifying gaps in information, and seeking predictable solutions. It involves restructuring hypotheses based on testing results to generate new solutions and subsequently communicating these findings to others.

J. P. Guilford (1997): Describes creativity as a set of skills that include fluency, flexibility, originality, and sensitivity to problems, along with the ability to reformulate hypotheses and elaborate on details (Al-Aasar, 2000, p. 56).

Mel Rhodes (Rhodes): Compiled 56 definitions of creativity and distilled them into four fundamental components that interact to define creativity functionally: Personal characteristics of the creative individual (*Person*); Qualities of the creative product (*Product*); The creative process (*Process*) and the creative environment (*Press*).

Fig.1. Treffinger's Model of Creativity Components



Source: Prepared by the researcher based on: (Juanengsih, 2018, p. 84)

Torrance stated that children's freedom to ask questions, seek explanations, and use their imagination is often discouraged by parents. Over time, children may learn to suppress their curiosity to gain parental and teacher approval. Numerous studies have examined the relationship between parenting styles and creative thinking. For example, Wesberg and Springer studied 32 families of innovators and found that these families strongly expressed emotions in an open and dynamic manner. When children disagreed, their parents accepted their behavior without undue restrictions.

3. Creative Thinking Skills

Creative thinking requires specific mental abilities and skills, which have been extensively studied by researchers aiming to identify, teach, and develop them. Personality psychologists argue that creative individuals

can be identified through personality traits, individual differences, cognitive abilities, and motivation.

In 1959, Guilford described creative individuals as possessing predispositions such as fluency, flexibility, originality, problem sensitivity, and the ability to redefine and elaborate on problems—skills that fall under divergent thinking. He also noted that many psychologists mistakenly assume that creativity is a single process, whereas, in reality, there are multiple creative processes as numerous as creative individuals themselves (Al-Kanani, 2005, p. 82).

Guilford identified four key abilities: originality, verbal fluency, intellectual fluency, and flexibility. Other researchers later expanded these to include: problem sensitivity, fluency, flexibility, originality, imagination, and persistence. This study will focus on the most widely recognized skills, as defined by Torrance and Guilford.

3.1 Fluency

Fluency is the ability to generate a large number of relevant ideas freely. It can be divided into several types:

- Associational fluency: Ability to generate associations between ideas.
- Expressional fluency: Ability to articulate ideas clearly.
- Ideational fluency: Ability to produce multiple ideas for a given problem.
- Semantic fluency: Ability to generate words with related meanings.
- Verbal fluency: Ability to produce words quickly and efficiently.
- Kinetic fluency: Ability to generate physical or motor-based creative responses.

3.2 Flexibility

Flexibility refers to the capacity to generate diverse ideas and shift between different modes of thinking easily. It can take two forms:

- Spontaneous flexibility: Rapidly shifting perspectives without conscious effort.
- Adaptive flexibility: Adjusting thinking based on new information or situations.

3.3 Originality

Originality is the ability to think in novel, unconventional ways and produce unique solutions. Guilford defined it as the degree of uniqueness in ideas and responses, which should be statistically rare yet contextually relevant. Originality can be categorized into:

- Spontaneous originality: Producing unique ideas naturally.
- Adaptive originality: Modifying existing ideas into innovative solutions.

3.4 Elaboration

Elaboration involves adding details to ideas to make them more comprehensive, persuasive, or aesthetically appealing. It also includes refining and expanding concepts to enhance clarity and effectiveness (Saada, 2006, pp. 275-277).

Creative thinking in this study is operationally defined as the set of abilities measured by the Torrance tests of Creative Thinking (TTCT).

4. Methodological steps and Tools:

4.1 Research Methodology:

It was clarified in the introduction that the research methodology used in this study is the descriptive method, as it is suitable for describing and analyzing the obtained results.

4.2 Study Sample

The study sample consisted of all second-year high school students at Ibn Khaldoun High School in the city of Belrahhal, in the streams of experimental sciences and humanities and literature, totaling 98 students. They were administered Form A of the Torrance verbal and figural test, as follows:

Table 1. Study sample of all second-year high school students at Ibn Khaldoun High School in the city of Belrahhal, in the streams of experimental sciences and humanities and literature

Stream / Gender	Experimental Sciences	Humanities and Literature	Total
Males	26	22	48
Females	17	33	50
Total	43	55	98

Source: by the researcher

4.3 Research Tools

The primary tool relied upon in this study is the Torrance Test for Creative Thinking (TTCT) – Form A (Verbal and Figural), due to its effectiveness in measuring the targeted skills, as reviewed in the literature on creativity.

5. Torrance Test for Creative Thinking (TTCT)

This test was developed by Paul Torrance in 1962, approximately twelve years after Guilford's 1950 call at the American Psychological Association (APA) conference to study creativity. Both Guilford and Torrance were among the pioneers in this field. Before designing this battery, Torrance conducted extensive research on educational experiences that foster creative skills and identified situations that, in his view, reflect real-world creative scenarios.

The TTCT aims to measure creative abilities and is also used for identifying gifted individuals. It consists of three main activities that prepare the test-taker to demonstrate fluency, flexibility, originality, and elaboration. Each task requires ten minutes to complete (De Bono Center for Teaching Thinking, 2016, pp. 1–2).

Torrance and his colleagues designed four test batteries: Two Verbal Test Forms (Verbal Form A, Verbal Form B); Two Figural Test Forms (Figural Form A, Figural Form B):

Each form is equivalent and measures creative thinking through different aspects:

Verbal Form (Six Subtests)

- Asking Questions: The participant generates questions about a given stimulus.
- Guessing Causes: The participant hypothesizes potential causes of a specific behavior.
- Guessing Consequences: The participant predicts possible outcomes of an event.
- Alternative Uses: The participant lists unusual or innovative uses for an object or idea.
- What If Scenarios: The participant imagines and describes what would happen in a hypothetical situation.

Figural Form (Three Subtests)

- Picture Construction: The participant builds a meaningful image from a given shape.
- Picture Completion: The participant completes an incomplete drawing by adding lines.
- Line Composition: The participant creates meaningful drawings using open-ended lines (Torrance, 1972).

5.1 Validity and Reliability of the TTCT

- **Content Validity**: The TTCT demonstrates content validity as its test items accurately represent the measured creative abilities. Examining sample test items confirms their appropriateness as a measure of creative potential.
- **Concurrent Validity**: In a study conducted by Torrance and Gupta (1964), teacher evaluations were used as a criterion. The results confirmed that the TTCT successfully differentiated between students with high and low levels of creative thinking in fluency, flexibility, originality, and elaboration.
- **Predictive Validity**: A longitudinal study by Torrance (1972) followed students for twelve years and found a correlation coefficient of 0.59 between their TTCT scores and their later achievements.
- **Validity and Reliability of the French Version**: The French version of the TTCT, used in this study, was also tested for validity and reliability, confirming its effectiveness (Torrance, 1972).
- **Validity and Reliability of the Arabic Version**: Rashid Al-Shanti (1983) conducted a reliability study using the test-retest method on a sample of 120 students, with a one-week gap between applications. The results showed reliability coefficients of 0.71 for the verbal test and 0.67 for the figural test, both statistically significnt at $p < 0.01$.

Correlation coefficients between subscale scores and total scores for the verbal and figural tests ranged from 0.76 to 0.41 for the first test and 0.76 to 0.42 for the second, indicating functional consistency within the test structure (Qasim, 1983).

The Torrance Test for Creative Thinking has been proven valid and reliable across multiple cultural contexts, including the original American version, the French version, and the Arabic version, making it a robust tool for assessing creative thinking skills.

6. Results and Discussion:

6.1 Presentation of Results:

After calculating the results of the Torrance Test across all skills and determining the arithmetic means, the following results were obtained:

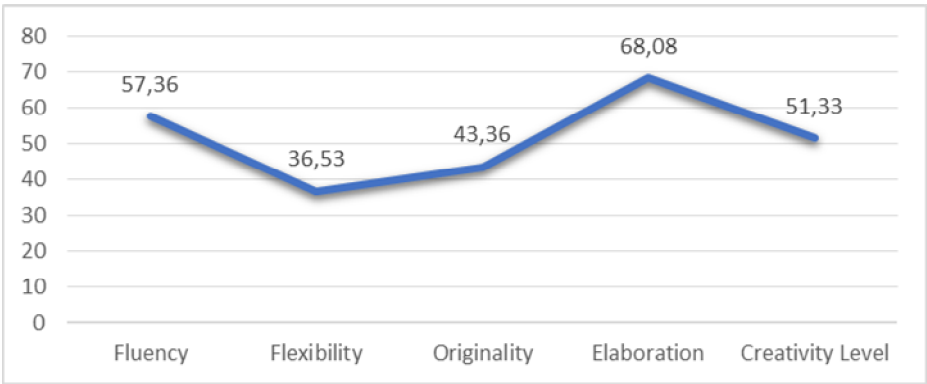
Table 2. Creativity skills level in the

Skills	Mean Score
Fluency	57.36
Flexibility	36.53
Originality	43.36
Elaboration	68.08
Creativity Level	51.33

Source: by the researcher

This is illustrated in the following graph:

Fig 1. Graphical representation of the arithmetic means of the recorded responses for each dimension



Source: by the researcher

year high school students at Ibn Khaldoun High School, based on the results obtained from administering the Torrance Tests of Creative Thinking. The analysis focuses on four key dimensions: fluency, flexibility, originality, and elaboration. This analytical process seeks to understand the students' overall creativity levels and to identify their strengths and weaknesses, thereby providing a scientific foundation for interpreting their creative abilities.

Analyzing these dimensions is of great importance, as each dimension reflects a different aspect of creative potential. Fluency refers to the student's ability to produce a large number of ideas, while flexibility reflects the ability to shift mental patterns and adopt multiple alternatives. Originality represents the capacity to generate new and uncommon ideas,

whereas elaboration indicates the ability to expand and enrich ideas with meaningful details. Measuring these dimensions allows for the development of a comprehensive and scientifically grounded picture of students' creative performance, supported by previous research models.

Based on the statistical results obtained, the following sections will present a detailed analysis of each dimension, interpreting the findings in light of previous studies and highlighting the educational implications that may contribute to enhancing and developing creative thinking skills among high school students

By calculating the arithmetic means of the recorded responses for each dimension, we observe the following:

_The first objective of this study was to determine the level of fluency among second-year high school students. The results showed that the arithmetic mean of unique responses was 57.36, which indicates a relatively above-average level of fluency. This suggests that more than half of the students were able to produce varied and meaningful responses within the fluency dimension. Such a finding is consistent with previous research emphasizing that fluency—defined as the ability to generate multiple, diverse, and contextually appropriate ideas—is a core component of creative thinking (Torrance, 1974).

Furthermore, studies have shown that adolescents who demonstrate higher fluency levels tend to possess stronger divergent thinking abilities, which contribute significantly to creativity and problem-solving skills (Runco & Acar, 2012) Fluency is also recognized as a foundational indicator of creative potential in educational settings, as it reflects the student's ability to retrieve information efficiently and generate numerous solutions to open-ended tasks (Kim, 2006). Therefore, the above-average mean score of 57.36 reported in the current study aligns with existing literature, suggesting that the students in this sample display a commendable level of fluency compared to typical performance patterns observed in secondary education..

_The second objective of this study was to determine the level of flexibility among second-year high school students at Ibn Khaldoun High School. The results showed that the arithmetic mean of repeated and unique responses was 36.53, indicating a low level of flexibility among the students. Cognitive flexibility, defined as the ability to generate a

variety of ideas, adapt to new situations, and shift thinking strategies, is recognized as a key component of creative thinking (Guilford, 1967).
Previous research has consistently shown that low flexibility scores among adolescents may reflect limited exposure to diverse problem-solving experiences or rigid thinking patterns, which can hinder creative performance (Runco & Acar, 2012). Flexibility is particularly important in educational settings, as it allows students to approach tasks from multiple perspectives, adjust strategies, and produce innovative solutions (Kim, 2006). Therefore, the relatively low mean score observed in this study highlights a potential area for educational interventions aimed at enhancing students' flexible thinking skills..

_The third objective of this study was to determine the level of originality among second-year high school students at Ibn Khaldoun High School. The results showed an arithmetic mean of 46.36, reflecting the number of unique responses in the originality dimension. This score is close to the average, indicating that the students' level of originality is limited. Originality, defined as the ability to produce novel and unique ideas, is a core component of creative thinking and a key predictor of innovative problem-solving (Torrance, 1974).
Previous research has highlighted that adolescents often display moderate levels of originality, which may be influenced by factors such as educational environment, opportunities for divergent thinking, and encouragement of independent thought (Runco & Acar, 2012). Low to average originality levels may suggest that students rely on conventional responses and are less inclined to produce unique solutions. Enhancing originality in students requires targeted educational strategies that promote creative exploration, risk-taking, and independent idea generation (Kim, 2006). Therefore, the mean score observed in this study suggests that originality is present but remains an area in need of development among these students.

_The fourth objective of this study was to determine the level of elaboration among second-year high school students at Ibn Khaldoun High School. The results showed that the arithmetic mean of unique responses was 68.08, indicating a high level of elaboration compared to the other dimensions. Elaboration, defined as the ability to expand, add details, and develop ideas thoroughly, is a critical aspect of creative thinking and is closely related to the depth and richness of students' responses (Torrance, 1974).

Research has demonstrated that students who score high in elaboration tend to produce more developed and detailed solutions, reflecting advanced cognitive processing and engagement with tasks (Kim, 2006). The high mean score in elaboration compared to fluency, originality, and flexibility suggests that while students may generate ideas at moderate levels, they are particularly capable of developing these ideas in detail. Educational interventions that foster elaboration skills can further enhance overall creativity by encouraging students to think critically, provide justifications, and expand on their initial ideas (Runco & Acar, 2012).

Based on the results, the dimensions of creativity in this sample can be ranked in descending order as follows: elaboration, fluency, originality, and flexibility. This ranking provides valuable insight into the relative strengths and weaknesses of students' creative abilities, which can inform targeted strategies to develop underperforming dimensions.

_The general objective is to determine the level of creative thinking among second-year high school students at Ibn Khaldoun High School, where the arithmetic mean was 51.33, indicating a moderate level. Therefore, it can be said that second-year high school students at Ibn Khaldoun High School in Belrahhal have a moderate level of creative thinking, with variations in the levels of dimensions.

based on the assessment using Form A in both its verbal and figural formats.

Second-year high school students at Ibn Khaldoun High School in Belrahhal have a moderate level of creative thinking, while the dimensions show varying levels, ranging from low in flexibility (36.53) to above average in elaboration (68.08).

From these results, we can help students develop their creative abilities through programs proposed by scholars, such as De Bono's Six Thinking Hats and CoRT Thinking Program. This scholar has also pointed out that creative thinking can be taught, whether independently through these programs or by integrating their skills into educational curricula.

7. Conclusion

In conclusion, as stated by many researchers such as Torrance and Guilford, every individual possesses a certain level of creativity. As demonstrated in this study, high school students exhibit a moderate level of creative abilities, including fluency, flexibility, originality, and elaboration. The topic of creativity and creative thinking holds great importance in the knowledge economy for both nations and individuals, as the world increasingly relies on new, original, and innovative ideas.

Given that every person has a relative level of creative thinking and that nations need creative and innovative thinkers, we can derive some recommendations from this study, including:

- Developing and enhancing individuals' level of creative thinking.
- Promoting education aimed at fostering creative thinking skills.
- Encouraging further studies on the topic of creative thinking.

The present study examined the levels of creative thinking among second-year high school students at Ibn Khaldoun High School across four dimensions: fluency, flexibility, originality, and elaboration. The results indicated that students performed highest in elaboration and fluency, while flexibility and originality were relatively lower. These findings highlight the students' strengths in developing and expressing ideas in detail, but also point to areas needing improvement. The study underscores the importance of targeted educational strategies to enhance all aspects of creative thinking, preparing students for more complex problem-solving and innovative tasks.

9_Recommendations

1. Enhance creative thinking programs by integrating activities that develop fluency, flexibility, originality, and elaboration in the high school curriculum.
2. Provide training for teachers on strategies that promote divergent thinking and encourage students to generate multiple and unique ideas.
3. Increase opportunities for open-ended tasks that allow students to practice creative problem solving in various subjects.
4. Develop targeted interventions to strengthen low-performing dimensions—particularly flexibility and originality.
5. Encourage a supportive classroom climate that values experimentation, risk-taking, and nontraditional answers.
6. Use creativity assessments periodically to monitor students' progress and adjust instructional strategies accordingly.

7. Engage students in extracurricular activities such as clubs, competitions, and projects that foster creative expres

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