

## Lateral Thinking of Teachers of Biology and Its Relation to the Successful Intelligence of Their Students

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### Abstract

The aims of the current search is to identify:

1. Lateral thinking of teachers of biology of fifth grade.
2. Successful intelligence with its three capabilities (analytical, practical, and creative) of 5th grade scientific students.
3. The correlation between the lateral thinking of biology teachers of the fifth grade and the successful intelligence of their students.

The present research is limited to the biology teachers and students of fifth scientific grade in the preparatory and daytime secondary schools of the Babylon Education Directorate/Centre. The research sample is composed of 16 teachers and 219 students. In order to achieve the research objectives, the research tools are built according to: biology teachers' lateral thinking scale for fifth grade scientific; the lateral thinking scale of biology teachers and students of fifth scientific grade is composed from (50) paragraphs; and the successful intelligence scale of the biology teachers' students as a research sample is made up of (36) paragraphs. When extracting the psychometric characteristics of the two scales, the final version of the lateral thinking scale is made up of (48) paragraphs. The successful intelligence consists of (34) paragraphs. After applying the latest version of the two scales on the research sample, the results are found that the research sample teachers have side thinking, the research sample students have successful intelligence, as well as the results showed an correlation between the research sample teachers' lateral thinking and the successful intelligence of their student.

**Keywords:** lateral thinking, successful intelligence, cognitive behavior, step-by-step logic.

### Research introduction

#### First: Research problem:

Contemporary and future challenges have imposed outcomes for education worldwide And one of the most prominent of these results is those associated with the role of the teacher in the educational process, In order to be able to keep up with the requirements of modern times, teachers must be skilled and intellectually prepared for their important role in improving their students' abilities (analytical, practical, creative)

Developed countries are interested in improving thinking and problem-solving capacity because they recognize their importance to renewed conditions, where familiar habits are no longer enough to confront new positions. Because every new situation has a problem that requires study and reflection, so lateral thinking abilities have an important role to play in the development of modern society. Psychologists have turned their attention to studying the creative person and the factors that contribute to his creativity from learning to think, ways to confront problems and provide creative solutions to them. By studying the concept of lateral thinking and its skills and familiarizing them with a number of research on it, as one of the kinds of thinking that undermines old, outdated ideas, rebuilding all the information learned and thinking about solving problems in new and non-traditional ways, as well as studying the concept of successful intelligence in its three components (Analytical, practical, creative) They have a belief that a teacher who is characterized by lateral thinking may have an important role to play in improving his students' successful intelligence and therefore the researchers

considered it necessary to examine the relationship between teachers' lateral thinking, And the successful intelligence of their students is a serious scientific attempt to reveal the relationship between these two variables in these important educational segments in the educational and educational process. hence the problem of current research, which involves trying to answer a question:

**Is there a correlation between biology teachers' lateral thinking of fifth grade science and their student's successful intelligence?**

**Second: The importance of research:**

One of the highest aims of education is to make an individual able to think, and it has a great impact on stimulating minds and stimulating cognitive abilities. (yousif, Mahmood, 2020:548), adapt to different life attitudes, and have a significant influence on the choice of educational activities to be adopted in teaching, especially teaching science, thereby contributing significantly to the achievement of the required goals. (Ahmed, Aziz, 2018:502) A teacher who thinks sideways looks at any problem from different angles rather than committing to a direct watercourse line of research. This kind of thinking tends to take into account various other perspectives but sets off from what is familiar in thinking, so it is a creative method of problem-solving and an entry point for creativity. (Said, 2015:198) Therefore, lateral thinking plays a vital role in teachers' success and progress within and outside educational institutions and that performing lateral thinking skills may be one of the most important activities a teacher can undertake at school, For many reasons, the teacher gives a sense of conscious control over his thinking. And when this is combined with improving the level of attainment of his application, Grows a sense of self-confidence in the face of school and life missions s experience in solving problems and issues. (Jasim, 2020:8), stimulating students' interest and desire, stimulating their talents, highlighting their imaginative and creative abilities, increasing their intellectual activity and encouraging the largest number of students to find new ideas. (yousif, 2018:158), using higher mental abilities (analysis, composition, evaluation), and making teaching and learning activity focused on students, which can stimulate their thinking and may develop their intelligence, especially their successful intelligence. (yousif, 2019: 2901)

All that has been mentioned thus contributes to the comprehensive and integrated development of their personality, affecting all aspects of their development, including physical and mental development, which enhances the student's confidence, stimulates thinking and creativity, and opens the way for success in the light of the dramatic developments and rapid changes in the world in various areas of human knowledge. (Abbood,2023: 50) And Sternberg Sternberg emphasizes that success is achieved by balancing analytical, creative and practical abilities. Success in life requires not only the ability to analyze one's thoughts and those of others, but also the ability to generate ideas and convince others of their value. Sternberg, 2010:91, highlights the importance of successful intelligence in enabling students to take advantage of their strengths and correct or offset their weaknesses. They adapt to environments by finding a balance in their use of analytical, creative and practical capabilities. (Sternberg & Grigorenko , 2004:1428)

Based on the foregoing, the importance of the research is summarized in the following points:

- The need of biology teachers for lateral thinking skills in order to keep pace with the rapid scientific and technological changes and developments.
- Teachers should be drawn to the need to have lateral thinking, as it may help them improve the successful intelligence of their students.
- Knowing the lateral thinking of biology teachers for the fifth grade through the lateral thinking scale that was built for this purpose, and it is the first research in Iraq in which the lateral thinking scale is built for teachers (according to the researchers' knowledge).
- Knowing the successful intelligence of the students of the teachers of the research sample through the successful intelligence scale that was built for this purpose.
- Knowing the relationship between the lateral thinking of the teachers of the research sample and the successful intelligence of their students.

### **Third: Objectives of the research:**

*The current research aims to identify:*

- Lateral thinking of biology teachers for the fifth grade.
- Successful intelligence with its three capabilities (analytical, practical, and creative) in 5th grade scientific students.
- The correlation between the lateral thinking of biology teachers of the fifth grade and the successful intelligence of their students.

### **Fourth: Research Limits**

The current research was limited to biology teachers for the fifth grade of science affiliated with the General Directorate of Education of Babylon / Center and their students for the academic year (2023-2022).

### **Fifth: Defining Terms**

#### **1. Lateral thinking has been defined by:**

- **(De Bono, 2005a) as:** seeking to solve problems in ways that are unconventional or seemingly illogical.(De Bono, 2005a: 91)
- **(Al-Halfi, 2020) as:** the type of thinking that seeks to surround the aspects of the problem in search of solutions, and also seeks to generate unavailable information about the problem. (Al-Hilfi, 2020, 113)
- **(Abbood, 2023) as:** creative ways to solve problems, lead to changing the individual's perceptions and concepts about a problem, by creating as many solutions and alternatives as possible.( Abbood,2023: 25)

The Researchers adopt the definition of (de Bono, 2005) as a theoretical definition of current research being the first to address the concept of lateral thinking.

**The researchers define it procedurally as:** a set of mental processes practiced by biology teachers for the fifth grade of science in order to solve problems and situations that may encounter them through their ability to produce (, new concepts, new ideas, new perceptions, new alternatives, new innovations) and is measured by the degree obtained by the teacher in the scale prepared for that (lateral thinking scale).

#### **Successful intelligence was defined by :**

- **(Sternberg, 1999):** The ability to balance creative, practical and analytical capacities to adapt, select and shape environments for success, regardless of its identification, within an individual's social and cultural context. (Sternberg , 1999: 438)
- **(Nyunt Saw, & Buxin, 2021):** The ability to achieve success in terms of individual standards within the cultural and social context, leveraging strengths and offsetting weaknesses through the balance of analytical intelligence (AI), creative intelligence (CI) and practical intelligence (PI). (Nyunt Saw , & Buxin , 2021:3)
- **(Al Jasim 2010)** is an integrated system for a range of capabilities that an individual needs to succeed in life by identifying their strengths and weaknesses and balancing analytical, creative and practical capabilities.(Al Jasim, 2010:150)

Researchers adopt the definition (Sternberg, 1999) as a theoretical definition of being a successful intellectual theorist, the first to address the concept of successful intelligence.

**It is procedurally defined by researchers as:** The ability of fifth-grade scientific students to exercise abilities (analytical, practical, creative) and measured by the degree to which students receive in the measure prepared for this (the measure of successful intelligence).

### **Research methodology:**

Researchers have adopted the correlative descriptive curriculum to suit it in achieving the research's objectives; Because the correlative descriptive approach is a method of scientific research, relies on the study of

reality or phenomenon, as in fact it is concerned with it as an accurate description and expresses it qualitatively or quantitatively. The qualitative expression describes the phenomenon, clarifies its characteristics, and the quantitative expression gives us a digital description of the extent or size of the phenomenon and the degree of its association with other phenomena. (Kalander, Abbas, 2017:1038), the current research aims to find out the correlation between the study's lateral thinking variants of the research sample teachers and the successful intelligence of their student.

**First: The research community and its sample:**

**a) Research Community:** The research community consists of biology teachers for the fifth grade of science affiliated to the General Directorate of Education of Babylon / Center for the academic year (2023-2022), numbering (131) teachers and schools, and their students (4362) male and female students.

**b) Research sample:** The sample of teachers included (16) teachers and a teacher of biology for the fifth grade of science affiliated with the General Directorate of Education of Babylon / Center for the academic year (2022-2023), and they were randomly selected in order to obtain a representative sample of the research community, as for students, the number of a sample of students was determined for each teacher of the research sample by calculating (10%) of the total number of students he teaches, and the students were selected by simple random sample method.

**Second: The tow Research Tools:** Building the two research tools is one of the current research requirements.

The two research tools are the lateral thinking scale for biology teachers for the fifth grade of science, and the scale of successful intelligence for fifth grade scientific students, and the following are the procedures for building or designing these tools:

**A - Lateral Thinking Scale:** After the researchers reviewed a number of previous studies, and some theoretical frameworks and literature on the concept of lateral thinking. The paragraphs of the scale were formulated in the light of the theoretical framework of de Bono's theory (2005), and in a way that suits the Iraqi environment, and commensurate with the teachers to whom the scale will be applied (research sample). Accordingly, the scale consists in its initial form of (50) paragraphs, by (10) paragraphs for each skill of lateral thinking skills, and the scale included positive paragraphs and the number (40) paragraphs and negative paragraphs (10) paragraphs, and the researchers adopted a five-dimensional Likert method (always apply to me, apply to me often, apply to me sometimes, apply to me rarely, do not apply to me at all), and the answers to the positive paragraphs are corrected according to the sequence (5,4,3,2,1) respectively, meaning the alternative is given the corresponding degree sequentially and respectively. In the sense that the alternative gives the corresponding degree sequentially and respectively, the correction of negative paragraphs that measure against the direction of the scale is according to the sequence (1,2,3,4,5) respectively, and after conducting a statistical analysis of the paragraphs of the scale by the researchers, it was found that all paragraphs of the scale function except for two paragraphs have been deleted, and thus the scale in its final form consists of (48) paragraphs. The following is an explanation of the steps of the statistical analysis of the scale:

**1. Apparent honesty of the scale:** After verifying the apparent validity of the scale, the researchers relied on the percentage and the value of the chi-square ( $Ka^2$ ) to calculate the agreement of experts and arbitrators on the paragraphs of the scale, and all paragraphs of the scale (50) paragraphs got the approval of the competent arbitrators, and by (80%) or more, as well as the values of the square ( $Ka^2$ ) statistically significant at the level of (0.05) because the calculated values are greater than the tabular value of (84.3).

**2. Exploratory application of the scale:** The researchers conducted the exploratory application in two stages: the first exploratory application of the scale, which is done for the purpose of ensuring the clarity of the paragraphs of the scale and the clarity of its instructions and determining the time required to answer, and the results of the application ended with the lack of teachers' inquiries regarding the paragraphs of the scale, and the average response time for the paragraphs of the scale was (26) minutes. The second exploratory application of the scale, which is carried out for the purpose of extracting the psychometric properties of the scale.

**3. Finding the cycometric properties of the scale:** After conducting the second exploratory application of the lateral thinking scale, the teachers' answers were corrected so that they were statistically analyzed as follows:

– **The discriminatory power of paragraphs:** The researchers arranged the scores of the second survey sample in the lateral thinking scale in a descending manner, and the two peripheral groups were identified, a higher group (with high scores), and a lower group (with low scores), in order to extract the discriminatory power of the scale, and by adopting the T-test, the results showed that the T-value ((t) calculated for all paragraphs ranged between (12.32 – 29.19), as all paragraphs were acceptable and distinctive because their calculated T values are greater than the tabular value, except for paragraphs (2,13), and accordingly Excluded from the scale, because it has a T-value less than the tabular T value of (2.00).

– **Sincerity of construction :** The construction sincerity of the lateral thinking scale was verified by what comes:

1. **The subparagraph degree correlation coefficient with the overall degree of scale:** the Pearson correlation coefficient was used to determine each paragraph's degree coefficient with the overall degree of the lateral thinking metric, and the results showed that the correlation coefficients values (r) calculated ranged from (0.26 - 0.65) i.e. all of them are statistically significant, as the correlation values (r) calculated greater than the value of the (r) tabular link of (0.21) , and therefore all paragraphs except paragraphs (2.13) were accepted s rights ", which had fallen by previous treatment.

2. **The subparagraph degree correlation coefficient with the overall degree of the area (skill) to which it belongs:** it was calculated using the Persoon correlation coefficient as well, and the results showed that all correlation coefficients are statistically significant at the level (0.05); Calculated correlation values for the skill of generating new ideas (0.32 - 0.70), the skill of generating new concepts (0.37 - 0.60), the skill of generating new realities (0.44 - 0.70), the skill of generating new alternatives (0.39 - 0.61) and the skill of generating new creations (0.42 - 0.63), all greater than the value of (0.21) tabular correlation.

3. **Field Degree Correlation Coefficient (Skill) with Total Scale:** Pearson's Correlation Coefficient was also certified, and all the correlation coefficients calculated were statistically relevant, as the calculated value of lateral thinking skills was (Generating new ideas, generating new concepts, generating new realizations, generating new alternatives, generating new creations) is (0 .84, 0 .81, 0 .89, 0 .89 and 0.91) respectively greater than the tabular value of (0.21).

– **Scale Stability:** There are different methods of calculating measurement instrument stability. In this study, the following are used:

1. **Internal consistency coefficient method (alpha-kronbach)** The constant coefficient is calculated according to the alpha-kronbach equation, reaching (0.96) , which is an excellent indicator of scale stability.

2. **Half-split method:** to extract the binding factor between the halves (individual and marital vertebrae) of the scale Pearson's correlation coefficient was used and reached (0.91), and after correction using the Spearman-Brown equation the constant of the lateral thinking scale (0.96), this indicates that the scale is on a high percentage of persistence.

4. **The final version of the scale:** After checking the cycometric characteristics, the scale is finalized to consist of (48) subparagraphs spread over lateral thinking skills, and each paragraph of the scale has five alternatives. Therefore, the highest scale in its final form will be (240), the lowest score (48), and the average hypothesis (144), thus making the scale ready for final application to the search sample.

**B. Successful intelligence (IQ):** After the researchers were briefed on a number of previous studies and some theoretical frameworks dealing with successful IQ measurements, the researchers drafted the subparagraphs of the scale and ensured that the formulation was commensurate with the research sample of fifth-grade scientific students, so that the scale is as early as possible. (36) A paragraph, by (12), for each component of successful intelligence, varied between positive paragraphs. (30) paragraph, negative paragraph (6) paragraph (s), the purpose of which is to eliminate the state of psychological predisposition to which the student may respond when the paragraphs are repeated in a single pattern, as well as to ensure that the student has read the paragraph well before answering it, and the researchers have adopted a four-dimensional Licert method (Apply to me always, apply to me sometimes, apply to me rarely, never to me) The responses to positive paragraphs are corrected according to sequence (4,3,2,1) respectively, while the correction of negative

paragraphs (1,2,3,4) respectively, and after statistical analysis of the measurement paragraphs, all successful IQ paragraphs have been found to be statistically relevant except for two paragraphs that have been deleted, with the measure finalized consisting of (34) paragraphs. The steps of statistical analysis of the scale are illustrated:

**1. Apparent authenticity of the measure:** the percentage and value of the kai box (c2) was adopted to calculate the consent of the arbitrators to the paragraphs of the scale. All paragraphs of the scale (36) were approved by the arbitrators and (80%) and above. The values of the box (c2) were also statistically significant at (05.0), as the calculated values were greater than the tabular value of (84.3).

**2. Exploratory application of the scale:** The exploratory application was conducted in two phases: the first exploratory application of the scale; the researchers applied the scale to a random sample of Scientific Grade 5 students consisting of (30) students and an equal student, other than the research sample; the average approximate time of responding to the scale's paragraphs (35) minutes. The second exploratory application of the scale is made for the purpose of extracting the scale's psychometric properties.

**3. Finding Psychometric Characteristics of the Scale:** After the second survey application of the scale, the students' answers were corrected until they were statistically analyzed as follows:

– **Discriminatory power of paragraphs:**

Students' grades were graded downward, and the two parties, a higher group, were taken (high grades), low group (low grades) and to extract the discriminatory force of the paragraphs, t-test for two independent and equal samples between the upper and lower groups at the t-test level (0.05), the results showed that the T value T calculated for all paragraphs ranged from (14.25 - 38.65), as all paragraphs of the scale were acceptable and distinct; That its calculated T values are greater than the tabular value, with the exception of paragraphs (30, 36), the calculated T value was lower than the tabular T value of (2.02) and were therefore excluded from the scale.

– **The sincerity of construction**

sincerity of a successful intelligence (IQ) scale is verified by what comes:

**1. Subparagraph degree correlation coefficient to the overall scale:** the Pearson correlation coefficient was used; To find the correlation factor of the degree of paragraph to the overall degree of successful IQ, the results showed that the calculated correlation value (r) ranged from (0.31-0.62), i.e., all correlation factors were statistically significant at an indicative level (0.05), with the exception of paragraphs (30,36).

**2. The subparagraph degree correlation coefficient with the overall degree of the area to which it belongs:** Pearson's correlation coefficient was also used to establish the degree coefficient of each paragraph to the overall degree of the area to which it belongs, and the results showed that the values of the correlation coefficients calculated were all statistically significant at an indicative level (0.05); Analytical intelligence calculated correlation values ranged from (0.42-0.59) to creative intelligence (0.43-0.62) to practical intelligence (0.45-0.60), all of which were greater than adult tabular correlation values (0.15).

**3. Correlation coefficient of the degree of the field with the total degree of the scale:** To find the correlation between the scores of students for each field and the total degree of the scale, Pearson's correlation coefficient was also adopted, and it turned out that all the correlation coefficients calculated statistically significant at the level of significance (0.05), as its values reached (0.92, 0.87, 0.88) respectively for each of the intelligence (analytical, creative, practical), while the tabular value was (0.15).

– **Scale Stability:** To calculate the stability of the successful IQ scale, the following are used:

**1. internal consistency coefficient method(alpha-cronbach):** the constant coefficient is calculated according to the alpha-cronbach equation; To calculate the measure's internal consistency, it was 0.88, which is a very good indicator of scale stability.

**2. Half-hash method:** Pearson binding coefficient was used; To extract the binding factor between the two halves (individual and marital paragraphs) of the scale was 0.78, and after correction using the Spearman-Brown equation the constant of the successful IQ (0.88), this indicates that the scale is on a high percentage of persistence.

**4. The final version of the scale:** After the psychometric properties were verified, the final IQ was made up of (34) paragraphs distributed to the components of the successful intelligence, so the highest scale would be

(136), the lowest score (34), and the average hypothesis (85), thus making the scale ready for final application to a sample.

**Presentation, interpretation and discussion of results:**

**First objective: To learn about the lateral thinking of biology teachers for the fifth grade:** After applying the lateral thinking scale to the research sample teachers, the results showed that the computational average of the research sample teachers' grades had reached (191.31), with a standard deviation of (9.73), whereas the metric's hypothetical average value was (144), after the application of one sample T test ((t.test), the calculated T value was found to be equal to (19.45), which is greater than the tabular value of (1.753) at a level (0.05), and the degree of freedom (15), so it is a statistical function, this result indicates that teachers have higher side thinking than the hypothetical average, as shown in table (1):

**Table (1) Results of the T test of the research sample teachers in the lateral thinking scale**

Statistical significance	T value		Hypothetical mean	Standard deviation	SMA	Sample
	Tabular	Calculated				
Significant	1.753	19.45	144	9.73	191.31	16

It is clear from the above table that teachers have lateral thinking, which is consistent with the work they practice, as teachers need a high ability to deal with problems that may encounter them during teaching, as well as the role of the direct and important teacher in positively influencing the thinking of students and helping them improve their mental abilities, and this result agreed with the study (Al-Gharbawi, 2013), and the study of (Jassim, 2020), and differed with the study of (Saleh, Saud, 2014), and the study of (Shana'a, 2019).

**Second Objective: Identifying the successful intelligence of fifth grade students:** After the researchers applied the successful intelligence scale to the students of the teachers of the research sample, the results showed that the arithmetic average of the scores of the students of the research sample had reached (91.88), with a standard deviation of (12.81), while the value of the hypothetical average of the scale had reached (85), and after applying the T-test for one sample (t.test), it was found that the calculated T value is equal to (4.482), which is greater than the tabular value of (1.98) at the level of (0.05), and the degree of freedom (218), as shown in Table (2):

**Table (2) The results of the T-test for the students of the research sample in the successful intelligence scale**

Statistical significance	T value		Hypothetical mean	Standard deviation	SMA	Sample
	Tabular	Calculated				
Significant	1.98	4.482	85	12.81	91.88	219

It is clear from the table above that students have a successful intelligence higher than the hypothetical average ,This shows the important positive impact on students by teachers ,The teaching method has contributed significantly to improving the successful intelligence of their students. This result is consistent with the results of the study (Al-Zoabi, 2017), and differed with the results of the study (Al-Anbaki, 2017), and the study (Momani, 2014).

**The third objective: to identify the correlation between the lateral thinking of biology teachers for the fifth grade of science and the successful intelligence of their students:** To achieve this goal. The data were processed statistically using Pearson's correlation coefficient, as the correlation coefficient between the lateral thinking of biology teachers for the fifth grade and the successful intelligence of their students was (0.34). When compared with the tabular value of (0.087), at the level of significance (0.05) and the degree of freedom (233), it appeared that the calculated value is higher than the tabular value, and this means that there is a statistically significant correlation between the two variables and Table (3) shows this.

**Table (3) Correlation coefficient between teachers' lateral thinking and the successful intelligence of their students**

Significance Statistics	Degree of freedom	Tabular value of the correlation coefficient	The calculated value of the correlation coefficient
Significant	233	0.087	0.34

The researchers' finding suggests that there is a positive correlation between the lateral thinking of biology teachers for the fifth grade and the successful intelligence of their students. which showed that a teacher with lateral thinking is a teacher capable of solving problems, And finding new alternatives, solutions and creations, which contributes to improving the successful intelligence of his students by using his intellectual abilities and skills, especially lateral thinking in the teaching process. (Al-Rabbi, 2013) asserts that no education system can be at a higher level than teachers because its presence is entirely dependent on teachers. If we consider education a process of suitability and reconciliation between the student and the environment, we realize that the teacher's job helps the student to reconcile himself - his needs and development - with the environment by placing him in the right position for such reconciliation. (Al-Rabbi, 2013:45)

**Conclusions:**

After presenting and discussing the findings, the researchers concluded:

- ❖ Biology teachers of the fifth grade have the ability to solve problems by introducing new ideas and concepts, and come up with new alternatives and creations for having the ability to lateral thinking
- ❖ Students of teachers who can use their lateral thinking during teaching have a successful intelligence.
- ❖ There is a positive correlation between the lateral thinking of biology teachers for the fifth grade and the successful intelligence of their students.

**Recommendations:**

- Educational supervisors should be brought to the attention of the need to conduct training courses aimed at improving the lateral thinking of secondary biology teachers in order to improve the successful intelligence of their students.
- Include activities and training in skills and strategies to develop lateral thinking in university curricula for faculties of education
- Provide students with the opportunity to exercise successful intelligence capabilities (analytical, practical, creative) and provide a supportive climate.

**Proposals:**

- Undertake a similar study on other samples of teachers at different levels of study and their students.
- Study the relationship of lateral thinking in teachers with other changes in students such as mental motivation.
- Study the relationship of successful intelligence with other variables in students such as decision-making skill and meditative thinking.

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