

How to Cite:

Jassim, S. J., & Muhammad, A. R. (2022). The effectiveness of Smith's strategy in the achievement of fourt-grade female students in Biology and their thinking outside the box. *International Journal of Health Sciences*, 6(S6), 6850–6869.
<https://doi.org/10.53730/ijhs.v6nS6.11948>

The effectiveness of Smith's strategy in the achievement of fourt-grade female students in Biology and their thinking outside the box

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Abstract--The current research aims to identify the effectiveness of Smith's strategy in the thinking outside the box of fourth-grade female students in Biology. The research sample included two groups, one of them is the experimental group with (34) female students and the control group with (34) female students too. The researchers chose Al-Fajr High School for Girls affiliated to the General Directorate of Education in Dhi Qar / Qalat Sukkar Education Department in Dhi Qar Governorate / Al-Fajr City intentionally from the research community. As the researchers adopted the experimental research as a method to conduct their research, which includes an independent variable (Smith's strategy) and a dependent variable (the thinking outside the box), the researchers chose the experimental design to control the research variables. Before starting the application of the experiment, parity was conducted between the two research groups to obtain accurate results with the following variables (the chronological age of the female students in months, the academic achievement of the fathers, the academic achievement of the mothers, the previous information test, the Otis-Lignon intelligence test, the grades of the first semester in Biology). The researchers prepared the test of the thinking outside the box using 20 essay questions, after completion of the application of the experiment, the researchers applied their research tool to the two research groups. After analyzing the results statistically, the researchers obtained data for the two research groups, and these data were processed statistically by means of a t-test for two independent samples. The results showed that the students of the experimental group outperformed the students of the control group, according to Smith's strategy in the thinking outside the box.

Keywords---Smith's strategy, thinking outside the box, fourth-grade science students, biology.

Problem of the Research

The low academic achievement of students in academic subjects is one of the main education problems, which in turn negatively affects the student, the family, the school and the community. And (Nabhan, 2001: 2) confirms that many educators in different countries have realized in recent years that students in schools do not think as skillfully and critically as they should. A number of books, articles and reports have shown support for the thinking movement. For example, prominent organizations Such as the Educational Committee in the United States of America, the College Board, 3198, and the book (A Nation in Danger), pointed out the weaknesses in the higher-order thinking processes as one of the most prominent contradictions in American education. The researchers noticed the schools' lack of using modern strategies after conducting an exploratory questionnaire on biology teachers, so they did not use Smith's strategy and did not focus on developing thinking outside the box. Based on the foregoing, the research problem can be formulated in the following question:

What is the effectiveness of Smith's strategy in the achievement of fourth-grade students in biology and their thinking outside the box?

Importance of the Research

Human thinking is a key factor in preparing individuals to face everyday situations, helping them to solve the problems they encounter in normal educational situations, and taking the optimal solution at the appropriate times. The role of thinking has emerged in the renaissance and progress of nations over time. Among his interests, de Bono expresses thinking outside the box through a theory bearing his name, where he talked about thinking outside the box with several names, and considered thinking outside the box an educational product emanating from that theory. principles, or axioms approved for training (Abu Jada and Nofal, 2007: 462). Al-Suwaidan (337:2008) believes that thinking outside the box has great effects in expanding the imagination and thinking about many possibilities, so it develops the mind towards expanded thinking, and also helps in the development of intelligence skills significantly. Here, we can say that accustoming students to these skills makes them think outside the boundaries of traditional thinking, confront problems with better ideas, to obtain required sound outputs, develop habits and creative practices, and transform problems into opportunities for creativity. In the foregoing, the importance of the research lies in the following:

- Emphasis on the use of modern teaching strategies to address the criticisms leveled against traditional methods, including Smith's strategy, as it is to the knowledge of the researchers the first Iraqi study that dealt with Smith's strategy in thinking outside the box in biology.
- This study presents a list of teaching skills that may be interested in enriching the knowledge structure of biology teachers.

- The importance of thinking outside the box, which contributes to solving problems and studying the interpretation of various phenomena.
- Teaching plans according to Smith's strategy and thinking outside the box may benefit future biology teachers.
- The results of the research may benefit those in charge of education affairs, such as teachers, supervisors, and authors, to raise the scientific level of students.

Aim of the Research

The research aims to identify the effectiveness of Smith's strategy of thinking outside the box.

Hypothesis of the Research

- There is no statistically significant difference at the level of significance (0.05) between the average scores of the experimental group students who will study biology according to Smith's strategy and the average scores of the control group students who will study biology according to the traditional method in the achievement test.

Limitation of Research

- Human limits: a sample of fourth-grade students at Al-Fajr School for Girls in Al-Fajr City, which is affiliated with the General Directorate of Qalaat Sukar Education in Dhi Qar Governorate.
- Spatial boundaries: middle schools affiliated to the Directorate of Education of Qalaat Sukkar in the city of Al-Fajr.
- Time limits: The second semester of the academic year 2021-2022 for a period of eight weeks.
- Scientific limits: the topics of the biology book for the fourth scientific class in the second semester.

Define terms

Thinking outside the box

Asfour (2017: 51) defined it as a mental attitude that enables the learner to search for alternatives or solutions to solve problems and confront situations in unconventional ways by moving between ideas in ways that are out of the ordinary and not anchored in stereotyped ways, and thus he is interested in rebuilding ideas and employing them to obtain solutions. (Al-Khattat, Habeeb, & Mohammed, 2019)

Theoretical background and previous studies

Thinking outside the box

Thinking is one of the important aspects that educators began to focus and pay attention to in recent years as one of the important solutions to achieve the educational goals of the learning and teaching processes, as well as to achieve positive cognitive progress that allows the learner to use the maximum of his

mental energies to achieve excellence and success and to adapt to learning situations or His public life (Al-Atoum et al., 2009: 201). Thinking is a series of mental activities that the brain performs when an individual is exposed to a stimulus through one or more of his senses (Kateet, 2008: 24). Swartz (2001: 271) has pointed out that the more clear the steps you are trying to gain learners are, the more likely they are to learn and change their thinking habits, and this requires teachers to motivate their students to be aware of what they are thinking and reflecting on. In their thinking with observation, guidance and evaluation (Alzamili & Mohammed, 2019).

Edward de Bono is considered to be the one who coined the term “thinking outside the box” and it was added to the English Oxford dictionary. 2010:8). So, the simplified way to describe thinking outside the box is to say: You cannot dig a hole in several places by expanding the depth in the same hole, and this explains the search for different approaches and other ways to look at things (Edward de Bono, 2005: 91), so thinking outside the box It aims to restructure thought, as it is the basis of insight and creativity, because it is dedicated to changing concepts and perceptions, and its value lies in solving problems, because it generates new alternatives and challenges (Philips, 2014; 187)

The concept of thinking outside the box

(Mohammed Abdel-Raouf, 2016: 529) mentioned that thinking outside the box is a pattern of thinking resorted to by those who can break the restrictions of vertical thinking, so that he can see more angles of the problem, enabling him to produce more ideas to solve it, and this method remains rational for its owner and illogical for others People with a vertical pattern of thinking. The person who thinks outside the box is not satisfied with a single solution, but rather puts possible solutions to the problem, and then excludes the inappropriate solutions until he reaches the correct solution and then makes the decision (Rida Ahmed, 2016: 276) (Mohammed, 2017). It is possible to use the term “thinking outside the box” for two meanings, one of which is specialized, and the other is general (Edward de Bono, 2005: 93). The specialist: the use of a set of systematic methods to change concepts and perceptions and generate new ones. General: Discovering multiple possibilities and methods rather than taking a single path. In light of the foregoing, the current research sees that thinking outside the box in biology is one of the thinking patterns that are concerned with developing students’ ability to recall familiar and unfamiliar ideas and to think illogically to generate solutions, ideas, concepts, perceptions and new viable alternatives to the problems facing students when they study biology .

Nomenclature of thinking outside the box

There are many names for thinking outside the box, according to the viewpoint of de Bono, educators, and psychologists, including: (Fadel Zamel, Qusay Ajaj, 2014: 38), (Mahdi Awad, 2017: 28)

- Lateral thinking
- Lateral thinking
- peripheral thinking

- Renewed thinking
- Thinking outside the box
- Serious creativity

The foundations of thinking outside the box

Kleiman (Shlomo, 1997: 246), (Edward de Bono, 2010: 100) identified the foundations of thinking outside the box in the following:

- The limitations imposed by vertical thinking as a method for generating new ideas.
- Restructuring existing patterns, and adding new information and knowledge to them.
- Utilizing out-of-the-box thinking processes to generate new ideas.
- The purpose of thinking outside the box is to generate new, valuable, effective ideas.
- Searching for several alternative perceptual options for the mono-narrative that was identified in the first principle.
- Escaping from the iron grip of logic that dominates thought processes, because logic does not come up with new ideas.
- The use of chance, i.e. creating an element of randomness and surprise, to renew ideas and the actions of these four principles together is the unique feature of thinking outside the box when dealing with the task of thinking. (Mohammed Abdel-Raouf, 2016: 530)

Goals for thinking outside the box

Thinking outside the box aims to (Marwa Hussein, 2015: 67)

- Training on creative problem solving.
- Training on divergent thinking skill.
- Training to face the challenges and difficulties facing the individual in his practical life.

Previous studies

Think outside the box

- Study (Tamara, Carl: 2017) the effective role of using out-of-the-box thinking in creatively solving problems, where the study was applied to a sample of 127 students and given to faculty and staff in a private university in the Middle West, and the results indicated that training in thinking outside the box produces Creative solutions to the problems facing individuals and promotes innovation of creative results (Mohammed, Al-Khattat, & Al-Muhja, 2019)
- study (Affana, et al., 2020) on knowing the effectiveness of a proposed educational program in science based on de Bono's theory for developing lateral thinking and self-regulation skills for learning among eighth grade female students in Gaza. The research sample consisted of (80) students distributed equally to the experimental and control group.

Study tools

Lateral thinking test

- Study (Alwan, 2012) lateral thinking and its relationship to personality traits according to the model list of the five factors of personality list model among university students. The research sample consisted of (250) male and female students who were randomly selected from the colleges of Al-Mustansiriya University.

Tools

- Lateral thinking test
- The Big Five Factors List Scale prepared by Costa and Macri 1992

The researcher reached the results

- Decreased level of lateral thinking among university students in various disciplines and their gender.
- The sample members have traits of conscientiousness, neuroticism, openness to experience and extroversion rather than kindness.
- There is no statistically significant relationship between lateral thinking and the traits of neuroticism, extraversion and kindness, while the results showed that males were better in the relationship between lateral thinking and the trait of openness to experience and conscientiousness.

Study (Kazim, 2019) lateral thinking among female students of the College of Education for Girls in the Department of Psychological Counseling and Educational Guidance. The sample consisted of (60) female students.

Study tools

Lateral Thinking Scale was adopted from (Al-Moussawi, 2009). Search results included

- The research sample does not have lateral thinking
- There are no statistically significant differences in the academic specialization (psychological counseling and sports) among female students of the College of Education for Girls.

Research Methodology and Procedures

Research Methodology: The two researchers followed the experimental research method.

First: Experimental design: one of the most common designs among researchers, and it includes an experimental group and a control group that is applied to both a pre- and post-measurement (Mohammed & Raheem, 2018). (Al-Kilani, Al-Sharifin, 2005: 77). Since the current research includes three variables: the first of which The independent variable represented by Smith's strategy, and the

dependent variable (thinking outside the box), the researchers chose the experimental design with partial control as in Scheme (1).

Scheme 1
Experimental design of the research

dimensional selection	Dependant variable	Independent variable	parity	Group
achievement test	Achievement	Smith strategy	-Intelligence -chronological	Experimental
Test thinking skills outside the box	Thinking outside the box	traditional way	- age -Previous information - previous academic achievement -The first course -Parents - academic achievement	Control

Second: The research community and its sample

Research community

The current research community was represented in the government preparatory schools for girls only and affiliated to the Directorate of Education of Dhi Qar / Department of Qalaat Sukar / Al-Fajr district. (2) a school, and table (1) shows that.

Table 1
Preparatory and secondary schools for girls for the fourth scientific grade in Al-Fajr District in Dhi Qar Governorate for the academic year (2021-2022)

Number of students	Number of branches	School
200	4	Al-Wafa secondary school for girls
171	5	Al-Fajr high school for girls

Research sample

The selection of the sample is one of the important steps of the research. The researcher determines the community according to the topic, phenomenon or problem, and since the study communities are often large in size, so the research resorts to choosing a sample from that community to represent it faithfully. (Melhem, 2009: 269). The research sample is divided into:

- Schools sample: The researchers chose (Al-Fajr Preparatory School for Girls) in Al-Fajr District intentionally to conduct their research for the following reasons:

- The school director and owners cooperated with the researchers in completing the experiment in support of the educational process and their eagerness to know the results.
- The location of the school is close to the location of the researchers, as the location of the researchers and the school are located in one geographical area, which makes it easier for them to reach the school and prepare the experiment procedures.
- Sample of female students: After the researchers chose Al-Fajr Preparatory School for Girls to implement the experiment, they visited the selected school, and found it to contain five study divisions for the fourth scientific grade, as the number of female students reached (171) distributed among five study divisions, and the number of female students in one division reached In succession: (33, 34, 35, 34, 33), and two of them were chosen randomly: Divisions (A and D), which numbered (69) students. To represent the control group that will study the same subject in the usual way, and (1) female student was excluded for health reasons, and thus the final number of the research sample became (68) female students with (34) for each of the experimental and control groups, as shown in Table (2)

Table 2
Distribution of the research sample to the experimental and control group before and after exclusion

Final number of students	The number of excluded students	The number of students before exclusion	Branch	Group
34	There is non	34	D	Experimental smith strategy
34	1	35	A	Controlar, the usual method
68	1	69	Total	

Third: Equality of the two research groups

The researchers were keen to make equivalence with the following variables (the chronological age of the students calculated in months, the academic achievement of the parents, the previous information test, the intelligence test (Otis - Lenion), and the first course grades. Table (3) and (4) show the above equivalence.

Equivalence with the intelligence variable Equivalence by chronological age in months

The chronological age was calculated in months until the second month of 2022, then the researchers calculated the arithmetic mean of the age of the female students with the standard deviation for each of the two research groups. The mean of the experimental group was (197.29) with a standard deviation of (13.09),

while the arithmetic mean of the control group (194.97) with a standard deviation (7.83) Then the researchers applied the t-test for two independent samples, and the calculated t-value was (0.88), which is smaller than the tabular t-value at the level of significance (0.05) and the degree of freedom (66), which is (2.00), which means that the difference between the two groups is not Statistically significant and therefore the two groups are equivalent in chronological age.

Table 3

The results of the t-test of two independent samples for the significance of equivalence in chronological age in months

the decision	indication	Calculated T-value	Standard deviation	SMA	N.O	Group
equals	Non significant	0.88	13.09	197.29	34	Experimental
			7.83	194.97	34	Control

Equivalence with previous achievement (average of the female student in the ministerial exam)

The previous achievement was calculated (the average of the female student in the ministerial exam) for the previous academic year 2020/2021. Then the researchers calculated the arithmetic mean of the achievement of the female students with the standard deviation for each of the two research groups. The average of the experimental group was (70.1) with a standard deviation of (13.68), while the arithmetic mean of the group The control group (66.55) with a standard deviation of (10.75), then the researchers applied the t-test for two independent samples. It means that the difference between the two groups is not statistically significant, and therefore the two groups are considered equivalent in the previous achievement (Al-Khuza'i. & Al-Hussein., 2021).

Table 4

The results of the t-test for two independent samples to indicate equivalence in the previous achievement

the decision	Indication	Calculated T-value	Standard deviation	SMA	N.O	Group
Equals	Non-significant	1.19	13.68	70.1	34	Experimental
			10.75	66.55	34	Control

Equivalence with intelligence

The intelligence test was applied by Oates Lennon on 3/2022, then the researchers calculated the arithmetic mean of the IQ of the students with the standard deviation for each of the two research groups. The mean of the experimental group was (6.17) with a standard deviation of (1.93), while the arithmetic mean of the control group was (6.56) with a standard deviation of (1.94), then the researchers applied the t-test for two independent samples. The difference between the two groups is not statistically significant and therefore the two groups are equivalent in intelligence.

Table 5
The results of the T-test of two independent samples for the significance of equivalence in intelligence

the decision	Indication	Calculated T-value	Standard deviation	SMA	N.O	Group
Equals	Non significant	0,81	1,93	6,17	34	Experimental
			1,94	6.56	34	Control

Equivalence with the previous collection

The previous test was applied on 12/3/2022, which was prepared by the researchers for the female students, and then she calculated the arithmetic mean with the standard deviation for each of the two research groups. The mean of the experimental group was (10.88) with a standard deviation of (2.51), while the arithmetic mean of the control group was (10.67). With a standard deviation of (1.7), then the researchers applied the t-test for two independent samples. The two groups are not statistically significant and therefore the two groups are equivalent in the previous achievement.

Table 6
The results of the t-test of two independent samples to indicate the equivalence of the previous achievement

Decision	Indication	Calculated T-value	Standard deviation	SMA	N.O	Group
Equals	Non significant	0.39	2.51	10.88	34	Experimental
			1.7	10.67	34	Control

Equivalence in the first course grades in Biology

The grades of the first course were obtained from the school records, then it calculated the arithmetic mean with the standard deviation for each of the two research groups, so the mean of the experimental group was (74.2) with a standard deviation of (21.18), while the arithmetic mean of the control group was (76.47) with a standard deviation (13.42) then The researchers applied the t-test for two independent samples, and the calculated t-value was (-0.527), which is smaller than the tabular t-value at the level of significance (0.05) and the degree of freedom (66), which is (2.00), which means that the difference between the two groups is not statistically significant and therefore The two groups are equivalent in the previous achievement (Mohammed & Raheem, 2018).

Table 7
The results of the T-test for two independent samples to indicate the equivalence in the degrees of Biology for the first course

Decision	Indication	Calculated T-value	Standard deviation	SMA	N.O	Group
Equals	Non significant	0.527-	21.18	74.2	34	Experimental
			13.42	76.47	34	Control

Fourth: Adjusting the extraneous variables

Stabilization of the factors and variables that are related to the phenomenon under study with the exception of the independent factor, and during the experiment a group of factors and variables that affect the research experience appear, specifically their impact on the dependent variable that may be in favor or against, and to obtain good results, and to know the effect of the independent factor must The extraneous variables should be controlled before conducting the experiment, i.e., all the variables except for the independent variable should be controlled in order to isolate them so that they do not affect the result. The two research groups studied according to the prescribed classes for biology, with three classes per class per week, and according to the school administration's distribution of classes, which are indicated in the following table:

Table 8
Distribution of lessons between the experimental group and the control group

Time	Class	Branch	Group	Day
25minutes	First	A	Control	Saturday
25minutes	Third	D	Experimental	
25minutes	Fifth	A	Control	Sunday
25minutes	First	D	Experimental	
25minutes	Fifth	A	Control	Tuesday
25minutes	Third	D	Experimental	

Fifth: Research requirements

Before applying the experiment, the basic requirements of the experiment must be prepared, which are:

Determining the scientific subject

The researchers determined the scientific subject that will be taught to the students of the two research groups during the duration of the experiment. Therefore, the chapters that are taught within the annual plan for the content of biology for the fourth scientific grade were included, i 11, 2021, written by Daoud, Abdullah and others, during the second course in a manner The objectives of each of these three chapters are interrelated and integrated and unified with what the curriculum aims at in general, determined by the following (Chapter Eight: Adaptation of animals and plants with lifestyles in the environment, Chapter Nine: Relationships between living organisms, behavior and environmental succession, Chapter Ten: Environmental pollution) note The sixth and seventh semester has been deleted by the Ministry of Education to reduce the weekly working hours due to the pandemic.

Table 9
Topics to be taught during the trial period

N.O of pages	Chapter title	Chapter	T
11	Adaptation of animals and plants to the lifestyles of the environment	Eight	1
17	The relationships between organisms, behavior, and environmental succession	Ninth	2
16	Environmental pollution	Tenth	3
44	Total		

Formulation of behavioral objectives

(156) behavioral objectives were formulated by the researchers depending on the general objectives, and the content of the material distributed among the levels of Bloom's classification (remembering, comprehension, application, analysis, synthesis, evaluation), and to ensure its validity and fulfillment of the content of the subject. A group of specialists in the field of education and teaching methods, and as a result of analyzing the responses of the arbitrators, which numbered (10) arbitrators, modified some of the goals according to their opinions and observations, as the value of the square (K2) for independence was calculated for each of the behavioral goals and compared with the tabular value of (3.84 degrees of freedom). (1) At the level of significance (0.05), the results showed the validity of all behavioral objectives according to the opinions of experts and specialists, and all purposes were approved and kept in their final form (156) behavioral objectives with (66) at the level of remembering, (34) the level of comprehension (20) levels Application, (10) the level of analysis, (13) the level of installation, (13) the level of evaluation.

Table 10
Behavioral objectives according to the six levels of Bloom distributed according to the classes

Total	Evaluation	installation	Analysis	Applying	Understanding	Remember	Chapter
38	3	3	2	10	8	12	Chapter Eight / Adaptation of animals and plants with lifestyles in the environment
38	2	2	2	5	9	18	Chapter Nine: Relationships between living organisms, behavior and environmental succession
80	8	8	6	5	17	36	Chapter Ten/Environmental Pollution
156	13	13	10	20	34	66	Total

Preparation of Teaching Plans

Teaching plans were prepared by the researchers for the biology subjects that will be studied during the experiment, and according to the content of the textbook and the formulated behavioral objectives, and according to Smith's strategy for the students of the experimental group, and according to the usual method for the students of the control group, and then presented. The researcher has two model plans for a group of specialists in the educational field and teaching methods to explore their opinions, observations and suggestions in order to improve the formulation of those plans in line with the success of the experiment, and according to what the arbitrators showed, the researchers made some necessary modifications to them, and they are ready for implementation (Hamadi & Mohammed, 2020).

Sixth: The search tool

One of the important and basic things that you identify and build by the researchers is the preparation of the research tools, and the research includes a dependent variable that is thinking outside the box, and the following is a detail for preparing the research tool

Thinking outside the box test

For the purpose of measuring thinking outside the box, and after the researchers reviewed the studies that dealt with this topic, the researchers prepared a test of thinking outside the box according to the definition of thinking outside the box for (De Bono) in the test mode, which is the definition adopted by the researchers.

Description and correction of the test

The thinking outside the box test consists of (20) puzzles or paragraphs, and the respondent must solve these puzzles to measure thinking outside the box, Appendix No. (12). As for the correction of this test, it is done by (0, 1, 2, 3), that is, if the student answers the paragraph correctly. Completely given (3), but if the answer to the paragraph is correct, in which there is a deficiency and lack of integrity, the answer is given (2), and if the answer is poor and has some aspect of validity, it is given (1), and if the answer is completely wrong, it is given (0) and thus, the highest score obtained by the respondent It is (20) and the lowest score is (0), so the hypothetical mean is (10).

The logical analysis of the paragraphs

Paragraphs validity

This process refers to identifying the extent to which the test represents the variable to be measured (Abu Awwad and Nofal, 2012: 190). The test items were (20), and (Ebel, 1972) believes that the best way to ascertain the validity of the items is for a number of experts and specialists to assess their validity to measure the quality for which they were placed. Since the experts' judgment is characterized by a degree of subjectivity, the test is given to the largest number of arbitrators, and the degree of logical analysis of the paragraphs can be evaluated

through the compatibility between the arbitrators' assessments (Al-Chalabi, 2005: 103). Therefore, the test, including De Bono's definition of thinking outside the box, was presented to (20) experts in the field of science teaching methods to show the validity of each of the test's paragraphs, and to indicate whether it needed modification and what the appropriate modification was. In order to analyze the opinions of the experts, the value of the chi-square of independence was extracted and the calculated value was compared with the tabular value at the level of significance (0.05) and the degree of freedom (1), which amounted to (3.84), as well as the percentage of agreement between arbitrators that the percentage of agreement is not less than 80% (Al-Zamili et al., 2009 : 241). And based on this percentage of agreement, which is 80% or more, no paragraph was deleted, but some paragraphs were modified according to the opinions of the arbitrators, and thus the paragraphs of the scale became (20) paragraphs.

Initial survey application

The test was applied to an exploratory sample of 28 female students from Al-Wafa'a Preparatory School for Girls in order to verify the clarity of the paragraphs and the absence of ambiguous or unclear formulations. The students' questions and inquiries and some notes related to the test items and its instructions were recorded. It was found that the test instructions and paragraphs were mostly clear and understood by all students except for some words that were not understood and which were clarified. The average answer was (35) minutes and this was calculated by calculating The time taken for the first five students and the time taken for the last five to complete the test answer.

Discrimination coefficient for out-of-box thinking test items

The strength of paragraph discrimination means the extent to which it is able to distinguish between students with high and low levels in relation to the trait measured by the test (Stanley, 1972, 450). (Peers, 2006: 18). The researchers used the discrimination factor equation for the article paragraphs and it was found that it ranges between (0.25 - 0.63) and they are all distinct, as the discrimination factor can be accepted if its value ranges between (0.20 - 0.80).

The difficulty coefficient for the paragraphs of the thinking outside the box test

The purpose of calculating the difficulty of the paragraphs is to choose the paragraphs of appropriate difficulty and delete the very difficult or very easy paragraphs. The difficulty was moderate and acceptable, as the difficulty is considered acceptable if it ranged between (0.20 - 0.80).

The relationship of the paragraph's score with the total score of the test with its T-significance

The relationship of the paragraph's degree with the total score of the outside-the-box thinking test was calculated using the Pearson correlation coefficient. Then the researcher calculated the T significance for each of the correlation coefficients by using the T significance of the correlation and comparing the calculated value

with the T tabular value at the significance level (0.05) and the degree of freedom (198). And the amount of (1.96) (Al-Bayati 1979 pp. 273-274), so the relationship of all paragraphs to the total score was statistically significant.

Stability

The stability coefficient was calculated using Cronbach's Alpha equation, and its calculated value was (0.762).

Statistical Indicators Out-of-the-Box Thinking Test

This required the researcher to use the Statistical Package for Social Sciences (SPSS-26) to extract those statistical indicators.

Table 20
Statistical Indicators for Out-of-the-Box Thinking Test

Value	Statistical indicator
25.78	SMA
10.96	Standard deviation
20	N.O of paragraphs
30	hypothetical mean
56	Actual highest score obtained
3	The lowest actual score obtained
53	Term
0.149	Skewness
0.172	torsion error
0.018	Kurtosis
0.342	kurtosis error

When observing the values of the aforementioned statistical indicators for the out-of-the-box thinking test, we find that these indicators are consistent with most of the indicators of scientific standards, the distribution of the scores of the research sample individuals on the out-of-the-box thinking test, which is relatively close to the normal distribution, which allows generalizing the results of the application of this test.

Statistical means

The researchers used a set of statistical methods for data processing using SPSS and Microsoft office 2010. The effect size (D), was used to find out the size of the influence of the independent variable on the two dependent variables, and when observing the values of the aforementioned statistical indicators to test out-of-the-box thinking, we find that these indicators are consistent with most indicators of scientific standards, the distribution of the research sample's scores on the out-of-the-box thinking test and it approaches Relatively from the normal distribution, which allows generalization of the results of the application of this test.

Chapter Four
Presentation and interpretation of the results
First: Show the results

Presentation of the results related to the null hypothesis:

For the purpose of verifying the second null hypothesis of the research, which states that “there is no statistically significant difference at the level of significance (0.05) between the average scores of the experimental group students who studied according to Smith’s strategy and the average scores of the control group that studied in the traditional way of thinking outside the box. The researchers calculated the arithmetic mean of the scores of the experimental and control groups in the thinking outside the box test Supplement (15), the arithmetic averages of the experimental group were (34.47) with a standard deviation (8.8) and for the control group (25.12) with a standard deviation (8.4). Although the average scores of the experimental group are higher than the average scores of the control group in the out-of-box thinking test, the researchers wanted to know the significance of the difference between the mean scores of the experimental and control groups to test the validity of the second null hypothesis of the research, using the t-test for two samples. are independent, as shown in Table (12).

Table 12
 Results of the t-test for the two research groups in the Out-of-the-Box Thinking Test

Indication	T value		Standard deviation	SMA	N.O	Groups
	Tabular	Calculated				
Significant	2.00	4.48	8.8	34.47	34	Experimental
			8.4	25.12	34	Control

It is clear from Table (12) that the calculated t-value amounted to (4.48), which is greater than the tabulated t-value of (2.00) at the significance level (0.05) and the degree of freedom (66), which indicates that there is a statistically significant difference at the significance level (0.05) between The average scores of the group that studied the experimental method Smith and the average scores of the control group that studied the traditional way of thinking outside the box and in favor of the experimental group, so the researchers reject the null hypothesis and accept the alternative hypothesis.

Determining the effect size (d) (effectiveness) of the independent variable in the dependent variable (thinking outside the box). The researchers used the effect size equation (d) for the independent variable (Smith’s strategy) in the dependent variable (thinking outside the box).

Table 13

The effect size of the independent variable in the thinking outside the box variable

effect size	The value of (d) the size of the effect	Independent variable
Very big	1.08	Experimental
		Control

When calculating the effect size (d) of the independent variable (Smith's strategy) in the second dependent variable (thinking outside the box), the researchers found that the value of (d) = (1.08), which means that the size of the effect of teaching using (Smith's strategy) in (thinking outside the box) It was very big.

Second: Interpretation of results Consequences of thinking outside the box

The results shown in Table (12) showed a statistically significant difference between the students of the experimental group and the students of the control group in the thinking outside the box variable. The researchers attributed this to the following reasons:

- Teaching with Smith's strategy provided the opportunity for each student to participate and discuss the opinions and ideas that were mentioned in the lesson, which created an atmosphere that encourages free thinking. Therefore, thinking is a basic requirement for students to acquire thinking skills outside the box, as well as for many difficult educational situations and problems they are going through. The student had a significant impact on the students' acquisition of those skills.
- Teaching by Smith's strategy led to students' interaction with the lesson and increased their activity as a strategy in which the student's role is positive and thinking in a way other than the traditional method that does not include deviation from the routine followed in teaching, and this contributed to the result of thinking outside the box for them.
- Smith's strategy helped increase the students' desire and interest in renewal, change and acceptance of complexity. It also opened the way to think of unfamiliar solutions by mentioning the concepts and practical applications of the biological concepts presented in each lesson and the new discoveries in the field of biology development and its positive impact on the students' thinking.

Conclusions

In light of the results of the research, the following conclusions were reached:

- The effectiveness of teaching using Smith's strategy in increasing the achievement of biology compared to the usual method.
- The effectiveness of teaching using Smith's strategy in improving out-of-the-box thinking compared to the usual method.

Recommendations

In light of the results of the current research, the researchers recommend a set of educational recommendations that may work to enrich the educational process, especially in the teaching of science, through the following:

- Adopting the Smith strategy as one of the cognitive stimulants in the curricula of methods of teaching science and training students of colleges of education and teacher institutes on its adoption in teaching.
- Open development courses to train the teaching staff to teach according to Smith's strategy.
- The curricula of development courses for teachers in educational institutions include a number of modern teaching methods and models, including Smith's strategy.

Suggestions to complete this research

The researchers suggest the following:

- Conducting other studies on the use of Smith's strategy in other stages of study.
- Conducting studies to compare the effectiveness of Smith's strategy with other methods and strategies in developing achievement and thinking outside the box.
- Conducting studies on obstacles to the development of out-of-the-box thinking among students.
- Conducting a study similar to the current study in other variables, visual thinking, scientific thinking, deductive thinking, decision-making.

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