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Creative problem-solving skills for students of the College of Education for Pure Sciences

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ملخص الدراسة :

هدف البحث الحالي إلى التعرف على مدى امتلاك طلبة كلية التربية للعلوم الصرفة / قسم الكيمياء مهارات حل المشكلات الإبداعي، والتعرف على الفروق في مهارات حل المشكلات الإبداعي لديهم باختلاف متغيرات الجنس (ذكور –). إناث)، وتم تحديد البحث من قبل طلاب كلية التربية للعلوم الصرفة – ابن الهيثم / قسم الكيمياء / المرحلة الثالثة، للعام الدراسي 2020–2021، واعتمد منهج البحث الوصفي، وبلغ حجم عينة البحث (372) طالباً وطالبة تم اختيارهم بالطريقة العشوائية. ولتحقيق أهداف البحث أعد الباحثون اختباراً لمهارات الحل الإبداعي للمسائل من نوع الأسئلة الموضوعية والمقالات، والذي تكون بصورته النهائية من (27) فقرة، وكانت صدق الاختبار وثباته. تم التحقق. وتمت معالجة البيانات إحصائيا، واستخدم معادلة (ت–test) لعينة واحدة، وأظهرت النتائج أن عينة البحث تمتلك مهارات حل المشكلات الإبداعي، كما تم استخدام المنهج الإحصائي (t–test) لعينتين مستقلتين للتحقق من وجود فروق في مهارات حل المشكلات الإبداعي باختلاف متغيرات الجنس. وأظهرت النتائج عدم وجود فروق بين الجنسين. وفي ضوء النتائج أوصى الباحثون بإدراج برامج تعليم التفكير في مراحل قسم الكيمياء وتوظيف الأنشطة التعليمية التي تنمي مهارات حل المشكلات الإبداعي لدى طلاب كليات التربية. واقترح إجراء دراسة لمهارات حل المشكلات الإبداعي تجريبياً بمتغيرات مستقلة مثل (التفكير التوليدي، التفكير المنظومي، الذكاء المنظومي).

الكلمات المفتاحية: مهارات حل المشكلات الإبداعية لدى طلاب كلية التربية.

Abstract

The aim of the current research is to identify the extent to which students of the College of Education for Pure Sciences / Department of Chemistry possess creative problem solving skills, and to identify the differences in their creative problem solving skills according to gender variables (males - females), and the research was determined by students of the College of Education for Pure Sciences - Ibn Al-Haytham / Department of Chemistry / the third stage, for the academic year 2020-2021, and the descriptive research method was adopted, and the size of the research sample was (372) students who were randomly selected. To achieve the objectives of the research, the researchers prepared a test for the creative solving skills of problems of the type of objective questions and essays, which in its final form consisted of (27) paragraphs, and the validity and reliability of the test were verified. The data was processed statistically, the (t-test) equation was used for one sample, the results showed that the research sample possessed creative problem solving skills, and the statistical method (t-test) was used for two independent samples to verify the existence of differences in creative problem solving skills according to gender variables. The results showed that there were no differences between the sexes. In light of the results, the researchers recommended including thinking education programs in the stages of the Chemistry Department and employing educational activities that develop creative problem solving skills for students of faculties of education. It was suggested that a study of creative problem solving skills be conducted experimentally with independent variables such as (Generative thinking, systems thinking, systems intelligence).

Keywords: Creative problem solving skills, College of Education students.

Introduction

The current era is characterized by a great and amazing development in the field of science and technological applications of scientific knowledge, as science has become today in its modern concept and dynamic nature as a material and method of thinking, and this imposes on the educational and educational community the upbringing of generations capable of generating and inventing information and providing creative solutions to catch up with this scientific and technical development taking place.Chemistry is one of the study subjects that requires its students to think fertility and solve problems, because of its constantly changing and evolving topics.The researchers consider it important for learners, including students of the Department of Chemistry / College of Education for Pure Sciences, to possess the basic skills that will help them in teaching chemistry in the future, including creative problem-solving skills that the learner acquires through interactive teaching and laboratory application.

In order to determine the validity of the researchers' sense of this problem, they took a number of measures, including preparing a questionnaire and submitting it to a number of professors of the College of Education for Pure Sciences (Department of Chemistry), to identify the extent to which they employ creative problem-solving skills while presenting the study material to their students, and whether their knowledge of those skills was employed in measured by their students? The results were 90% of the teachers did not have knowledge of the appropriate way to measure these skills and they had never measured the creative problem-solving skills of their students. The researchers see the importance of conducting a study to identify the level of creative problem-solving skills among students of the Department of Chemistry by building tools to measure this. Therefore, the research problem is determined by the following question:

To what extent do students of the Department of Chemistry - College of Education for Pure Sciences possess creative problem-solving skills? First, the research problem:

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The importance of research:

Education is the main factor for the scientific development taking place in this era, as many countries have been able to achieve tremendous scientific progress for their societies and human and economic development that qualifies them to take their appropriate position among the societies. Education has also played a key role in building and refining the human personality and elevating it to higher levels. With the challenges faced by education, the process of providing learners with higher-order thinking skills, which is the basis for acquiring the rest of the abilities and skills necessary for life, and among these skills is the creative solution to problems, which is one of the higher mental processes that play an important role in facilitating the processes required to address problems creatively (Abdul-Aziz, 2013, 190).

The use of creative problem-solving skills depends on expanded thinking to solve problems, and is considered part of the learners' continuous experiences in trying to reach innovative creative solutions to the problems they face, as this method is characterized by being called for all kinds of thinking, the types of thinking overlap each other, as it sometimes appears Some of them over others, but what distinguishes creative problem solving is that it combines different types of thinking, and for this reason, creative problem solving is the scientific field to apply different types of thinking to reach innovative solutions. (Younes, 2016, 272)

Many studies emphasize the importance of creative problem solving on the shift of interest from developing creativity in general as a set of skills (originality, flexibility, fluency,) to interest in employing these skills in solving many renewable problems, as well as developing these skills among learners. In light of the rapid changes we are experiencing (Okasha and Madbouly, 2011, 17-59).

Based on this, the researchers see the importance of including the academic curricula, including chemistry curricula, at the university level with creative problem solving skills, since students at this stage are characterized by physical and mental development more than the previous stages they have gone through, as they acquire the ability to think abstractly; This is the result of cognitive changes, and they develop a new understanding, and are able to reflect on their thinking, in addition to providing a safe place where they experience their advanced abilities to reason, reflect and think about the issues facing them.

From the foregoing, the importance of his research is evident in the following points:

1- The research is a response to the recent trends advocated by educators to pay attention to the numbers of students of the College of Education for Pure Sciences in developing its academic programs to provide students with creative solving skills for chemical problems.
2- The current research may help draw the attention of those working in the field of curriculum planning and development to the importance of including creative problem solving skills in the content of these curricula.
3- The results of the research may contribute to a qualitative shift in the outcomes of the students of the College of Education, by directing the attention of faculty members to the importance of creative problem-solving skills for their students.
4- The research can be presented as a theoretical framework for the variable to be added to the Arabic and local literature.
1. 5. The research could open the way for other studies in the field of measuring the thinking skills of university students.

Research Objectives:

The current research aims to study the possibility of students of the Department of Chemistry / College of Education for Pure Sciences possessing creative problem-solving skills by answering the following questions: -

1- Do students of the Department of Chemistry - Third Stage / College of Education for Pure Sciences possess creative problem-solving skills?

2- Are there differences in creative problem-solving skills according to gender variables (male - female).

Research hypotheses:

To achieve the objectives of the research, the following null hypotheses were formulated:

- There is no statistically significant difference at the significance level (0.05) between the mean of the real and hypothetical performance of the students of the Department of Chemistry in the test of creative problem-solving skills.
- There is no statistically significant difference at the significance level (0.05) between the mean scores of male and female students in the creative problem-solving skills test.

Limitations of Research:
The current research was limited to the following limits:

- Spatial boundaries: University of Baghdad
- Human limits: Students of the College of Education for Pure Sciences (Ibn Al-Haytham) - Department of Chemistry / Third Stage.
- Time limits: the first semester of the academic year 2020-2021.

Defining Terms:
1- Creative problem solving skills:

It is defined by (Treffinger, Isaksen and Dorval, 2006) as the individual's ability to produce and generate a set of familiar and unfamiliar ideas. The goal is to reach a set of creative solutions to problems, implement them, and verify the validity of these solutions by understanding the nature of the problems and their constituent elements and the ideas received and expressing them in more than one way and applying these solutions in life situations.

The procedural definition of the researchers: It is defined as the student's ability to generate a set of ideas to reach a set of creative solutions to problems while going through the various stages of creative problem solving, which helps the student to distinguish in their implementation, verify their validity and obtain support and support for their acceptance, and it is measured by the degree that the student obtains in Test creative problem solving skills.

Theoretical framework and previous studies

1- Overview

The creative problem solving model has been developed as a result of the efforts of the scientist Osborne, which was through the study and analysis of people who were described as creators or who have outstanding creative abilities that led to the development of the creative problem solving model, as the main concern of "Osborne" was how to present these processes so that It is available when studied, and it was concluded through this study that the creative process is not limited to specific people as previously believed (Eyisi, 2016, 95). After this effort and as a result, an educational institution concerned with training in creativity (the Creative Educational Foundation) was established to facilitate the dissemination of his ideas and encourage studies on educational programs and training to teach creativity. The Creative Problem Solving Model, also known as the Osborne-Barnes model (Al-Alasar, 2000, 34).

Creative problem solving is distinguished from the traditional traditional solution to problems in how to deal with the problem or how to deal with it, and also differs in terms of the final product, as the method of creative problem solving needs a high degree of sensitivity for those who deal with the problem in identifying it and determining its dimensions, and it also needs a degree of Deduce the relationships between the variables of the problem in terms of formulating hypotheses or arriving at creativity in terms of the result, and that the output in both cases is different. It gives an original, new and unfamiliar product that can be implemented and achieved (Al-Shabib, 2004, 36).

2- Characteristics of creative problem-solving skills:

Creative problem solving has a number of characteristics:

A - It provides students with the opportunity to actively participate and express their opinion.
B - It works to provide students with technical skills, and provides them with practical practices as well.
C- It works to form positive attitudes among students towards their creative abilities.
d- It encourages students to unleash creative and unfamiliar talents inside the classroom, and transfer that outside the classroom to solve life problems.
E - Helping students to effectively face the problems they face. (Treffinger et.al, 2002, 121).

3- Obstacles to developing creative problem-solving skills:

There are many obstacles facing the creative person that stand in his way to prevent the generation of new ideas of creativity, including:

- Creative problem solving requires courage to act in an uncommon fashion and with a high degree of self-control.
- Creative problem solving requires thoughtful and careful planning to reach an optimal picture to be able to use it.
- The lack of a suitable environment for creativity and the production of unfamiliar solutions.
- Some students are afraid of asking questions for fear of ridicule and blame from the teacher and colleagues. (Gouda, 2010: 67).

Components of creative problem solving:
A) Understanding the problem: Defining the problem helps the individual to better understand the problem, determine the path he took and find successful alternatives (Isaksen et al., 2011, 55), and understanding the problem includes three basic stages:

1- The problem before identification (Miss-finding): In this stage, the individual tries to search for a foggy problem or situations that require the individual to pay special attention until he reaches the main point towards which he directs his activity and focuses his attention on, and this stage focuses on identifying and choosing a general aim. Or the starting point of solving the problem.

2- Finding data (data-finding.): This stage aims to seek to obtain as much information and data as possible that help individuals by using the brainstorming method to clarify and identify the ambiguous problem, analyze the situation and then report Which information and data seem best and most appropriate for understanding the problem (Treffenger et al., 2006, 113-114)

3- Defining the problem (Problem-finding): The aim of this stage is to generate and evaluate statements based on the previous stages, to arrive at identifying the real problem, as the problem can be identified and formulated by focusing on specific questions, and this stage also helps to identify The way that leads to the solution, and the benefit from this stage can be seen, is to focus on the degree of homogeneity in the components of the problem, and its formulation and verbal expression. (Al-Asaar, 2000, 34)

B) Generating Ideas: After formulating the problem, ideas are found, where the focus is on divergent thinking to arrive at multiple and diverse non-traditional ideas and creativity capabilities are used in this aspect (fluency - flexibility - originality - details) and not necessarily dealt with them All of them, as sometimes the problem or situation of interest requires focusing on some of them (Isaksen et al., 2011, 59).

C) Planning for Action: In this component, the individual is ready to develop solutions, and begins planning for implementation when available. He has multiple alternatives, as the individual here needs to make a decision and develop a plan to obtain support for this decision upon implementation. (Treffinger et al. al., 2006, 63)

This component includes two phases:
1- Solution-finding stage: This stage aims to further evaluate the possible ideas to solve the problem or situation in question, as the effort is focused on analyzing, evaluating and strengthening alternatives and moving from the large number of ideas to the least by choice until the ideas are evaluated better, this is done according to criteria Certain criteria to be of higher value and more useful

2- Acceptance-finding stage: At this stage, the focus is on identifying potential obstacles in the application that affect the development of effective use of creative solutions. The focus is also on actions and procedures in moving from one situation to another, and the potential implementation of solutions (divergent thinking) is also reviewed.), and accept the solutions reached, and the facilitating factors for implementation must be identified for acceptance and satisfaction, so the sources that influence the implementation of the best solutions must also be identified to ensure the successful achievement of the change process, especially those that require new and unfamiliar methods of implementation. (Isaksen & Treffinger, 2005, 347).

Previous studies:

1- Study (Al-Sibai & Khouribeh 2020): The study aimed to know the level of each of the creative solutions to teaching problems and the level of meta-creative knowledge among student teachers at the Faculty of Education, Zagazig University, and the researchers adopted the descriptive correlative approach. The fourth in the Faculty of Education, Zagazig University, and the scale of creative solution to teaching problems and the scale of meta-creative knowledge was adopted. The data were analyzed using the SPSS program, and the results showed that the presence of creative solutions to students' problems at an average level as well as the presence of a low level of meta-creative knowledge. Correlational relationship between the two variables (Al-Sibai and Kharibeh, 2020, 100).

2- Study (Afaneh, 2020): The study aimed to measure the effectiveness of a proposed educational program based on de Bono's theory for developing lateral thinking skills, self-regulation of learning and creative problem solving among eighth-grade students in Gaza. (80) female students, prepared a measure of self-organization and tests of lateral thinking and creative problem solving in science. The data were analyzed using the SPSS program, and the results showed that the experimental group outperformed the control group in the tests of creative problem solving and lateral thinking. (Afaneh, 2020, 196).

Research Methodology and Procedures:

First: Research Methodology: The researchers adopted the descriptive approach, in line with the objectives of the research, in measuring the creative problem-solving skills of students of the College of Education for Pure Sciences (Department of Chemistry).

Second: The research community: The term community refers to the large group that the researcher wants to generalize the results of his study to, that is, it is a group of elements or members, whether they

are goals, topics, or individuals who want to know more about them in order to generalize the results of the study to them. (Al-Atoum, Al-Manizil, 2019, 105), and the current research community consists of the students of the Department of Chemistry / College of Education for Pure Sciences (Ibn Al-Haytham) / University of Baghdad, the morning study for the academic year (2020-2021), and their number is (373) students from the stage The third, with (216) male students and (157) female students.

Third: The research sample: The researchers chose the research sample randomly, and distributed it proportionally to three samples: the first exploratory application sample, the statistical analysis sample, and the basic research sample, which consisted of (200) male and female students, with (117) males and (83) Females, from the third stage students / Department of Chemistry / College of Education for Pure Sciences - Ibn Al-Haytham, where this sample constituted (53.619%) of the total population for the purposes of the final application of the research.

Fourth: Testing Creative Problem Solving Skills: After reviewing a group of studies that dealt with creative problem solving, it was found that this study shares a number of points with the current research, but it did not provide a test for appropriate creative problem solving skills in chemistry, so the researchers built A test to measure the creative problem-solving skills of third-year students / Department of Chemistry / College of Education for Pure Sciences - Ibn Al-Haytham according to the following steps:

1- Determining the objective of the test: The objective is to measure the creative problem solving skills of the third stage students / Department of Chemistry / College of Education for Pure Sciences - Ibn Al-Haytham.

2- Determining the skills measured by the test: After reviewing the educational literature and previous studies that dealt with creative problem solving, it was found that there are differences between the opinions of researchers and theorists in their models about the skills, components and steps of creative problem solving, so the researchers decided to adopt three main skills, namely (understanding the problem Generating ideas – planning action.

3- Formulation of test items: The test items were formulated according to the procedural definition of the skill, and the test consisted of (27) items, distributed over (9) sub-skills, with (14) objective items with one correct choice and (3) objective items with three correct choices. But they differ in the degree of their validity, and (10) article paragraphs.

4- **Test instructions**: The test instructions were set on how to answer the items of the objective and essay test items, where the degree of the objective test items ranged between (zero) as the lowest degree and (1) as the highest degree, and there are items that included the answer to the correct choice among the choices and their scores ranged Between (1) as the lowest degree and (3) as the highest degree, and the degree of the article paragraphs ranges between (zero) as the lowest degree and (3) as the highest degree, meaning that the total score of the test is between (zero - 53) degrees.

5- **Apparent honesty:** In order to ensure the apparent honesty, it relied on the observations and suggestions recorded by the arbitrators on the test items. Results: All items of the test are characterized by apparent honesty.

6- **The first exploratory application of the test**: the researchers applied the test to a random sample of (20) male and female students, and its purpose is to know the clarity of the test instructions, the appropriateness of the method of answering the test completely, the students' inquiries and determining the time required to answer the test, where the researcher recorded The time for delivering the answer to each student, and by calculating the arithmetic mean of the time, it was found that the time required to answer all test items is 53 minutes.

7- **Application on the statistical analysis sample:** After the procedures of the first exploratory application, the test was applied for the second time on a random sample of (150) male and female students from the third stage / Department of Chemistry / College of Education Ibn Al-Haytham, to extract the psychometric characteristics of the test.

8- Statistical analysis responses to the creative problem solving skills test:

a. Paragraph difficulty coefficient: The difficulty coefficient was calculated for the paragraphs, and the values of the difficulty coefficient for the objective paragraphs ranged between (0.35 - 0.56), while the values of the difficulty coefficients for the article paragraphs ranged between (0.38 - 0.59), and this indicates the validity of all paragraphs.

B. The discriminatory power of the items: The discrimination coefficient was calculated for each of the test items:

• Whereas, the discrimination index for the substantive items ranged between (0.49 - 0.88), meaning that all the substantive items are acceptable.

• The discrimination index for essay items ranged between (0.61 - 0.90), meaning that all essay items in the test are acceptable.

c. The effectiveness of the wrong alternatives: the effectiveness of the wrong alternatives was calculated for each item of the objective test, as the results showed that the wrong alternatives attract a number of members of the lower group greater than what they bring from the upper group, and this is evidence that the camouflaged alternatives are appropriate and do not need to be modified.

9- Validity of construction: The validity of construction was verified to test creative solution skills through the following:

A- The degree of correlation of the paragraph with the total score of the test:

The internal consistency coefficient is a correlation coefficient between the score of each of the test items and the total score of the test. Therefore, the Point-Bayceryl correlation coefficient was used to extract the correlation between the score of each item and the total score of the test for the members of the statistical analysis sample for the items whose scores are intermittent, and the Pearson correlation coefficient for the items whose degrees are continuous, and to ensure the significance of the correlation, the T-values of the correlation significance were calculated and it was found that they are statistically significant when compared to the tabular value of (1.96) at the significance level (0.05) and the degree of freedom (148).

B- The relationship of the degree of each paragraph with the skill to which it belongs:

Where the sincerity of the paragraphs is more comprehensive, the correlation coefficient was calculated between each paragraph and the total sum of each skill to which it belongs. And Pearson's correlation coefficient for the paragraphs whose degrees are continuous, and to ensure the significance of the correlation, the T-values of the correlation significance were calculated and it was found that it was statistically significant when it was compared to the tabular value of (1.96) at the significance level (0.05) and the degree of freedom (148).

C- The relationship of the total score for each skill with the total score for testing creative problem solving skills:

The correlation of the degree of each skill with the total score for testing creative problem solving skills was extracted, and it was found that all the correlation coefficients are statistically significant, where the

Pearson correlation coefficient was used, as all the values of the correlation coefficients when calculating their T-values were greater than the tabular value of (1.96) when The significance level is (0.05) and the degree of freedom is (148), and Table (4) shows this.

D- The internal correlations between skill scores with each other to test creative problem solving skills:

The matrix of internal correlations was extracted between the degrees of each skill and the other skills, and it was found that all correlational transactions are statistically significant. Pearson correlation coefficient was used. 05) and a degree of freedom (148).

10- Reliability Test: The reliability coefficient was calculated in two ways, where the alpha Cronbach equation was used for internal consistency. The reliability coefficient in this way was found to be (0.820), which is a good stability coefficient. The half-split method was also used, where the Half Split Rulon method was adopted. This method is considered to calculate the stability between the two halves of the test if the number of test items or the scale is odd, meaning there is no discrepancy and the number of items is equal between the two halves of the test (Al-Dulaimi, 2018, 225), and the reliability coefficient was (0.817), which is a good parameter.

Search results and their interpretation

First: the search results

1- The first objective, which is to identify the creative problem-solving skills of the research sample members, and to verify this goal, the null hypothesis was formulated, which states (there is a statistically significant difference at the level of significance (0.05) between the average real and hypothetical performance of the students of the Department of Chemistry in the solution skills test The arithmetic mean and standard deviation were calculated and the t-test equation was used for one sample to find out the significance of the difference between the arithmetic mean and the hypothetical mean, and it was found that the calculated T-value (5.62) is greater than the tabular value (1.96) at the significance level (0.05) and the degree of freedom (199), as shown in Table (1).

Table (1) **Arithmetic mean, hypothetical mean, standard deviation, t-value and significance level for the scores of the sample members on the creative problem-solving skills test**

Skills	**the sample**	**Arithmetic mean**	standard deviation	**hypothetical mean**	**Calculated T**	**sig**
understand the problem	**200**	12.97	4.74	10.5	7.37	0.00
Idea generation		14.74	6.02	13	4.09	0.00
action planning		3.42	1.97	3	2.98	0.00
Creative problem solving		31.13	11.64	26.5	5.62	0.00

From the table, it is clear that the calculated T value is a function at the significance level of 0.05 and the degree of freedom of 199, that is, the students of the third stage - Department of Chemistry / College of Education for Pure Sciences - Ibn Al-Haytham, possess creative problem solving skills, and therefore reject the null hypothesis.

Interpretation of the result:

The researchers believe that the students' possession of creative problem-solving skills, at this stage, to gain experience through their study of the various topics of chemistry, and the focus of attention in their academic and educational preparation program depends on active participation in discussions, experiments and solving problems that they encounter during practical applications or study. The theory, as the nature of chemistry requires students to think about solving chemical equations and making a

balance between the materials used, as well as reaching new conclusions regarding reactions or mixing chemicals. Thus, the students were able to use their previous information to solve the problems included in the test prepared for that, which showed their creativity, and this result agrees with the study (Al-Sibai & Khreibeh, 2020) whose results found a medium degree of creative problem solving among student teachers.

3- The second objective is to identify the differences in creative problem solving skills according to the gender variables (male - female), where the null hypothesis was formulated (there is no statistically significant difference at the level of significance (0.05) between the average scores of male and female students in creative problem solving skills.), as the researchers used a fair t-Test for two independent samples, where the arithmetic mean of the students was (30.23), with a standard deviation (11.54), while the arithmetic mean for the female students was (32.39), and with a standard deviation (11.74), as it was found that the calculated T value (1.29) which is less than the tabular t-value (1.96) at the significance level (0.05) and the degree of freedom (198), as this result indicates that there is no statistically significant difference in the creative problem-solving skills of students of the College of Education for Pure Sciences - Department of Chemistry according to the variable Gender (male - female), as shown in Table (2).

Table (2) **The arithmetic averages of the sample in creative problem solving skills according to the gender variables**

Skills	sex	the number	Arithmetic mean	standard deviation	T-test	sig
understand the problem	Mention	117	12.51	4.72	-1.63	0.11
	female	83	13.61	4.72		
Idea generation	Mention	117	14.35	5.94	-1.09	0.28
	female	83	15.29	6.12		
action planning	Mention	117	3.37	2.05	- 0.40	0.69
	female	83	3.48	1.86		
Creative problem solving	Mention	117	30.23	11.54	-1.29	0.20
	female	83	32.39	11.74		

Accordingly, the null hypothesis was accepted.

Interpretation of the result:

Through the table (2) above, it was clear that the null hypothesis was accepted, which is that there is no difference between males and females, as this result is normal, as creative problem-solving skills reflect a mixture of students' creative self-awareness; And the interpretation of this result in light of the educational process that students undergo in the academic levels in general and university in particular and the third stage is more specific, through which information and knowledge of whatever type and form are provided in an equal manner for all students, whether male or female, or according to their academic level, and that male and female students They lived the same conditions, especially at this stage, and on the other hand, creative problem-solving skills are cognitive abilities and are the product of the individual's interaction with his environment, and thus these abilities can be developed and acquired through educational curricula. Here it can be said that all students were given almost equal attention through Developing them cognitively and limiting them to some skills and abilities in various fields without discrimination, including that they are all subject to the same educational systems.

In general, there is no statistically significant difference between students in the Department of Chemistry - the third stage in acquiring creative problem solving skills, due to the fact that students go through the same educational experiences during the study.

Second: Recommendations: According to the results of the current research, the following recommendations can be made:

- Inclusion of thinking education programs in the stages of the chemistry department, because it is considered the stages of academic preparation for future teachers.
- Employing educational activities that develop creative problem-solving skills among students of faculties of education, through chemistry lessons, teaching methods, application and practical practice.
- Paying more attention to the process of developing curricula for the Department of Chemistry and the need to include issues that develop creative problem-solving skills.
- Encouraging students to practice creative solutions to the problems they face.

Third: Suggestions: As an extension of the results of the current research, the researchers suggest the following:

- A study of creative problem solving skills in the Chemistry Department and for stages other than the third stage.
- Experimental study of creative problem solving skills with independent variables such as (generative thinking, systemic thinking, systemic intelligence)
- Doing a study to analyze the curricula of the chemistry department or chemistry books for the secondary stage according to the skills of creative problem solving.

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