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ALTERNATIVE BIOLOGICAL PERCEPTIONS IN BIOLOGY AMONG FIFTH-GRADE SCIENTIFIC

preparation

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التصورات البيولوجية البديلة في مادة علم الاحياء لدى طلبة الخامس العلمي في مدارس المرحلة الثانوية لمحافظة القادسية

اعدَادَ

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Abstract: This study aimed to investigate some alternative biological perceptions in biology among fifth-grade scientific students students in secondary schools in al-Qadisiyah governorate

To achieve the aim: The study tool was to test students for multiple choice, and the validity of the test was calculated by the validity of the arbitrators and stability using internal consistency by the Cronbach's alpha coefficient, where it reached 72%, the test consists of 30 items that were applied to a sample of 384 male and female students studying biology in the fifth grade of science in Al-Qadisiyah Governorate in the academic year 2024/2025, the study highlighted the spread of various alternative perceptions among students in the concepts of biology, including vital organs and processes in living organisms, reproduction, genetics, and cells and their activities. In addition to diversity and adaptation, which were addressed in previous years of the biology curriculum, these results suggest a set of proposals and recommendations to enhance students' understanding of these concepts and modify alternative perceptions among students. The researcher also proposed several proposals, including: 1- Conducting a study dealing with alternative biological perceptions among biology teachers for the secondary stage. 2- Modifying alternative biological perceptions in the biology book for the fifth grade of science.

ملخص البحث : هدفت هذه الدراسة الى تقصي بعض التصورات البيولوجية البديلة في مادة علم الاحياء لدى طلبة الخامس العلمي

"ولتحقيق الهدَف : تمثلت اداة الدراسة في اختبار الطلاب للاختيار من متعدد وتم حساب صدق الاختبار عن طريق صدق المحكمين والثبات باستخدام الاتساق الداخلي عن طريق معامل الفاكرونباخ حيث بلغ ٧٢% حيث يتكون الاختبار من ٣٠ مفردة تم تطبيقه على عينة مكونة من ٣٨٤طالب وطالبة يدرسون مادة علم الاحياء للصف الخامس العلمي في محافظة القادسية في العام الدراسي ٢٠٢٤ /٢٠٢٥واشارت الدراسة الى انتشار العديد من التصورات البديلة لدى الطلبة في مفاهيم علم الاحياء في فصول الاجهزة والعمليات الحيوية في الكائنات الحية والتكاثر والوراثة والخلية ونشاطاتها وكذلك التنوع والتكيف والتي وردت لسنوات دراستهم السابقة لمنهاج علم الاحياء وفي ضوء تلك النتائج هناك مجموعة من المقترحات والتوصيات التي تعمل على تحسين تعلم الطلبة لهذه المفاهيم وكذلك تعديل تلك التصورات البديلة لدى الطلبة .

كما اقترحت الباحثة عدة مقترحات منَها:١- اجراء دَراسة تتنَاوُل التصورات البيولوجية البديلة لدى مدرسي علم الاحياء للمرحلة الثانوية .٢- تعديل التصورات البيولوجية البديلة في كتاب علم الاحياء للصف الخامس العلمي

الكلمات المفتاحية : التصورات البيولوجية البديلة،علم الاحياء ، طلاب الصف الخامس العلمي

Keywords: Alternative biological perceptions, fifth-grade scientific ،students .biology Science

Chapter One / Research Definition

First / Research Problem

Biology is one of the important sciences that play an important role in the life of living organisms and the environment in which they are located, and the teaching of biology often begins from the middle school, most topics are closer to the student's life, whether they are seen with the naked eye or accurate that cannot be seen, such as viruses, bacteria and fungi, there are many topics of biology, with the facts associated with them, and thus there is difficulty for the student to comprehend them.

Also, these facts may be subject to forgetting, so educators emphasize the need to focus on clarifying scientific concepts in order to facilitate the students' acquisition of them. Scientific concepts are the main unit for teaching biology and the surrounding environment, which is the basic building block of science, it helps to gain scientific knowledge and make it more flexible and organized to facilitate the transmission of the impact of learning and its application in various life situations and scientific concepts have many definitions but to make it easier for the recipient to know what is meant by the scientific concept and through the

work of the researcher in the field of education for more than 25 years, I noticed that there is a confusion in the concepts which led to the existence of alternative perceptions among students due to the lack of clarification of the concept in the correct way, which creates fog, lack of knowledge and correct guidance of scientific information, here comes to mind the following question: What are (alternative biological perceptions in biology among fifth scientific students in secondary schools of Al-Qadisiyah Governorate)

Therefore, the researcher decided to delve into this problem to find solutions to it, as far as the researcher knows, few Arab and foreign studies look at these perceptions of secondary school, and thus the problem of research lies in answering the following question: 1- Are there alternative biological perceptions among fifth scientific students of the secondary grade?

Research Importance

In line with the research, I dealt with the definition of scientific perceptions the name, symbol, or term that is given to a set of common qualities, characteristics, or features that are perceptible or it is possible to realize its implications and implications through observation using the senses, and there are many examples of them such as humans, roses, cats and scorpions, there is another type of concept, which is called abstract concepts, and these cannot be recognized by observation, but rather need from the learner's mental processes and mental perceptions to identify them, such as the cell and the chromosome. Where educational literature touched on many benefits of interest in teaching these concepts (Najdi, Rashid, and Abdul Hadi, 1999)

It is considered more stable than scientific facts.
Necessary for scientific laws, principles, and theories to exist.
Be in direct contact with the student's life.
It is considered one of the entrances to organizing the content of biology curricula.
It can evolve and be flexible by modifying or canceling some facts.
The importance of identifying scientific concepts in teaching biology is crucial, as educators must pay attention to teaching and evaluating them correctly for students. To achieve this, numerous studies and research have been conducted on various teaching methods for effective instruction. Despite this, the difficulties of acquiring these concepts still exist, and there are many reasons, as noted by Ambusaidi and Al Balushi (2009).

The importance of this study can be summarized as follows:

The importance of this research is evident in light of the scarcity of studies that dealt with this subject.
Directing the attention of teachers and curriculum developers to focus on alternative biological scenarios.
Some abstract or complex scientific concepts, such as DNA, RNA, and genes.
There is confusion between the meaning of the concept and the semantics of some concepts, especially those used as terms and also used as a common language among some people, such as the nucleus and the flower.
The low level of the student's scientific background, as most concepts require previous knowledge to learn them.
Lack of use of the scientific term in new scientific situations, such as adaptation and adaptation.
Lack of terminology related to the environment in which the student lives.
Hasty generalization, such as considering that every animal has wings like birds.
Difficulty pronouncing some concepts, such as fibrinogen, as well as the length of some concepts
- Lack of the term in the student's daily language, such as antigens and toxins.

To address these cases, the teacher requires effort and the use of appropriate teaching methods and methods, and the method or method does not necessarily have to be appropriate; we may find that some students did not recognize these concepts, meaning that they did not have a correct scientific meaning in their minds. Thus, they have what is called in the educational literature an Alternative Conception or alternative understanding, which many definitions define. And other names and terms in the current study used the term alternative perception being the most common and used in the current period. Many definitions define what is meant by alternative conception. Among them is what Khatabiah mentioned in his definition, which defined it as "an unacceptable explanation, not necessarily a mistake, for those natural phenomena used by the student in his academic career resulting from passing through life or educational experiences." It may also reflect an imbalance in the arrangement and organization of expertise, even though the results from activities of intentional processes, such as those performed by scientists. There is another definition of Abd al-Salam 2001, 52), where he defined it as students' ideas, experiences, information, and beliefs about natural phenomena and concepts. These concepts have a significance and a meaning for them that is different from the meaning accepted and understood by

specialists in teaching biology in particular and science in general. Michael (2002) also defined them are wrong mental models formed by the individual for many things and concepts that he wants to learn.

Perhaps the subject of misperceptions is one of the most important topics that researchers in all fields seek to detect and address due to the significant defect caused by the existence of these perceptions in the structure of science in each of the fields, to do so, most of the educators from ancient times sought to find theories and educational strategies that contribute to solving this phenomenon, perhaps the constructivist theory is the most important of these theories because it includes many strategies and therapeutic methods that contribute to the treatment of alternative perceptions. Many specialists in the field of science teaching have explained that knowledge is built in the minds of students and proven by purposeful experimentation. Constructivism shows that school science is keen to construct and visualize the facts by students themselves. Teachers should encourage students to make their ideas and perceptions clear, and present them with events that challenge those ideas and encourage the formation of multiple interpretations. The teacher should provide students with appropriate opportunities to use new ideas in various life situations.

Research Objective: This research aims to achieve the following objectives:

Identifying alternative biological perceptions in biology among fifth-grade scientific students in secondary schools in Al-Qadisiyah Governorate

Research Hypothesis: The researcher assumes the existence of alternative biological perceptions among fifth-grade scientific students.

Research limitations: The current research was conducted by high school students in the fifth-grade scientific class.

Spatial limitations: Al-Qadisiyah Governorate / Secondary and Preparatory Schools.

Time limitations: Academic Year 2024/2025

Define Terms:

Alternative perceptions: defined by an illogical, unacceptable, and not necessarily incorrect interpretation of natural phenomena, it may reflect an error in the order of experiences provided by the student as a result of life or educational experiences. (Khatabiah, 2005, 41) Alternative biological perceptions are precise

misconceptions or unscientific notions about phenomenology and biological processes. These perceptions may consist of various sources, such as direct sensory experiences, inaccurate information, or common false beliefs.

The researcher has adopted the definition of Khatabiah has definition as it is procedurally incorrect and an unacceptable interpretation of concepts and natural phenomena as a result of life experiences and educational erroneous.

Previous Studies and Theoretical Framework

Alternative perceptions have been explored in recent years, and researchers have been working in this area. Hundreds of studies have been conducted in this field, and work has been continuing in the field of science more than in other fields, and the biological sciences have always lacked these studies.

identified eight claims that can be starting points for those who research in the field of alternative perceptions through their analysis of 400 studies in the field of alternative perceptions of scientific concepts, the most prominent of which were:

The student comes to the science learning room carrying a set of alternative perceptions of phenomena and things related to science, such as (physics - chemistry – and biology).
Alternative perceptions acquired transcend barriers of age, gender, and culture
Alternative perceptions are coherent and resistant to modification, especially by traditional methods
Alternative perceptions often correspond to what was advocated by the first researchers and scientists
Alternative perceptions are formed in the individual through their interaction with the environment and the available educational materials.
Teachers often share these perceptions with students.
These perceptions are mixed with knowledge within the school, so they show unwanted learning.
New educational strategies can be used to modify alternative perceptions.
Some previous studies explained.

(Hadhramiah, 2012, Ambusaidi, 2004, Lazarowitz & Lieb, 2006) Some of which have been in different environments - the results of these perceptions, however, more such studies on alternative perceptions among secondary education students are still needed; To supplement the Iraqi and Arab educational field with such survey studies

Research Methodology and Procedures

Research Methodology:

The researcher used the descriptive survey method in this study to suit the nature of the research. This approach seeks to determine the current situation of the research community to reach conclusions in light of their findings (Adas, 1992).

Research Population and Sample

The research community included middle school students in biology and the researcher identified the research sample represented by the fifth-grade scientific students in a deliberate way, where the researcher built the study tool, which is a multiple choice test represented by four alternatives, the alternative scientific biological concepts found in the biology book for the fifth grade were identified, which is more specialized than other academic stages, as well as the fact that the students have formed biological perceptions of the previous stages, as well as the experience of several biology teachers for that stage as well as several specialist supervisors, drafting the initial image of the test, which has 30 paragraphs in the initial image, which was presented to 19 arbitrators with competence in teaching biology, including professors, supervisors and teachers, some arbitrators and specialists in measurement and evaluation have indicated to use their opinions or to know the clarity of paragraphs and the extent of validity and accuracy and whether they are appropriate for the purpose of the research, all paragraphs were approved by experts and the value of ka² was calculated as shown in the table to

Table (1-1) Chi² Value and Percentage of Apparent Validity of Alternative Biological Scenarios Test Items

S.	Sequence of paragraphs	Experts			Percentage	Chi² Value		Degree of freedom	Significance at 0.05
		Total	Approvers	Disapprovers		Calculated value	Tabular value		
1	1-30	19	19	0	100%	19	3.84	1	Significance

It is clear from the table that all the test items are outwardly honest and acceptable, as they obtained an agreement rate (100%) and calculated the value of chi² for each paragraph at a degree of freedom (1) and a level of significance (0.05).

Exploratory application to test alternative biological perceptions:

The first exploratory application: the biological perceptions test was applied to a random sample of the research community it consisted of (20) male and female students at Abu Al-Fadhl Al-Abbas Mixed High School in the center of Al-Qadisiyah Governorate on Sunday (11/22/2024) to know the time required to answer the test as well as checking the clarity of the instructions for the test and students' inquiries where the notes were recorded in the records of the first exploratory application and then took into account what the students inquired about in the instructions of the final exam, the time allocated for the test was determined by (40) minutes by calculating the average time in which the students answered, and the application was in attendance and under the supervision of the researcher.

The second exploratory application: After making sure of the clarity of the paragraphs regarding the test, its instructions and the time specified for the answer, the test was applied to a random sample of (380) male and female students on Tuesday 20/2/2025 for statistical analysis and extraction of the psychometric properties of the test. The researcher adopted the descriptive survey approach to achieve the objectives of the research, the researcher prepared a tool to achieve these goals, which is the test of alternative biological perceptions, which are finalized from (30) objective items, the apparent validity and the construction validity were verified, as well as finding the difficulty and discrimination coefficients of the paragraphs and calculating the effectiveness of the wrong alternatives in the test, and also find the value of the stability coefficient of the test by the coefficient of Cronbach's alpha, which amounted to (0.72), the research tool was applied in the second semester in the academic year 2024-2025, and by the statistical bag Spss and Microsoft Excel, the data was processed statistically and showed the following results:

Fifth-grade scientific students have a good level of knowledge of biological perceptions.

The existence of a statistically significant difference in favor of females.

Table (1-2) Number of Students in the Research Sample

Grade	Male	Female	Total	Percentage of the population
Fifth Scientific	101	283	384	71%

Testing alternative biological perceptions

The alternative biological scenarios test has been prepared according to well-studied steps that we will mention in detail:

Test Objective:
It is to identify the extent to which fifth-grade students in Al-Qadisiyah Governorate know the concepts of alternative biological perceptions.

Alternative biological image test components
The researcher identified the components of the concepts of biological perceptions by reviewing the sources and methodological books of the fifth scientific stage and some previous stages

Formulation of alternative biological scenarios test items
The researcher formulated the test paragraphs in a clear and appropriate way for fifth-grade scientific students through information and topics that include special questions for everything related to the concepts of alternative biological perceptions through the curriculum and previous stages, answer to the student depends on their ability to use different thinking skills. The test in its initial form may consist of (30) items after consulting some experts in immunology, measurement, evaluation, and the subject teacher.

Test Instructions:
The researcher prepared the instructions for answering the test with a paper that was attached to the test to clarify how to answer the students on test paragraphs, in addition to oral clarification.

Correction of the test of immunity concepts:
The researcher, with the help of specialists in the concepts of alternative biological perceptions, determined the test correction criterion, since all the paragraphs of the test were objective, that is, when the student answered correctly, he is given one grade for that paragraph but when the answer is wrong or more than one alternative answer in the same paragraph or not answering at all, the student will get zero for that paragraph, and thus the amount of grades for this test ranges from (zero - 30) degrees.

Validity of paragraphs
The researcher presented the immunity test to a group of experts specialized in the field of life sciences and methods of teaching life sciences, measurement, and evaluation to seek their opinions or to know the clarity of paragraphs and the

extent of validity and accuracy, and whether they are suitable for the research, all the items were approved by the experts and the value of chi² was calculated as shown in Table (1-1) above.

Statistical analysis of test items

Coefficient of difficulty of the paragraphs: The test items are not supposed to be too difficult for all the individuals examined to answer them, nor are they so easy that all individuals can answer them. The difficulty coefficient is meant to be "an indicator that reflects the percentage of students who answered incorrectly to the paragraph, by dividing the number of individuals who answered the paragraph incorrectly by the total number of individuals who answered the paragraph correctly. And that the value of the coefficient of difficulty ranges between (0.20-0.80) as indicated by.

The results showed that there are (5) paragraphs were with a coefficient of difficulty less than (0.20) and were deleted for difficulty, namely paragraph (2, 3, 10, 12, 21) Appendix (6) clarifies that and replaced by the paragraphs that follow in sequence, the difficulty coefficient for the remaining paragraphs in this test ranges between (0.25-0.80), and this indicates that these paragraphs are considered with an acceptable and good difficulty coefficient. The effectiveness of false alternatives:

The effectiveness of the wrong alternative means its ability to attract the attention of students with a low level to choose it as an alternative that represents the right answer, an effective alternative is the camouflaged or distracted from the correct answer and attracts a larger number of students from the lower group . If the alternative attracts too few or if the number of attracted from the upper group is greater than the number attracted by the lower group, the alternative is considered ineffective, it should therefore be replaced after applying the equation of the effectiveness of alternatives to the objective paragraphs of the current test, it appears that each alternative attracted a larger number of students from the lower group and thus considered all alternatives to all substantive paragraphs appropriate.

Validity of the test A good test has the most important characteristics of honesty, where the test is honest if it measures what was set to measure it, that is, if it achieves the purpose for which it was designed, that is, in the sense of everything that its vocabulary expressed and gave a direct and accurate picture of the concepts that the test was developed to measure.

Apparent Validity:

The researcher verified the apparent validity by presenting the test to a group of experts to find out the validity of the paragraphs, the clarity of the instructions, and the suitability of the paragraphs for the purpose of the research.

Construction Validity:

mentions that the sincerity of the construction aims to determine the qualities that characterize the test and the nature of those qualities that constitute the basis of a set of test signs and the most important proof of the sincerity of the construction .

This type of validity has been verified through the following indicators:

Calculate the discriminating power of each test item

The paragraph discrimination coefficient means a score that determines the ability of a test item to distinguish between the answers of high-level students and those of low-level students .

To calculate the discrimination coefficients for the paragraphs, the equation for calculating the coefficient of discrimination of the substantive paragraphs was applied, where the values of the discrimination coefficients ranged between (0.20-0.53). Thus, all paragraphs are prepared as acceptable, where the paragraph can be accepted if its coefficient of distinction is (0.20) or above as indicated by (Ebel, 1979) . Using the equation for differentiating paragraphs to test the concepts of alternative biological images, we found that:

The total score of the test and its relationship to the score of each paragraph, it means knowing the correlation of the degree of the paragraph with the total score of the test, and the correlation coefficient of the degree of each paragraph is calculated by the point correlation coefficient (Point - Paisril) for the objective paragraphs (Abdul Rahman, 2008: 232) Where the results showed that the value of the correlation coefficient for paragraphs ranges between (0.228-0.633) Thus, the validity of the construction of the paragraphs is clear and the following table shows the values of the coefficients of difficulty, discrimination and correlation to test alternative biological scenarios.

Table (4-3) Coefficients of Difficulty, Discrimination and Correlation for Alternative Biological Scenarios Test Items

Item	difficulty Coefficient	Discrimination coefficient	Correlation coefficient

1	0.63	0.30	0.319
2	0.51	0.36	0.424
3	0.36	0.30	0.254
4	0.80	0.23	0.336
5	0.35	0.25	0.633
6	0.42	0.29	0.229
7	0.30	0.35	0.372
8	0.38	0.22	0.386
9	0.28	0.33	0.504
10	0.25	0.53	0.400
11	0.38	0.27	0.316
12	0.40	0.23	0.366
13	0.44	0.34	0.233
14	0.39	0.34	0.263
15	0.39	0.28	0.314
16	0.44	0.26	0.258
17	0.40	0.36	0.436
18	0.24	0.22	0.372
19	0.46	0.25	0.225
20	0.46	0.39	0.508
21	0.44	0.28	0.410
22	0.33	0.34	0.296
23	0.44	0.33	0.274
24	0.59	0.30	0.228
25	0.63	0.35	0.234

Test stability: The stability of the test means that it gives almost the same results every time this test is applied to the same group and under the same conditions.

Consistency is of great importance in the selection and use of a particular test, which symbolizes the amount of confidence that enables us to put it in our test results. Therefore, the stability of the test was confirmed using the equation (alpha-Cronbach) the test includes objective paragraphs, and the basic idea of this equation is based on calculating the correlations between the marks of the stability groups on all test items, as if each paragraph represents a subtest, with grades representing the students' grades on that paragraph. Thus, the alpha-Cronbach coefficient expresses the average of all possible half-fractionation

coefficients of the test and the stability coefficient was (0.72) which is a good stability coefficient.

Final image of the test of alternative biological perceptions concepts, where the test of perceptions concepts in the final form included (25) items in the form of objective questions in which the answer is one correct among four alternatives, as shown in Appendix (5) the statistical indicators of the test items.

Table (5-3) Statistical indicators for test items

Statistical indicators	Value
Mean	13.943
Median	12
Std Deviation	4.661
Variance	21.26
Skewness	0.70
Kurtosis	0.332
The lowest grade that students can get	0
The highest-grade students can get	25
Range	19
Hypothetical average	12.5

Moderate Distribution of Scores of Sample Members on the Alternative Biological Perceptions Test

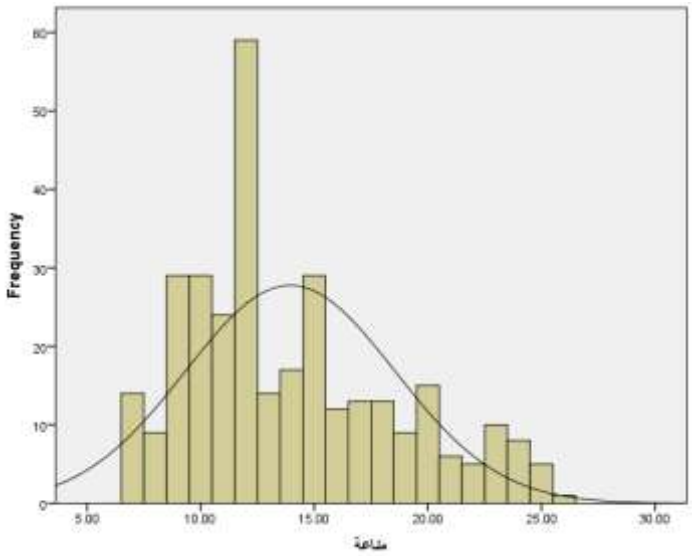

Figure (1-3) Moderate distribution of the scores of the sample members on the test of immunity concepts

Presentation and Interpretation of Results

First: Presentation of Results

The first objective: the extent to which the fifth scientific students know the concepts of alternative biological perceptions: To measure the knowledge of the members of the research sample of the concepts of perceptions, the arithmetic mean and standard deviation of all members of the sample, who numbered (384) male and female students in the concepts, were calculated.

The T-test was used for a sample T-test to find out the significance of the difference between the hypothetical mean and the arithmetic mean. The calculated T value appeared (10.51), which is greater than the tabular value of (1.65) at the level of significance (0.05) and the degree of freedom (383). This degree indicates that fifth-grade students have a good knowledge of these biological perceptions, and here is further illustrated in Table (4-1).

Table (1-4) Results of t-test for One Sample for Biological Perceptions Test

Variable	Sample	Arithmetic mean	Standard deviation	Hypothetical average	T-value for one sample		Significance 0.05
					Calculated	Tabular	
Biological	384	5.21	4,661	12.5	10.51	1.65	Significan

perceptions							ce

The second objective: According to the gender variable (males - females): We identify the differences in the perceptions test among students, the arithmetic mean for females was (14,980) with a standard deviation (5,317), and the arithmetic mean was calculated for males and its value was (13,371) and with a standard deviation (4,162). After that, the T-test was applied to two independent samples, so the calculated T-test value was (2,818), which is greater than the tabular value of (1,968) and with a level of significance (0.05) and a degree of freedom (282), which indicates that there are differences and were in favor of the upper average, namely females, and Table (1-5) shows that

Table (1-5) t-test results among the average scores of students on the perceptions test according to the gender variable

S.	Gender	Number of students	Arithmetic mean	Standard deviation	Degree of freedom	T-value for one sample		Statistical significance at 0.05
						Calculated	Tabular	
1	Female	101	14,980	5,317	282	2,818	1,968	Significance
2	Male	183	13,371	4,162				

Second: Interpreting our findings according to the research objectives

Concepts of alternative biological perceptions

The researcher explains that fifth-grade students have a good level of knowledge of misperceptions due to the nature of the subjects that students receive at various academic levels, which includes information about these perceptions and therefore it is natural that it is among their interests and to see the developments that occur in these concepts and update their information that makes them able to answer the questions that have been asked within the test in this research, the researcher explains the difference in knowledge of these perceptions according to the gender variable males and females in favor of females: Although the difference is not great, the researcher explains this statistically significant

difference to the fact that the biological perceptions test has dealt with some components of the fifth scientific method, and this was confirmed by a study Which dealt with the areas of (nutrition, personal health, exercise and strength), in which females outperformed males.

Conclusions:

Fifth-grade students know alternative biological perceptions.
Females are more familiar with perceptions due to access to some sources outside the curriculum.

Recommendations

Make adjustments to the curriculum in line with the extent of students' knowledge of these concepts and correct some misconceptions about them.
Using modern teaching methods in identifying these perceptions and correcting them among students to replace them with correct scientific perceptions.
Activating the role of the laboratory in proving misperceptions by the teacher

Propositions:

Conducting a similar study on students of the College of Education, fourth stage, and comparing it with the results of the current study.
Conducting a similar study among biology teachers. Conducting an experimental study to design a training program for biology teachers according to alternative biological perceptions and how to correct them with active learning.

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