

Analysis of the content of preparatory school biology books in light of pivotal thinking skills

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Article History: Received: 5 April 2021; Accepted: 14 May 2021; Published online: 22 June 2021

Abstract: The current research aims to analyze the content of biology books for the preparatory stage in the light of pivotal thinking skills for the academic year (2021/2020). The research problem was identified in the following questions: What are the pivotal thinking skills that should be included in the content of biology books for the preparatory stage? And what is the percentage? What are the main and subsidiary pivotal thinking skills included in the content of biology books for the preparatory stage? And what is the percentage? The pivotal thinking skills in the content of biology books for the preparatory stage include eight main skills (remembering, information gathering, concentration, organization, analysis, generation, integration, evaluation) and twenty-one sub-skills: (defining problems, setting goals, observation, formulating questions, coding, recalling, comparing, categorizing, arranging, representing, defining features and components, defining patterns and relationships, defining main ideas, identifying errors, inference, prediction, expansion, summarizing, reconstructing, building standards, validation, and according to the arbitrators' expectations for the percentages of including pivotal thinking skills in the content of biology books for the preparatory stage, the percentages for these skills were as follows: Organizing skill obtained (20%), analysis (20%), focus (15%), information gathering (10%) and remembering (10%). Integration (10%), Obstetrics (10%) and evaluation (5%). In order to verify the inclusion of pivotal thinking skills in the content of biology books, the researcher prepared a list of pivotal thinking skills, which consisted of (8) main skills and (21) sub-skills, and the validity and reliability were verified after being presented to a group of experts and arbitrators, the researcher carried out the analysis process for the three targeted books for the preparatory stage, the results were recorded by means of repetitions and percentages, using the descriptive analytical approach, and based on the unity of the explicit idea, where the stability of the analysis was confirmed by agreement of the researcher with external analysts and the researcher himself over time, the researcher prepared a test for the pivotal thinking skills, the eight main and the twenty-first sub-aforementioned, and to verify the validity of the test in its initial form, it was presented to a group of arbitrators. The clarity of its items and their relevance to students were ensured, and the psychometric properties of the test were confirmed by calculating the internal consistency of the items and calculating the discrimination coefficient, and the difficulty coefficient of the items on a sample of students consisting of (120) male and female students, and the stability was calculated by the Kewder-Richardson equation 20, so the test became ready for the final application, and it consisted of (30) items, the test was applied at the end of the first course of the academic year (2020-2021) on a random sample of (300) male and female students from the sixth preparatory students, distributed over (5) schools from the morning schools for the preparatory stage in the center of Kirkuk governorate, and after the data was collected and processed using the statistical package Spss, and some statistical methods were used, including: Holstey equation and percentages, t-test for one sample and t-test for two independent samples, the researcher used Microsoft Office Excel 2010, objective item difficulty and ease coefficient, item discrimination equation, efficacy equation of wrong alternatives, Point-Baserial correlation coefficient, Keuder-Richardson equation 20. The percentages of pivotal thinking skills in the biology book for the fourth preparatory grade are as follows: Where the skill of organization got a percentage of (22.85), followed by the skill of concentration (20.38), analysis skill by (16.80), collecting information by (13.77), the skill of generation (12.76), the skill of integration by (4.95), and the evaluation skill by (4.64).), and finally the memory skill with a percentage of (3.85).

Keywords: Content Analysis, Pivotal Thinking.

1. Chapter one: Introduction to the research:

Search problem:

The problem of the current research stemmed from the field examination of the researcher in the field of teaching biology, where the textbooks in Iraq witnessed a rapid change after the year (2003 AD) in all academic levels, as the Ministry of Education began to change the biology books for the preparatory stage, and the interesting question is: Are These rapid changes occurred with sufficient awareness of the methodology of criticism, analysis, planning and selection, which is based on a theory or systematic scientific thought? Did these changes take into account the rapid change and cognitive development, which is one of the most important reasons for updating the curricula? In light of the two previous questions, it can be said that we live in an era in which scientific knowledge has accumulated and witnessed a revolution flowing with information and technologies; And because the branches of science, including biology, are among the branches of knowledge that are most relevant to scientific and technological developments and are closest to the student's life in schools, where the researcher concluded that there is a problem with students in understanding the biological concepts that are taught at this stage, with the students lacking the necessary thinking skills at this stage of Teaching, especially for the subject of biology, it is

necessary for the content of biology books that are presented to students to receive more study and scrutiny, in order to determine the extent to which it keeps pace with these developments, so analyzing its content represents the starting point in the reform of curricula, despite the diversity and multiplicity of learning sources, the textbook still represents the most important source for the teacher and student to achieve learning goals, and the development that took place in the last decade of this century in the field of science in general and biology in particular because of its link to human health and life, which increased the importance of the role of these sciences, the learning process no longer aims to provide students with a set of knowledge, skills and trends as much as it aims to modify and change students' behavior to become more able to invest their own energies and capabilities in different areas of life, discussions and surveys with educational staff are nothing more than personal observations and impressions, it is necessary to carry out scientific research to ascertain and stand up to these problems, especially those related to thinking patterns and the degree of their inclusion in books and the extent to which students have acquired them, recent studies dealing with the analysis of the content of science books and other training programs have indicated a clear weakness or shortcoming, which was reflected in the low level of achievement in biology, among these studies are the studies of Al-Issawi (2015), Fayyad (2016), Al-Khafaji (2016), Younis (2019), and by looking at samples of questions from previous years, it was noted that most of the questions focus on remembering and understanding information and neglecting other thinking skills, and among the important thinking skills are pivotal thinking skills, which is one of the five dimensions of thinking identified by the American University to supervise the development of Curricula (ASCD) to be an integrated framework for thinking represented by (thinking in thinking _ creative and critical thinking _ thinking processes _ pivotal thinking skills _ the relationship of content knowledge to thinking), so the acquisition and teaching of pivotal thinking skills is an urgent need and importance for the teacher and the learner, possession of these skills helps the learner to process the information he receives, and here the textbooks must be subjected to continuous and permanent analysis and evaluation, and based on the foregoing, the research problem has crystallized in conducting a research aimed at (analyzing the content of biology books for the preparatory stage in the light of the skills of pivotal thinking).

In light of the above, the research problem can be identified by answering the following questions:

1: What are the main and subsidiary skills of pivotal thinking that should be included in the content of biology books for the preparatory stage?

Research Importance: The importance of analyzing the content of the textbook appears through the following:

- 1: Exposing its strengths and weaknesses (Khawaldeh, Yahya, 2006, 162)
- 2: Enriching the curriculum or the textbook in achieving the most effective goals, through the results reached through analysis (Al-Hashimi, Mohsen, 2009, 161)

Research Aims:

The current research aims to analyze biology books for the preparatory stage in the light of the skills of pivotal thinking.

Research Hypothesis:

1- The hypothesis of the first aim of the results of the analysis: there are no statistically significant differences at the level of (0.05) in the importance given to the skills of pivotal thinking in biology books for the preparatory stage in terms of the ratios of the results of the analysis and the spoken ratios proposed by the specialized arbitrators

2- The two hypotheses of the second aim / a: There are no statistically significant differences at the level of significance (0.05) between the mean scores of the research sample and the hypothetical average of acquiring pivotal thinking skills.

b: There are no statistically significant differences at the level of significance (0.05) in the responses of the research sample in the test of acquiring pivotal thinking skills due to the gender variable (male - female).

Research limits:

Research limits: content analysis of the biology book for the fourth grade of science, written by a committee from the Iraqi Ministry of Education, 7th edition of 2016, issued by the Ministry of Education / General Directorate of Curricula, after excluding chapters and index interfaces.

Defining terms

Content Analysis: Content Analysis (Saleh and Samaa, 2017): A method in descriptive research to describe the apparent content of the educational material in an accurate, objective, bound and quantitative manner (Saleh and Samaa, 81, 2017).

The text book: Defined by: (Good 1973): a source that deals with a specific study subject according to a special format for the purpose of benefiting from it at a specific educational level in which it is used as a source of information (Good, 1973, p15).

Pivotal Thinking Skills: Defined by (Beyer, 1987): Providing students with the same opportunities to practice specific operations, which are used in information processing, as thinking consists of multiple skills that each prevents them from finding the effectiveness of the thinking process. (Beyer 1987, 37)

2. Chapter Two: Theoretical Background and Previous Studies:

Axis one: Pivotal thinking skills

First: Focusing skill: It is a mental cognitive skill that requires advanced mental actions, it helps students achieve goals when facing a problem, the skill contributes to preparing a set of experiences and stored information that are related to the goal, the skill requires defining the problem that dominates the mind or the subject of research, and formulating early goals that show the teacher's effort in solving the specific problem, and two sub-skills branch from it:

1- The skill of defining problems: It refers to working to clarify the questionable situations by the student, such as: Who is facing the problem? Is it necessary to solve this problem? (Qatami, 2004, _27 28)

2- The skill of setting aims: It is represented in defining all the desired goals and educational outcomes that students are expected to achieve after successful educational experience and exposure to a confusing scientific situation, which enables students to set specific and short-term aims (Al-Absi, 2009, 221)

Second: Information gathering skills: This skill is related to the topic or problem and is represented by the students' ability to access the knowledge content of the problem, and the skill includes two sub-skills (Atiya, 2015), 79

1- Observation skill: It refers to the use and activation of one or more of the human senses to obtain information from the environment in which the student is located, this skill is a prerequisite for cognitive processes, such as classification, hypothesis formulation, and scientific inference (Ali, 2011, 209).

2- The skill of formulating questions: The skill includes clarifying issues through the research and investigation method, which draws attention and obtains important information, it is formulated in order to create new information (Qatami, Raghdah, 2007, 58).

Third: The memory skill: The skill that stores information in long-term memory and keeps it. (Letter, 2008, 32), and the skill includes two sub-skills:

1: Coding skill: It is the integration of small pieces of information with each other in order to keep them in the long-term memory. (Al-Atoum, et al., 2005, 215).

2: The skill of recall (retrieval): an organized and conscious process of storing information so that it is easy to retrieve. It depends mainly on how the information is stored and how it is organized and encoded (Abu Jadu, Muhammad, 87, 2015).

Fourth: Organizing skill: The skill of organization is considered as a set of measures and organizations in storing information, the purpose of which is to understand it and to become more effective. This skill enables the formulation of a set of assumptions, due to the available information and experience, by comparing the similarities and the difference between things. And noticing the difference between these things. This skill has four sub-skills.

1- Comparative skill: the skill that works to identify the similarities and differences between the existing information and the information that is being investigated. The skill helps the teacher to organize the stored information, which helps in recalling it. (Nofal, Faryal, 2010, 51)

2- Classification skill: the skill refers to the work of assembling items and vocabulary on the basis of their critical characteristics, or working on developing vocabulary based on their common characteristics. (Jude, 228, 1995)

3- The skill of arrangement: the skill includes subjecting the vocabulary and elements to the organization according to a specific scale. (Ibrahim, 2011, 209)

4- Representation skill: In the skill, the teacher changes the form of information received from the external environment, and establishes relationships between the specified elements, and is given a problem that is easy to represent in the form of a graph or diagram. Representation takes many forms, including (visual, symbolic, and verbal). (Khawalda, 41, 2016)

Fifth: Analyzing skill: The analysis skill is one of the skills that examines the available parts in the relationships and information between them. This information is clarified by distinguishing between attributes and items, and through it the teacher can identify the components, features and reasons. The function of the analysis

skill is to research in the internal characteristics of ideas, as it is the home of critical thinking as defined by philosophers (Ali, 2011, 212). The analysis skill has four skills:

1- The skill of defining features and components: It is possible to know the characteristics of the skill by defining the properties and parts of the rules of something through the knowledge stored with the teacher, and then clarifying the parts that represent the whole. (Al-Absi, 232, 2009)

2- The skill of identifying relationships and patterns: it can be a cause-and-effect relationship, a temporal relationship, a partial or transformative relationship, or the relationship of the whole to the parts, it depends on the knowledge of the content as well as the previous experience of the learner, which he has already gone through, and which plays an important role in determining patterns and relationships (Al-Absi, 2009, 233)

3- The skill of identifying the main ideas: It represents the skill of the main ideas. In the past, the skill was limited to reading lessons. Such as extracting the main idea from the Qur'anic text, but now it is widely used in other topics such as dialogue and scientific investigation. (Al-Askari, 2010, 89)

4- The skill of identifying errors: The skill is mainly used in discovering errors, which includes the logical presentation of a set of arithmetic operations and information. It is also concerned with identifying errors and working to correct them. (Ibrahim, 2011, 213)

Sixth: Generation skill: The skill includes previous knowledge in addition to new information in a constructive way, where the learner in this skill connects old ideas with new ideas by finding a coherent structure of ideas (Al-Hallaq, 2010, 33-34). Three sub-skills:

1- The skill of inference: a type of inductive and deductive proof. Deductive proof is the ability of the learner to determine a logically existing principle. As for inductive proof, it refers to generalization and logical statement based on observing different cases. It is necessary to explain the activities that take place among individuals.

2- Forecasting skill: a skill that involves using previously available information to predict the occurrence of a phenomenon or event in the future (Shawahin, 2009, 79).

3- Expansion skill: The skill is intended to add more explanation and information related to previous knowledge, with the aim of improving the students' understanding process. (Razuqi, Muhammad, 2019, 42_43)

Seventh: Integration skill: the skill of arranging things that have common relationships with each other, which leads to a deeper understanding of those relationships. Such as merging new learning with previous learning to obtain new learning that he wants to learn for students. The skill contains two skills.

1- Summarizing skill: the teacher's ability to extract basic information on a subject through a group of coherent phrases to form that leads to a clear meaning in the student's mind (Abu Jadu, Muhammad, 2007, 103)

2- Reconstruction skill: the process of changing the cognitive structure directed to the purpose of integrating new information And reorganizing the material that the student learns in order to leave previous information and his awareness of facts and trends that are no longer correct. This is also a major part of the student's cognitive development process (Al-Absi, 2009, 241).

Eighth: Evaluation skill: The process of honesty and reasonableness of ideas and results that are reached. Therefore, it is an organized process of collecting and analyzing information for the purpose of determining the extent of achieving goals and making decisions. The skill contains two sub-skills:

1- The skill of building criteria: It refers to setting a set of criteria in order to judge the quality and value of ideas. (Al-Askari, 2010, 90)

2- Verification skill: the skill aims to confirm the accuracy of the allegations made about a particular case using evaluation criteria. (Al-Afoon, ended 2012, 25)

The researcher believes that pivotal thinking skills are mental and cognitive processes that are not separate from each other and are characterized by integration, and contribute to revealing the latent energies of students, the need that they learn is very necessary that must be focused on during teaching by the teacher to improve their educational competencies and help them develop themselves, the application of these skills requires providing an appropriate classroom environment for teaching them in our schools today and keeping pace with the progress made around us in the world.

The second axis: previous studies:

1: Study (Fayyad, 2016): Analyzing the content of physics books according to the skills of pivotal thinking and visual thinking for the secondary stage, and their acquisition by students, in Iraq, the explicit idea was adopted and the axial and visual thinking skills were tested, the results were that the inclusion of skills in the six books was random for the pivotal thinking skills, not based on a specific criterion, whether according to the type of skill or according to the classroom, as well as weakness and disparity in the percentages of including pivotal thinking skills for the secondary stage and most of the skills the percentages of its inclusion were lower than the percentages of experts' expectations, the results of the pivotal thinking test were almost in agreement with the results of the book

analysis, where there was a deficiency in the level of inclusion and the level of the answer to the test of pivotal thinking, and the statistical bag spss, Holsti equation, alpha Cronbach equation and Pearson correlation coefficient.

2- Study: (Farhan 2020): The pivotal thinking skills included in the mathematics book for the third intermediate grade, the explicit idea, the test of pivotal thinking skills, Holstey's equation, the mathematics book for the third intermediate grade was analyzed and it includes all the main pivotal thinking skills, but in varying proportions, some of the sub-skills which are the skills of identifying the main ideas and the skill of formulating questions are not included in the content of the mathematics book.

3. Chapter Three / Research Methodology and Procedures

Research Methodology: The researcher adopted the descriptive analytical approach using content analysis to analyze biology books for the preparatory stage because it is most appropriate to achieve the objectives of the research in revealing the pivotal thinking skills included in biology books and it is one of the survey methods in the descriptive approach to reveal the extent of interest and care in the content of biology books for the preparatory stage in Iraq.

Research procedures:

This chapter includes the methodological procedures carried out by the researcher in order to achieve the objectives of his research, this is through the research methodology followed, defining the research community and its sample, defining the research tool, and statistical analysis of the test items, as well as extracting validity and reliability, and ending with the statistical processing methods used.

First: Choosing the research method: The researcher adopted the descriptive analytical approach using content analysis to analyze biology books for the preparatory stage because it is most appropriate to achieve the objectives of the research in revealing the pivotal thinking skills included in biology books, and it is one of the survey methods in the descriptive approach to reveal the extent of interest and care in the content of books Biology for the preparatory stage in Iraq.

Second: Determine the research community: The research community consists of:

- 1- All biology books for the preparatory stage approved in Iraq for the academic year (2020-2021)
- 2- Students of the fourth scientific grade for the preparatory stage of government day schools in Kirkuk Governorate for the academic year (2020-2021).

Third: The research sample: The current research sample consisted of:

1- Books Sample: It included all biology books for the (preparatory) stage scheduled for the academic year (2020-2021), after excluding tables, index and questions, and Table (1) shows the data that were subjected to the analysis process Table (1) illustrates this.

Book name and class	Edition and year of Edition	number of pages
Biology book for fourth grade science	Seventh Edition 2016 AD	208

2- Student sample: A random sample was selected from the sixth scientific grade students for the preparatory stage of government day schools for the academic year (2020-2021) and its students are still attending school.

Selecting the sample for analysis:

The researcher selected biology books for the preparatory stage for the academic year (2020-2021) with the exclusion of the evaluation (questions) at the end of each academic unit and for all books.

Table (2) the number of repetitions and percentages of the skills of pivotal thinking in the biology book for the fourth grade of preparatory school

S	Skill	Number of repetitions	Percentage
1	Focus skill	74	20.38
2	Information gathering skill	50	13.77
3	Remembering skill	14	3.85
4	Organizing skill	83	22.85
5	Analytical skill	61	16.8

6	Generation skill	46	12.76
7	Integration skill	18	4.95
8	Evaluation skill	17	4.68
Total		363	100%

Preparing a tool (analysis list): he adopted the analysis list, which includes (8) main skills and (21) sub-skills of pivotal thinking skills, unit of analysis, page, repetition and percentage.

Tool Validity:

The validity of the analysis lists was confirmed as the lists were drawn up in their initial form by presenting them to arbitrators and specialists, the lists obtained agreement with a percentage of (87), and this value is considered an acceptable value, according to what was mentioned (Al-Zamili et al., 2009, 243) and (Abu Saleh et al., 1995, 213)

Tool Stability:

The most important condition of the content analysis is to achieve objectivity, and to accomplish this, the stability of the analysis must be known, and stability means the stability of the results of the analysis when re-analyzing according to the analysis and time, and therefore the stability in light of the repetition of the analysis process again, whether by the researcher himself or the use of other analysts, if the coefficient of agreement is large, the results of the analysis can be trusted (Abdul Hamid, 203, 1985), (Salman, Khalaf (1987, 27).

Calculating the number of points that each researcher agreed upon with himself after a period of time, the researcher and the first analyst, the researcher and the second analyst, the first analyst and the second analyst, and then extracting the reliability coefficient of Holste

Where the agreement between the analysts was calculated from the following equation:

$$C.R = 2C / C1 + C2$$

Where as

C.R = stability coefficient

C = number of ideas agreed

(C1 + C2) = the total number of ideas in both times of analysis (Imam, Mustafa and others, 1990)

The coefficients of agreement obtained by the researcher when calculating the stability of the analysis are sufficient to ensure confidence in the stability of the analysis, as the stability rate of more than (70%) is considered good as shown in Table (9). (Al-Sudani, Abbas 2011, 123).

Consistency in content analysis research is achieved by two types of consistency

A: Consistency over time: a condition of effective measurement tools, ensuring the stability of the analysis by selecting two chapters from biology books, the researcher analyzed the content of the book according to the skills of pivotal thinking, and then re-analysis after 21 days of the first analysis, and according to the correlation coefficient between the results of the two analyzes, which was (93.18).

B: Consistency between analysts: The researcher trained analysts on the analysis process and then asked them to analyze two chapters in biology books according to the lists of pivotal thinking skills, and according to the correlation coefficient between the obtained values between the researcher and the first analyst and the researcher and the second analyst and between the first and second analysts, and the percentages of agreement ranged Among the analysts (88.63) as in Table (3), which are acceptable values and indicate the stability of the analysis process

Table (3) Correlation coefficients between researcher and analysts

Agreement	Agreement points	Difference Points	Stability coefficient
Between the researcher and himself, an interval of 21 days	82	6	93.18
Agreement between the researcher and the first analyst	79	9	89.77
Agreement between the researcher and the second analyst	75	13	85.22
Agreement between the first analyst and the second analyst	76	12	86.63

The final form of the analysis lists: the lists are in their final form. The list included (8) main skills and (21) sub-skills of pivotal thinking skills, annex (6).

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Statistical means: The researcher used Microsoft Office Excel 2010 to analyze the data.

4. Chapter Four: Presentation, interpretation and discussion of the results.

In this chapter, the results of the research, their interpretation and conclusions will be presented, and suggestions and recommendations will be presented as follows:

❖ Discussing the results related to the question and their interpretation: Since the first question of the research stated:

What are the pivotal thinking skills that should be included in the content of biology books for the preparatory stage? What are their percentages?

After unpacking the answers of the experts to the questionnaire that was directed to them, the average of the proposed ratios is calculated and it was as in Table (5), and from it we find that the experts believe that the pivotal thinking skills included in biology books for the preparatory stage should not be in the same proportions, as they gave a percentage (% 15) for the skill of concentration, the percentage (10%) for the skill of collecting information, the percentage (10%) for the skill of remembering, the percentage (20%) for the skill of organizing, the percentage (20%) for the skill of analysis, the percentage (10%) for the skill of generation, and the percentage (10%) for the skill of integration And a percentage (5%) of assessment skill.

Interpretation of the results related to the first question: Through the results shown in Table (5) and Figure (1), it is clear that the inclusion of skills in the three books was random, and is not based on a specific criterion, whether according to the type of skill or according to the type of class, and there is a clear contradiction in some percentages of skills Actually included in the books and percentages suggested by experts.

- The first, fourth and fifth skill got a percentage that may be high compared to the rest of the skills.
- As for the second, third, sixth and seventh skill, it got a medium inclusion rate for the rest of the skills.
- As for the eighth skill, it got a low percentage compared to the rest of the skills

❖ Discussing the results related to the second question: Since the second question stated:

What are the main and subsidiary axial thinking skills included in the content of biology books for the preparatory stage? And what are their percentages?

To answer the second question, the researcher used the lists he prepared, and the analysis process for biology books for the preparatory stage was conducted according to the skills of pivotal thinking, and after completing the analysis process, the data was unloaded as shown in Table (6), (7), (8) showing the results of the analysis of the three books According to the main and sub-axial thinking skills as follows:

• The number of repetitions and percentages of the pivotal thinking skills for the fourth grade of preparatory school:

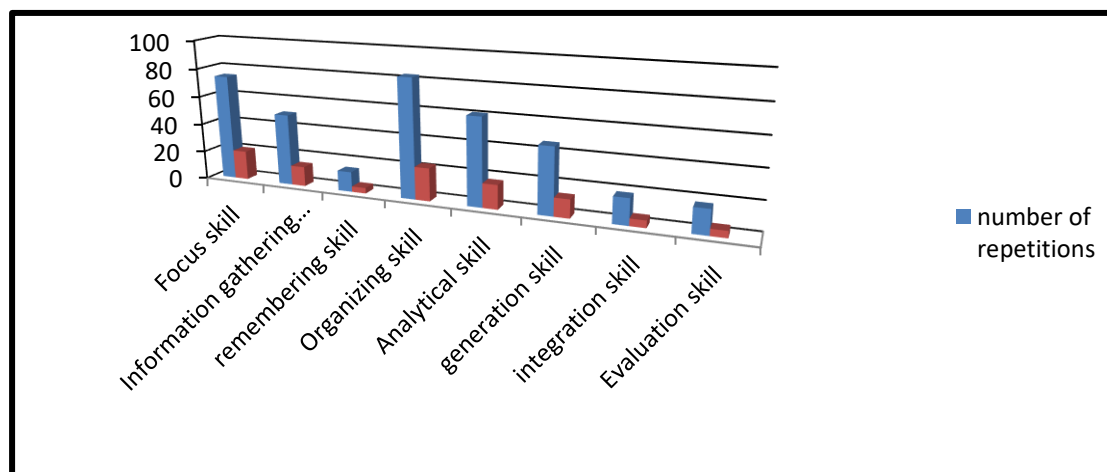
The skill of organizing got the largest number of repetitions (83) repetitions and a percentage of (22.85), and this indicates that the percentage of including the skill of organization with a high percentage in the content of the biology book for the fourth grade of the preparatory stage, followed by the skill of concentration with a number of iterations (74) and a percentage (20.38), the concentration skill is also very well included in the biology book content, as for the analysis skill, it got a number of iterations (61) and a percentage (16.80), as the percentage of its inclusion in the content of the biology book is considered good, and the skill of collecting information got a number of repetitions (50) with a percentage of (13.77), and this percentage is considered medium compared to the skill of organization, focus and analysis, as for the generation skill, the number of repetitions was (46) and a percentage (12.76), as it is considered a small percentage in the content of the biology book for the preparatory stage, and the skill of integration with a number of repetitions (18) and a percentage of (4.95), the integration skill has a weak percentage of its inclusion in the content of the biology book for the fourth grade of preparatory school, and the evaluation skill with the number of repetitions (17) with a percentage of (4.64), also, the assessment skill is considered a weak percentage to be included in the biology book for the fourth grade of preparatory school, and finally the skill of remembering with a number of repetitions (14) and a percentage of (3.85), meaning that the percentage of including the memory skill is small in the content of the biology book for the preparatory stage through the proportions shown above, the percentages of including skills (organization, focus and analysis) were

high, as for the percentages of skill (information gathering) were medium, and the percentage of skill (obstetrics) was few, as for skills (integration and evaluation), the percentages of their inclusion were weak, and the skill (remembrance) obtained weak percentages in the inclusion in the content of the biology book for the fourth grade of preparatory school, as shown in the following table:

Table (4) the number of repetitions and percentages of pivotal thinking skills in the biology book for the fourth grade of preparatory school

S	Skill	number of repetitions	Percentage
1	Focus skill	74	20.38
2	Information gathering skill	50	13.77
3	Remembering skill	14	3.85
4	Organizing skill	83	22.85
5	Analytical skill	61	16.8
6	Generation skill	46	12.76
7	Integration skill	18	4.95
8	Evaluation skill	17	4.64
Total		363	100%

Chart (2) Percentages of pivotal thinking skills in the content of the biology book for the fourth grade of preparatory school



Interpretation of the results of the second question: Through the results shown in Table (2) and Chart (2), the following becomes clear:

The percentages of inclusion of pivotal thinking skills in the biology book for the fourth grade of preparatory school were varied and distributed unequally, the fourth skill (organization) got a very high percentage in relation to the rest of the skills, and this indicates that the percentage of its inclusion is high in the content of the biology book for the fourth grade of preparatory school and was compatible with the percentages of the arbitrators' expectations as it is a major skill from which four skills are branched: comparison, classification, arrangement and representation, it was reasonable for this skill to be ranked first, followed by the first skill (concentration), which contains two sub-skills (defining problems) and (setting goals) its percentage was high and this explains that the percentages of its inclusion in the content of biology books for the fourth grade of preparatory school are high, as the percentage was consistent with the percentages of the arbitrators' expectations, as for the fifth skill (analysis) Its inclusion rate was lower than the arbitrators' expectations, and this indicates that it was not included well.

The skill (third, seventh, eighth) (remembering, integration, evaluation) these skills obtained low rates of inclusion, as the percentage of inclusion of the third skill (memory) was less than the expectations of the arbitrators, and this indicates that it was not included well in the content of the book, while the percentages of inclusion of the seventh and eighth skills (integration and evaluation) were close to those of the arbitrators' expectations.

5. Conclusions

By presenting the results of the research, the researcher reached the following conclusions:

- 1- The percentages of including the content of biology books for the preparatory stage according to the skills of pivotal thinking were not at the required level
- 2- The process of building the curriculum was not done according to the skills of pivotal thinking.
- 3- The students' ability to answer the questions of the axial thinking test is medium and did not reach the hypothetical average in most of its items.

6. Recommendations

In light of the research results, the researcher recommends the following:

- 1- The necessity of developing the biology curriculum for the preparatory stage according to the skills of pivotal thinking in order to achieve the quality of education in Iraq.
- 2- Including some basic skills and sub-skills of pivotal thinking skills that were not covered in good proportions.
- 3- Attention on the part of those concerned with education affairs, curricula and teaching methods with the skills of thinking of its various types in general and the skills of pivotal thinking in particular, and to include these skills when developing and updating curricula.
- 4- Conducting in-service training courses for biology teachers in order to develop them in practicing pivotal thinking skills, and how to provide them to their students.
- 5- Urging the directorates of education for school administrations to benefit from the scientific and professional experiences of teachers, especially those with service in training new teachers through the model educational lessons provided by teachers during the school year.

Suggestions

In light of the results reached by the researcher, he suggested conducting the following studies:

- 1- Conducting a similar study on (chemistry and physics) books for the preparatory stage.
- 2- Conducting a survey to explore the opinions of specialists and curriculum developers in including thinking skills for other types of thinking.
- 3- Conducting a study on the obstacles to developing students' pivotal thinking skills.
- 4- Conducting a comparative study between the pivotal thinking skills and other thinking skills in teaching.

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