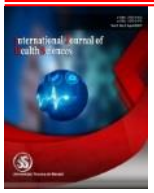

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Content Analysis of Biology Book for the Fourth Scientific Grade According to the Levels of Depth of Knowledge

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depth of knowledge;

Abstract

The aim of the research was to analyze the content of the biology book for the fourth scientific grade in high school according to the levels of depth of knowledge (DOK), in order to know the extent of the availability of indicators of these levels in the scientific content of the book, which would achieve deep understanding of students in biological concepts and develop strategic and extended thinking in solving scientific problems in a sustainable style, the researchers used the descriptive analytical approach, and the research community was represented by the content of the biology book, and the sample was the first six chapters. The research tool was built and included (22) indicators, and was presented to a several of arbitrators in teaching methods to verify the validity of the tool. The researchers analyzed the content of the biology book, depending on the explicit and implicit idea as a unit of recording, and the Holsti formula was used to calculate the reliability of the analysis. The results showed that the biology book does not contain all indicators, and the levels appeared in varying and unbalanced proportions. level (Recall and reproduction) obtained (63.49%), level (Skills and concepts) obtained (19.07%), level (Strategic thinking) obtained (8.84%), and level (Extended thinking) obtained (8.60%), accordingly the researchers presented several recommendations, including emphasizing the inclusion of the biology book for the fourth scientific grade of levels of depth of knowledge in balanced and close proportions, while achieving the standards of sequence, integration and balance.

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Contents

1 Research Problem

Our current era is several developments, changes and challenges, result of the information technology revolution, which directly affected for all life's area, especially education, so it must be a careful the reconsideration of educational theories, philosophy and curricula, and reformulation in a way that helps prepare a generation of students capable of overcoming their responsibilities and contributing to the development of their societies along with Preserving education in its comprehensive sense and objectives, international standards for preparing textbooks indicate meeting students' needs for a deep understanding of scientific knowledge (Graneheim & Lundman, 2004). therefore, the depth of knowledge is one of the important levels in the area of science education, as it activate deep thinking among students and meets their needs to understand scientific knowledge and represents an in-depth test of new knowledge and ideas and linking them to previous ideas to solve problems and predict results to keeps pace with the scientific and technical development taking place in the areas of science in general and the area of biology in private (Graneheim et al., 2017). Therefore, the researchers directed a survey questionnaire to male and female teachers of biology for the fourth scientific grade and those affiliated with the General Directorate, and those whose actual service was not less than (5) years in teaching, they were asked about the availability of indicators of levels of depth of knowledge in the content of the biology book for the fourth scientific grade, to know the extent of the availability of those levels, and the results of the questionnaire showed varying opinions about the presence of some indicators and the absence of others. the results of the survey showed that (85%) of the opinions of male and female biology teachers were that there were only two levels (level 1: Recall and reproduction, level 2: Skills and concepts), and (15%) of their opinions were that there were four levels of depth of knowledge. Therefore, the researchers decided to analyze the content of the biology book for the fourth Scientific grade to determine the extent to which it includes indicators of levels of depth of knowledge. The research problem was determined by answering the following question: To what extent does the content of the biology book for the fourth scientific grade include levels of depth of knowledge?

2 Research Importance

The educational process must develop and advance in various parts of life, and this will not happen unless we take good care of education and good interaction between its basic elements, the education is a means of human development by providing chance for students to improve their reality, expand their mental awareness, and correct the thinking for them, according to which the mind good works in all mental processing, this positively affects the reception of information and the better performance of working memory. It also contributes to the proficiency in setting aims according to the standards required by life (Ahmed & Aziz, 2018). The breadth of concepts, ideas and theories as a result of the information technology development that occurred in various countries, it led to the weakness of students' ability to conceptual assimilation and terminology and learn them or distinguish them from each other. it's a difficult to benefit from their use in the learning, and thus they were easily forgotten. This works to create negative attitudes

among students towards the subject. academic achievement, and low level of achievement (Yousif & Mahmood, 2020).

Therefore, attention must be paid to the curricula and attention should be directed towards developing it through continuous analysis in accordance with modern scientific and educational developments, especially for the levels of depth of knowledge for (Norman Webb), which is considered one of the priorities of teaching and training curricula because it stimulates students' motivation to think and link current information with experience precedent, analyzing information, achieving meaningful learning, and working to solve problems in strategic and sustainable methods (Kaplinsky, 2023). Norman Webb's model of knowledge came as a development of Bloom's taxonomy of the cognitive process, and Webb's classified it into a set of tasks or indicators that reflect a level of Perception and anticipating them, and the model includes all forms of explane and procedural knowledge. The depth of knowledge classification differs about Bloom's classification of the cognitive level in that the latter is expected to appear in students after the education process, while the depth of knowledge focuses on the situation in which knowledge is expressed and used. In other words, the classification presents Bloom presents the educational framework, while Depth of Knowledge presents the applied framework for education (Gopal, 2021).

Based on the necessary cognitive requirements, curriculum elements can be classified to produce an acceptable student response and measure the depth of their understanding. Students are required to participate in planning, research, and drawing conclusions about what they are learning. Therefore, the depth of knowledge in curriculum development and construction is one of the contemporary trends. This came as a reaction to some of the problems in textbook content, including superficial knowledge, fragmentation, and weak coherence. They lack the knowledge foundations that achieve the depth of scientific material, which negatively impacts the quality of the teaching and learning processes (Roth, 2014).

The researchers emphasize the importance of depth of knowledge and the necessity of having indicators of it in textbooks. Therefore, the researchers analyzed the content of the Biology textbook for the fourth scientific grade according to levels of depth of knowledge. The importance of the current research can be summarized as follows:

1) Contributes to advancing the Biology book for the fourth scientific grade through modification and development according to content analysis of the Biology book.
2) Assists curriculum designers in considering the results of the current research.
3) The first research (to the researchers' knowledge) to analyze the content of the Biology book for the fourth scientific grade in the high school according to levels of depth of knowledge.
4) Provides indicators for levels of depth of knowledge in the life sciences field, opening doors for other researchers in different scientific disciplines based on levels of depth of knowledge and for other educational stages.
5) Demonstrates the importance of having levels of depth of knowledge to stimulate thinking among students and achieve a deep understanding of scientific knowledge, enabling them to remember, reproduce, apply, analyze, and evaluate information to solve problems sustainably and to innovate in all parts of life.

Aims of the Research

The current research aims to:

1) Analyze the content of the biology book for the fourth scientific grade according to the levels of depth of knowledge.
2) Construction a list of indicators of levels of depth of knowledge, which can be included in the biology textbook for the fourth scientific grade.
3) detect the percentage of differences between the levels of depth of knowledge in the biology book for the fourth scientific grade.

Limits of the Research

This search was limited to the biology book for the fourth scientific grade for the academic year (2024-2025), and it includes:

1) Material limits: Content of the biology book for the fourth scientific grade, twelfth edition, issued by the General Directorate of Curricula/Ministry of Education for the year 2023.
2) Time limits: Academic year (2024-2025).
3) Theoretical limits: levels and indicators of depth of knowledge

Determination of Terms

First: Content Analysis, a term defined by:
- (Patankar, 2024): " a research tool used to determine the presence of certain words, themes, or concepts within some given qualitative data (i.e. text). Using content analysis, researchers can quantify and analyze the presence, meanings, and relationships of such certain words, themes, or concepts" (Patankar, 2024, p:50)
- (Crowther & Lauesen, 2017): "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use " (Crowther & Lauesen, 2017, p: 352)

The researchers define it procedurally: the method that the researchers used to segment and disassemble the scientific material in the biology book for the fourth scientific grade according to the levels of depth of knowledge and its indicators, by adopting the explicit and implicit idea, in order to achieve a purposeful, organized and objective quantitative description.

second: Biology book for the fourth scientific grade
Researchers define it procedurally: scientific topics organized into ten chapters, according to the standards and objectives of the biology book, which are scheduled to be taught to students in the fourth science grade of the high school in the education system.

Third: Levels of depth of knowledge (DOK):
- Webb (2002): "is the degree or complexity of knowledge that the content curriculum standards and expectations require." (Webb, 2002)
- Researchers define the levels of depth of knowledge procedurally as: the levels of thinking that students must master, and how to benefit from the information contained in the biology book for the fourth scientific grade in different contexts, and link it to the previous knowledge they possess to understand ideas and apply them, and reach generalizations, in order to solve realistic problems. In strategic and sustainable ways, it is measured by the grade that a fourth-grade science student obtains in a test prepared for that purpose within the levels of depth of knowledge (Recall and reproduction, Skills and concepts, strategic thinking, and extended thinking).

3 Theoretical

Content Analysis

Content analysis is of great importance in the educational process, which aims to help students at all educational levels acquire of knowledge and science in order to achieve a comprehensive and integrated development of their personality that affects all aspects of their physical and mental development (Abbood, 2023a). The requirements of life, especially we live in an era in which knowledge has accumulated and the volume of available information has increased, it has become necessary to develop the general framework of curricula, which is the cornerstone of the development of the educational system, and for education to go beyond the area of providing students with information to the level where the individual is in a position from which student can learn himself, and developing his potential to acquire advanced knowledge (Yousif, 2018). Therefore, understanding content and extracting important information from texts can lead to new discoveries and a better understanding of phenomena and relationships, using them effectively and logically.so requires evaluating the content by analyzing its elements, components, and recognizing the extent

to which it adheres to the principles and standards, and describing it quantitatively and qualitatively (Neuendorf, 2017).
emphasized (Abbood, 2023b) giving importance to the textbook in order to design educational curricula that help learning better and faster and help the teacher follow the best educational methods with the least possible time and effort (Abbood, 2023b)

Basic principles of content analysis

Whilst the tools used for analysis may have changed and developed, the essential principles of content analysis have remained constant. To conduct a content analysis, the data are coded or grouped into categories which are tested for their reliability and validity. These categories or codes will include words or themes, word senses, phrases or whole sentences. Once coded, the textual data are interpreted and the results of the analysis provided (Wilkinson & Birmingham, 2003), and they added (Starita & Malafronte, 2015) about basic principles:

1) Objectivity: Which means that the analysis is pursued on the basis of explicit rules, which enable researchers to get the same results from the same documents.
2) Systematic: Which means the inclusion or exclusion of content is done according to some consistently applied rules where by the possibility of including only materials which support the researcher's ideas.
3) Generalizability: The results obtained by the researcher can be applied to other similar situations.

(Starita & Malafronte, 2015)

And they indicated (Schyns et al., 2017):

4) Reliability: This means the extent to which a measurement execution yields the same results in frequented trials. Without acceptable levels of reliability, content analysis measures are meaningless
5) Validity: As the researcher select what to measure and how to measure it, it is necessary that an empirical measure adequately reflects the true meaning of a concept.

(Schyns et al., 2017)

Purpose of content analysis

The purpose of content analysis is to discover and interpret the meaning imbued in the words of respondents or in historical or written documents (Houser, 2018), It can be summarized as follows:

1) Know the nature of the content and its components of ideas, concepts, principles, laws, trends, and skills.
2) Improving the quality of textbooks and educational materials and raising their adequacy to achieve the objectives of the curriculum.
3) Accessing the strengths and weaknesses in the scientific content of textbooks with the aim of evaluating it.
4) Providing assistance to book authors, publishers, and those involved in preparing textbooks by providing them with what should be included in the content and what should be avoided.
5) Identify the thinking patterns and mental skills that the textbook develops**.**

(Krippendor, 2004)

Methods of content analysis

Indicated were (Wilkinson & Birmingham, 2003) the most important and common methods of analyzing textbook content are:

1) Conceptual analysis: "is by far the more popular. This approach examines either the incidence or the frequency of concepts (themes/issues, words, phrases, etc.) in a text. It quantifies the occurrences of the concepts you have chosen for examination. Conceptual analysis is also referred to as thematic analysis because it is the themes or issues in the text that the researcher intends to analyze"

2) Relational analysis: "develops the conceptual analysis further by examining the relationships among concepts in a text. Each type of analysis may lead to different results, conclusions, interpretations and meanings".

The researchers adopted the second method of content analysis, because it is compatible with the nature of the research, and the analysis categories in the research were represented by a list of levels of depth of knowledge that had been prepared in advance, and in light of it, the content of the biology book for the fourth scientific grade will be analyzed, to determine the availability of indicators for those levels, and it was adopted the explicit and implicit idea are the unit of analysis (Kondracki et al., 2002).

Concept of a textbook

The book represents one of the most important educational resources in educational institutions. Because it supplies high levels of educational experiences, information, and knowledge in a logical and methodical style that is gradual from easy to difficult that suits the requests of growth and the principles of education. Its purpose also goes beyond establishing reading and studying habits to developing the inclination for self-education directed at achieving the educational goals that are intended to be achieved. In general, it is described as easier Educational resources available in educational environments (Sikorová & Bagoly-Simó, 2021), and (Wikman & Horsley, 2012) are add:

"That textbooks are texts produced for educational use within educational institutions like schools. They are also considered to be 'adapted' texts that convey a special form of approach to knowledge. This discourse provides some frames for the concept of 'textbook"

Given the importance of textbook for the promotion of a written culture in the twentieth one century, textbook contains the educational material in helping students to identify of the natural wealth and resources in the environment in a method appropriate to their educational stages and level of development, and working for raise awareness of the importance of these sources and the methods of using, saving, and making good use of it (Yousif, 2019). As a composite medium, attributes to textbook the roles to structure content, motivate students, offer support, transport innovation, offer learning tasks, and control the teaching-learning process (Bagoly-Simó, 2021)

Modern trends in the area of education views the textbook as a major input to the development of educational process, and stresses that analysis, evaluation, and development of textbooks, in terms of its objectives, content, and organization, must be a continuous process that does not stopping at a certain level, taking into account other sources of learning. so the textbook is a frame of reference for teachers and students in the education process (Valverde et al., 2003)

Main characteristics of the textbook

The text book is a printed teaching material used in a learning activity with the aim of helping understanding learning material. Characteristics of textbooks in general as stated by (Mesquita & Ramos, 2013, p: 261) as follows:

1) The textbook as means to organize the curriculum and as a tool for teaching and learning used in educational situations.
2) The textbook is a complex structure that can include of several parts and exists in a printed, digital, and hybrid (combined) form.
3) Textbooks include various structural elements of verbal and iconic nature, especially interpretive texts, elements directing students' learning.
4) A textbook is professionally designed, created, and published.
5) Edit and publish textbooks state institutions (ministry of education) (Mesquita & Ramos, 2013)

Importance of The Textbook

The importance of textbook is directly related to the subject, chapter, and didactic unit so that the students know the goals they have to achieve, working with a source of motivational work. Its contents must be of several authors, publishers and illustrators in order to be objective, flexible (Ferreira & Ricoy, 2019)

1) Provides scientific material which the teacher bases his teaching, and divides it in a appropriate ways to the time available for explanation.
2) It provides questions and activities that can help the teacher guide students in order to achieve the objectives of the curriculum.
3) It increases students' reliance on themselves as a source of acquiring information.
4) It develops the desire to read for students, and gives them various skills, as thinking, analysis, deduction, and others.
5) The basis for introducing students to the environment surrounding them, and thus helping to preserve and sustain it.

(Slamet et al., 2023)

Levels of depth of knowledge (DOK)

Norman Webb's model of depth of knowledge (DOK) is based on the assumption that all elements of the curriculum can be classified on the basis of cognitive depth to produce an acceptable response, and each set of tasks reflects a different level of awareness in the depth of knowledge required to complete the task (Crosson et al., 2019). depth of knowledge (DOK) refers to the comprehension and interpretation that is mandatory in order to perform an activity or reach a solution.

"Depth-of knowledge consistency between standards and assessment indicates alignment if what is elicited from students on the assessment is as demanding cognitively as what students are expected to know and do as stated in the standards". (Webb, 2002)

The DOK model goes beyond the "what" and seeks to go deeper into the "how" (Gopal, 2021). Webb identified four distinct DOK levels to aid in alignment analysis of curriculum objectives, contents, and assessments. The levels are;

Level 1: Recall & Reproduction**:** This level describes the basic tasks that require students to remember or reproduce knowledge related to the elements of the curriculum " Recall a fact, term, principle, or concept; perform a routine procedure". The role of the teacher in the level is to ask the student questions that require what has been explained and recalled, with the depth of the question gradually leading to understanding (Denga et al., 2017)

Level 2: Basic Application of Skills/Concepts: This level requires students to be able to highlight differences or compare and rephrase information from one form to another. It also requires classifying or sorting things into meaningful categories and clarifying relationships, and Use information, conceptual knowledge; select appropriate procedures for a task; perform two or more steps with decision points along the way; solve routine problems; organize or display data; interpret or use simple graphs (Absattarovna, 2024).

Level 3: Strategic Thinking: This level requires students to be able to use higher-order thinking processes, such as analysis and evaluation, in order to draw and predict conclusions. Tasks in this category require students to coordinate knowledge and experiences from multiple fields to implement the required processes (Holmes, 2012).

Level 4: Extended thinking: This level is also called extended strategic thinking. This level requires students to use the most advanced higher-order thinking processes, such as synthesis, reflection, and evaluation. requires students to be able to create new structures, new thoughts, original documents, etc. and Students participate in conducting an investigation to solve real problems, while they must reach unpredictable results (Sizemore, 2015).

The importance of the depth of knowledge

1) It is compatible with the principles of the constructivist school by paying attention to the amount of students' prior knowledge.
2) It is suitable for all academic subjects due to the depth of these levels and the diversity of the objectives of each level.
3) It clearly includes the importance of enabling students to apply knowledge to new life situations.
4) It clearly includes the activities that the teacher must perform to achieve the goals and focuses on active knowledge that students can transfer to new situations.
5) It focuses on superficial, shallow, and deep knowledge directly, appropriate for beginners and expert students.
6) Only objective questions are not sufficient to measure the extent to which students achieve the cognitive objectives in the Web classification, and essay questions must be used.

(Elfiel, 2019)

Previous studies

The researchers list an Arab and foreign study that dealt with content analysis according to levels of depth of knowledge:
Study for (Shaheen, 2020): This study aimed to reveal the extent to which the levels of depth of knowledge specified in this study are available in the biology textbooks (1) (2) (3) for the curriculum system for the secondary stage. This study was conducted in Saudi Arabia. included tool's study (indicators of levels of depth of knowledge and a form for analyzing the content of biology books), using the descriptive analytical approach and using the following statistical methods, which are frequencies, percentages, the Holsti formu, and the chi-square test, the results of the study showed that there were statistically significant differences in the levels of depth of knowledge between biology books in favor of the biology book (1) comparison. In my books Al-Ahya (2) and (3) (Shaheen, 2020)
Study for (Aboud & Jassim, 2022): The study aimed to analyze the chemistry textbook for the third intermediate grade according to the levels of depth of knowledge represented by remembering, applying concepts and skills, strategic thinking, and extended thinking. In order to achieve the research aim, researchers was used the descriptive analytical method, and the research population was identified and sampled. With all the topics included in the content of the Chemistry book for the third intermediate stage for the intermediate stage, the research tool was to prepare a list of indicators of levels of depth of knowledge, it was (41) indicators, they verified from validity and reliability. The two researchers analyzed the content of the Chemistry book for the middle stage for the academic year (2019-2020). The explicit idea was adopted as a unit of recording and the Cooper equation was used to calculate the stability of the analysis. The results showed that the chemistry textbook for the third intermediate grade contained levels of cognitive depth of (42.6%) (Aboud & Jasim, 2022).

4 Research Methodology

The researchers adopted the descriptive analytical method to analyze the content of the biology textbook for the fourth scientific grade, according to the levels of depth of knowledge, because it depends on the study of reality or the phenomenon as it exists in the field, and is interested in describing it accurately, and expresses it in quantitative and qualitative terms, and the qualitative expression describes the phenomenon and explains its characteristics. As for the quantitative expression, it gives it a numerical description that explains the magnitude or size of this phenomenon and the degrees of its connection with various other phenomena, and it explains the material that it analyzes in an objective manner, because the tool is subject to the condition of validity and reliability, and its method is organized; Because the analysis is carried out on the basis of the analysis categories, units, steps and results (Iorio et al., 2017).

The Research Community

The research community was determined by the biology textbook for the fourth scientific grade/ high school, for the academic year (2024-2025).

The Research Sample

The selection of the sample is according to scientific methods and truly represents the research community, The research sample represented the first six chapters of the biology textbook for the fourth scientific grade (Chapter One: Classification of Living Organisms, Chapter Two: Ecology and the Ecosystem, Chapter Three: The food chain and the cycle of elements in nature, Chapter Four: Environmental habitats and biomes, Chapter Five: Factors affecting the environment, Chapter Six: The adaptation of animals to the environment (bonefish), after an exception (Introduction of the book, list of contents, sources, and glossary of terms ,The end-of-chapters questions included in the book are part of the analysis, and it turns out that the total number of pages in the book is (192) pages, while the number of pages to analysis was (76) pages, Table (1).

Table 1
Biology book for the fourth scientific grade

Title of the textbook	Stage	Grad	Edition	Chapters	Year of publication	Total pages	Analyzed pages
Biology	High school	fourth Scientific	13	10	2024	192	76

Research Tool
In order to the content analysis to be systematic, objective and quantitative, and for the purpose of reaching the research aim, the following steps were followed:

1. *Building a list of indicators for levels of depth of knowledge*
   Reviewing several previous studies with depth of knowledge, and reviewing books, sources, and scientific journals about topics of depth of knowledge. accordingly, researchers built a list of indicators for levels of depth of knowledge for the content of a biology book, namely (Recall and reproduction, Skills and concepts, Strategic thinking, and extended thinking).
2. *The initial list of the content analysis tool*
   In its initial list, the tool consisted of (22) indicators distributed among four levels. The level 1: remembering and reproducing included (7) indicators. The level 2: Skills and concepts included (6) indicators. The level 3: strategic thinking included (5) indicators. The level 4: Extended thinking included (4) indicators.
3. *Certified content analysis tool*
   The researchers presented the analysis tool in its initial form to a several of curricula and teaching method arbitrators to ensure the clarity and integrity of the formulation of indicators of levels of depth of knowledge.
4. *The final list of the analysis tool:*
   The researchers relied on a percentage (80% or more) of agreement between the arbitrators, to keep the paragraph, delete it, or modify it, and this is what was indicated by (Bloom et al., 1984) as stated in (Mohammed & Hamoodi, 2023), and thus the tool included in its final form (22) indicators divided into four levels.

Analysis of the content of the biology book for the fourth scientific grade according to the levels of depth of knowledge and its indicators

1. **The aim of the analysis:** to determine the extent to which the content of the biology textbook for the fourth scientific grade is included, according to the levels of depth of knowledge and its indicators according to the previously prepared tool.
2. **Analysis sample:** The analysis sample represented the content of the biology textbook for the fourth scientific grade for the year (2023).
3. **Categories of analysis:** represented by the analysis tool according to the four levels of depth of knowledge in its final form.
4. **Unit of analysis:** The researchers relied on the idea (explicit and implicit) as the basic unit of analysis.
5. **Enumeration unit:** The researchers adopted the frequency unit to count the occurrence of an idea for each indicator related to the levels of depth of knowledge in the book content analysis tool in its final form.
6. **Controls of the analysis process:** The analysis must be in accordance with the content of the biology textbook for the fourth scientific grade/ high school for the year (2023). For the first six chapters, with (76) pages out of a total of (192) pages, the analysis tool must be approved in its final form.
7. **Steps for analyzing the content of a biology book:** In the analysis, the researchers will follow the steps mentioned by (anonymized) , which are:
   Step1: Read the text in general and well, so that the text becomes clear in the analyst's mind, to identify the ideas contained in the topic.
   Step2: To determine which idea includes levels of depth of knowledge, the same topic is read again carefully.
   Step3: To determine whether the idea belongs to the levels of depth of knowledge and its indicators, the idea is compared with indicators of the levels of depth of knowledge, according to the correspondence between the content of the idea and the content of the indicator in the tool.
   Step4: The type of idea (explicit or implicit) in the phrases is determined, and its frequency is recorded in the tool used.
   Step5: writing the results of the analysis, as one repetition is given when any idea appears, whether explicit or implicit, and then transformed into percentages in preparation for its interpretation.
8. **Validity of the analysis**: The researchers the validity of the analysis by presenting a model from the analyzed material to a number of arbiters of teaching methods, and they unanimously agreed on the validity of the analysis process, which the researchers considered to be the validity of the analysis.
9. **Reliability of the analysis Reliability:** The researchers extracted the reliability of the research tool in two ways:
   A: Persistence over time: the degree of agreement between the results obtained by researchers when re-analyzing the same content after a certain period of time (4-6) weeks from its first analysis, by comparing the results of the first and second analysis by the researchers and themselves. Using the pre-prepared analysis tool.
   B: Persistence among analysts: To calculate the stability of the analysis, the researchers sought help from two external analysts with experience in the analysis process[c], and chosen a sample of the analyzed material (20%) of the total content of the book subject to analysis, which amounts to (17) pages. Therefore, the researchers chosen the first chapter, Table (2).

[c] External Analysts
-Assist. Prof. Dr. Fouad Salem Ismail (University of Mosul/College of Education for Women) specializing in Biology.
-Lecturer Dr. Reem Salem Mustafa Al-Sarraj (Ministry of Education/General Directorate of Nineveh Education) specializing in Biology Teaching Methods.

Table 2
Values of analysis stability coefficients

Agreement over time	Between the researchers and themselves after 30 days	0.98
Agreement between analysts	Between the researchers and the first analyst	0.96
	Between the researchers and the second analyst	0.95
	Between the first analyst and the second analyst	0.92

Indicates (Ursachi et al., 2015) the reliability coefficient values less than (0.60) are unacceptable values, a reliability rate less than (60%) is considered weak, and is acceptable if it is between (60-70%, and good if it is between (70-80%), and if it exceeds (80%) it is considered excellent , and therefore the reliability coefficients obtained by the researchers are excellent.

10. **Conducting the analysis:** After ensuring the validity and reliability of the analysis, the researchers carried out the analysis process according to the approved steps and objectives of the analysis, focusing on objectivity (avoiding bias and subjectivity), then converting the data into frequencies and placing them in the fields designated for them within the analysis form for Statistical treatment and quantitative description of content phenomena.

Statistical Means

The researchers used the following methods:

1) The two mathematical methods (frequencies and percentages) of the search results, using Microsoft Excel.
2) The statistical method is the (Holsti) equation, to calculate the stability coefficient of the analysis

Presentation and interpretation of results

For the purpose of revealing the extent the biology book includes for levels of depth of knowledge and its indicators, the researchers used the analysis list that they built, and in light of the analysis they carried out, the researchers present the results of the analysis as follows:
First: For Levels of depth of knowledge:
The researchers present the results of the content analysis of the biology textbook prescribed by the Ministry of Education for fourth scientific grade students in light of the levels of depth of knowledge, Table (3), Figure (1):

Table 3
Frequencies and percentages for levels of depth of knowledge for the fourth scientific grade

no.	Levels	Frequencies	percentage	Rank
1	Recall and reproduction	273	63.49%	1
2	Skills and concepts	82	19.07%	2
3	Strategic thinking	38	8.84%	3
4	Extended thinking	37	8.60%	4
	Total	430	100%	

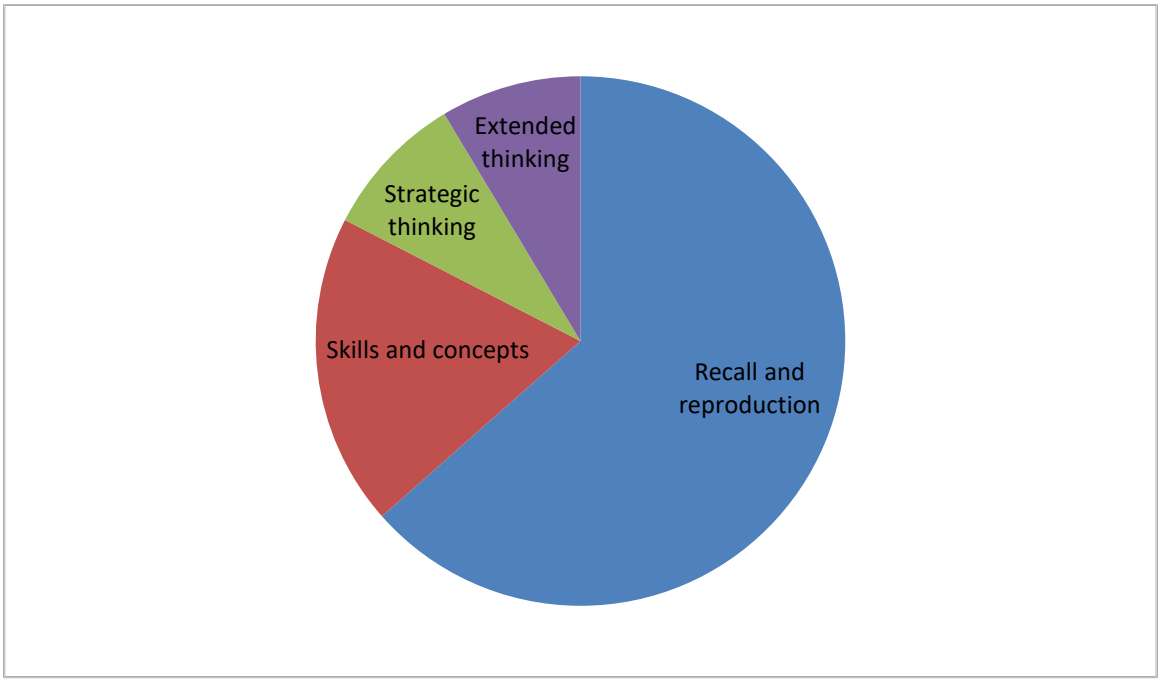

Figure 1. percentages for levels of depth of knowledge for the fourth scientific grade

level 1: recall and reproducing

the level obtained (273) repetitions, a percentage of (**63.49%)** from the total number of frequencies amounting to (430) frequencies, according to the results in Table (3), and these frequencies were distributed among (5) indicators from a total of (6), as shown in Table (4), where the indicator (a clear definition of scientific concepts and terminology) obtained the highest frequency of (71) occurrences, at a rate of (26.01%), and the indicator (includes illustrative forms of scientific material) obtained (35) occurrences, at a rate of (12.82%). The indicator (includes scientific results using significant numbers and ratios) received (51) repetitions, with a percentage of (18.68%), while the indicator (clarifying the relationships between scientific concepts and terminology) and the indicator (presents new knowledge through linking to previous knowledge) obtained (68), and (48) repetitions, at a rate of (24.91%) and (17.58%) for each of them, respectively, and the number of indicators that were not achieved was one indicator (an appropriate summary is provided at the end of each chapter of the content), meaning that it did not receive any repetition.

Table 4
Frequencies and percentages for indicators of the level of recall and reproducing

No.	Indicators	frequencies	percentage
1	a clear definition of scientific concepts and terminology	71	**26.01%**
2	presents new knowledge through linking to previous knowledge	35	**12.82%**
3	clarifying the relationships between scientific concepts and terminology	51	**18.68%**
4	includes scientific results using significant numbers and ratios	68	**24.91%**
5	includes illustrative forms of scientific material	48	**17.58%**
6	an appropriate summary is provided at the end of each chapter of the content	0	**0.00%**
	Total	430	100%

Level 2: Skills and concepts

The Frequencies obtained by this level reached (82) Frequencies, representing a percentage of (19.07**%)** out of the total number of repetitions amounting to (430) repetitions, according to the results in Table (3), and these Frequencies were distributed among (6) indicators out of a total of (7) indicators, as shown in Table (5), the indicator (classifying topics or elements into categories) and the indicator (making decisions in light of observations and available information) received the highest frequencies of (9) and (12), with a percentage of (10.98%) and (14.63%) for each of them. Respectively, the indicator (provides an example and scientific evidence that contributes to students' understanding) obtained (11) frequencies, with a percentage of (13.41%), and the indicator (that compares scientific concepts and terminology) received (30) frequencies, with a percentage of (36.59%), while the indicator (applies Scientific concepts in different forms) and an indicator (that explains concepts through scientific diagrams and shapes) at (14) and (6) repeatedly, at a rate of (17.07%) and (7.32%) for each of them, respectively, and the number of unachieved indicators was one indicator (using questions while viewing the content to stimulate thinking The students) meaning that there was no frequencies.

Table 5
Frequencies and percentages for indicators of the level of Skills and concepts

No.	Indicators	frequencies	percentage
7	that compares scientific concepts and terminology	9	10.98%
8	applies Scientific concepts in different forms	12	14.63%
9	provides an example and scientific evidence that contributes to students' understanding	11	13.41%
10	classifying topics or elements into categories	30	36.59%
11	making decisions in light of observations and available information	14	17.07%
12	that explains concepts through scientific diagrams and shapes	6	7.32%
13	using questions while viewing the content to stimulate thinking The students	0	0.00%
	Total	82	100%

level 3: strategic thinking

The repetitions obtained by this level reached (38) frequencies, representing a percentage of (8.84%) out of the total number of repetitions amounting to (430) frequencies, according to the results in Table (3), and these frequencies were distributed among (4) indicators out of a total of (5) indicators, as shown in Table (6), the indicator (linking scientific ideas for expecting results (analysis and conclusion) received (11) Frequencies, at a rate of (28.95%), and the indicator (presenting solutions to several scientific problems) received (8) Frequencies, at a rate of (21.05%). Both the indicator (includes predicting some outcomes related to the course) and the indicator (using data and tables in presenting information) received (10) and (9) repetitions. Respectively, at a rate of (26.32%) and (23.68%) for each, and the indicator (include a critique of some ideas at the end topics) obtained zero Frequencies.

Table 6
Frequencies and percentages for indicators of the level of strategic thinking

No.	Indicators	frequencies	percentage
14	linking scientific ideas for expecting results (analysis and conclusion)	11	28.95%
15	includes predicting some outcomes related to the course	8	21.05%
16	presenting solutions to several scientific problems	10	26.32%
17	using data and tables in presenting information	9	23.68%
18	include a critique of some ideas at the end topics	0	0.00%
	Total	38	100%

Level 4: Extended Thinking

The Frequencies obtained by this level reached (37) Frequencies, representing a percentage of (8.60%) out of the total number of repetitions amounting to (430) Frequencies , according to the results in Table (3), and these frequencies were distributed among (3) indicators out of a total of (4) indicators, as shown in Table (7), the indicator (guides students to employ their research skills) received (11) Frequencies, with a percentage of (29.73%), and the indicator (presents knowledge and information to solve realistic problems) received (14) repetitions, with a percentage of (37.84%), while The indicator (reflection, evaluation, and modifying plans over time) received (12) Frequencies, with a rate of (32.43%), while the indicator (planning to conduct experiments and judge the results and their impact) was not achieved, meaning that it did not obtain any repetition.

Table 7
Frequencies and percentages for indicators of the level of extended thinking

No.	Indicators	frequencies	percentage
19	reflection, evaluation, and modifying plans over time	11	29.73%
20	presents knowledge and information to solve realistic problems	14	37.84%
21	guides students to employ their research skills	12	32.43%
22	planning to conduct experiments and judge the results and their impact	0	0.00%
	Total	37	100%

The researchers see from the results of the above analysis of the levels of depth of knowledge and their indicators in the content of the biology book for the fourth scientific grade, that there is a clear disparity in the percentages of those levels and their indicators, and the non-appearance of some indicators, and the appearance of others in high percentages at the expense of the noticeable decline in other indicators, explains lack of attention, balance and integration in including these levels in the biology book, this may be reflected in the students' depth of knowledge in understanding and applying scientific material and linking new knowledge with previous experience to achieve meaningful learning and transfer it to reality through analysis.

5 Conclusion

The following can be concluded in light of the research results:

1) The lack of repetition of some indicators is evidence that these indicators are not included, and this may be reflected in the depth of knowledge of the students in understanding the scientific material and linking new knowledge with previous experience to achieve meaningful learning.
2) There is a large discrepancy between the percentages of indicators of levels of depth of knowledge, which explains an imbalance in their distribution within the content of the biology textbook for the fourth scientific grade, which confirms the focus of the content on certain aspects and not others, and thus a weakness in stimulating deep thinking among students on the interconnection of scientific ideas and investing them in Analyzing and evaluating problems and arriving at solutions in new and sustainable ways.

Recommendations

In light of the research results, the researchers recommend the following:

1) Emphasis on including the biology book for the fourth scientific grade with levels of depth of knowledge in close proportions to each other, especially indicators that did not reach any Frequency, while achieving the standards of integration and balance.
2) Reconsidering the biology book for the fourth scientific grade and emphasizing increasing the last two levels of strategic thinking and extended thinking, and integrating them into the books in reasonable, logical and balanced proportions with the first two levels of cognitive depth: remembering and producing knowledge, and applying concepts and skills.

3) Establishing training programs for teachers of the biology for the fourth scientific grade to raise awareness of the levels of depth of knowledge.

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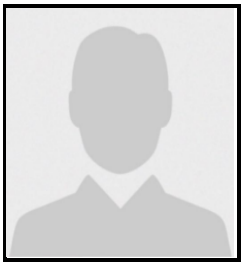

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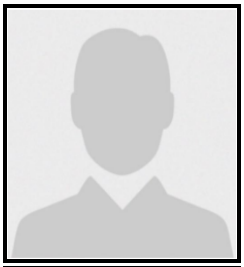

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