



## The Bioinformatics in the Biology Academic Book for the Third Intermediate Grade in Iraq - A Study of Content Analysis

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**Abstract:** The current research aims to build a tool to analyze the content of the book for the third intermediate grade in the light of vital information, as well as to analyze the content of the book for the third intermediate grade scheduled for the academic year (2020-2021) in light of the vital information contained in it. To achieve the goal of the research and reach the results, it is necessary to build a tool to analyze the content of the book and verify its psychometric properties. The results showed that the biology book for the third intermediate grade does not include bioinformatics to the appropriate extent, and the process of including this information is not at the required level.

**Keywords:** Biology, Bioinformatics, Intermediate Grade

### I. AN INTRODUCTION TO THE RESEARCH

#### ***The research problem:-***

The textbook is a cornerstone of any curriculum, as it puts in front of the learner what he can learn, and provides him with facts, concepts, principles and procedures, in proportion to his level of cognitive development and the educational stage he is in. Therefore, the content (the book), audio-visual aids, other educational activities, and evaluation methods are the cornerstones of building the curriculum. Clarity of the goals and their connection to the content and clarity for the teacher and learner lead to effective learning, and in recognition of the importance of the textbook, especially biology books and the scientific information they contain that is intended to enable The learner is one of the most important elements of the curriculum in the educational process.

Although the modern view of the textbook confirms that it is a source of learning and not all sources of learning, but it remains under the Iraqi educational system the main source of learning, as teachers are committed to teaching its subjects and providing students with the information contained in it, and despite the fact that biology books in Iraq It has recently witnessed a change and development of many chapters, axes and scientific topics discussed in them, but those who follow them find that they are still focused on providing scientific content in a way that does not take into account the excitement of thinking about modern scientific issues, and among these modern topics is bioinformatics, as it is an important axis that should shed light on the content of books Biology sheds light on it by stimulating it to students, as the content of biology books for the third intermediate grade is a fertile material for reviewing and presenting many bioinformatics to students.

Therefore, the two researchers feel the importance of biological information and the extent to which textbooks for the intermediate stage in the Republic of Iraq are interested in these concepts and the need to conduct a research to analyze the content of the biology book for the first intermediate grade to know what it contains of this information. By answering the following question:

To what extent does the biology book for the third intermediate grade include bioinformatics?

#### ***The research importance:-***

The textbook is a major part of the curriculum and has an active role in the educational process and is the basic structure in the learning and teaching process, and its role in shaping the learner's personality and its balanced structure in instilling the desired values and consolidating them among learners by keeping pace with scientific and technological developments to keep pace with the accelerating scientific

and technological progress and the accompanying Positives and negatives on people's lives, welfare and culture so that they are able to solve the problems they face in practical life in a manner consistent with the requirements of the times.

***The importance of the research is as follows:-***

- The current study seeks to reveal the extent of bioinformatics in the content of biology books.
- The attention of designers and planners of biology curricula and their developers in the intermediate stage may be directed to the importance of including bioinformatics topics and its applications when developing these curricula as a global requirement in keeping pace with global trends and keeping pace with technological developments and innovations in biology and linking them to vital issues.
- Keeping pace with recent trends related to recent discoveries in various fields, which combine biology and computer software, and include many innovations, modern scientific applications and controversial issues arising when designing modern curricula.
- The current research could allow researchers in the field of curricula and methods of teaching sciences; To conduct many similar studies in the field of scientific education and at different educational stages.
- This study and its results benefit the General Directorate of Curricula in the Iraqi Ministry of Education and will draw the attention of experts and authors in a precise quantitative manner to the volume of bioinformatics to fill the shortage in controversial topics when changing, modifying or developing educational curricula.

***The research aims :-***

***The current research aims to:-***

- 1- Building a tool to analyze the content of the book Al-Ihya for the third intermediate grade in the light of vital information.
- 2- Analysis of the content of the book of revival for the third intermediate grade scheduled for the academic year (2020-2021) in the light of the vital information contained therein.

***The search boards :-***

The current research is limited to biology books for the intermediate stage, in the Republic of Iraq, for the academic year (2020-2021).

***Defining the terms:***

***1- The Analysis:***

A cognitive level that refers to the learner's ability to divide the learned material into its constituent elements, which shows his knowledge of it and his understanding of its organizational environment (Samara, Al-Adili, 2008:52) .

***2- The Content:-***

The totality of facts, information, concepts, principles, generalizations, ideas, performance and mental skills, as well as the trends and values contained in the educational material of the book, which the learner is intended to acquire, absorb and represent in his mental, emotional and performance structures. (Atiya,315:2008)

***3- The analysis of the Contents:***

A method of scientific research that aims at an objective, organized and quantitative description of the apparent content of the communication material, or the investigation of information in the content of printed communication materials (Samara and Al-Adili, 2008: 53).

### ***The Procedural Definition:-***

The Content analysis:- A descriptive research method, the objective of which is to describe the objective, organized, and arbitrator of the basic components of the materials subject to analysis (Biology book for the third intermediate grade) according to the analysis tool that was prepared for this purpose.

### ***4- The Biology Book :***

The book that deals with the study of accurate scientific information that aims to build the new human being supported by science and knowledge. The book of Biology deals with life concepts related to the environment, physiology of organs, the cell and its genetic material in living organisms. It also answers many important issues and seeks to use the newly arrived information.

### ***5- The Intermediate level :***

The ***Intermediate level*** between primary and secondary education, in which those who have completed primary school and are aged for students from (13-15) years are accepted, and they are prepared for the purpose of continuing secondary education. (Ministry of Education, 1991 ).

### ***6- The Bioinformatics :***

"Using each of the applied computer science informatics techniques to solve biological problems". (Kovarik et al, 2013: 87)

"The science that uses the primary computer, programs and databases to solve, explain and interpret many biological questions and deals with the enormous biological data generated by large scientific projects." (Al-Zuhairi, 2015: 10)

A concept that resulted from merging the science of biology, including molecular biology and biotechnology, with information technology to be combined in one format, including various scientific applications ) Afifi, 2009: 353)

***Theoretical definition:*** The researchers adopt a definition (Afifi, 2009) as it is consistent with the research objectives.

***Procedural definition:*** a set of scientific issues that will be identified through analyzing the content of biology books for the third intermediate grade in Iraq, which include knowledge, concepts, information and facts resulting from the integration of information technology, computer software and biology.

## II. A THEORETICAL FRAMEWORK AND PREVIOUS STUDIES

### ***The first axis: a theoretical framework***

#### ***The concept of bioinformatics***

It means bioinformatics, computational biology, or computational biology as the science of integrating computers and its applications with biology and using the latest computer technologies, applied mathematics, informatics, statistics and computer science to solve biological problems. (Cain, 2017: 8).

( bdurakhmonov, 2016, 425) indicates that bioinformatics must be distinguished from related scientific fields such as biological computing, which aims to develop biological computers using the innovations of biological engineering, cybernetics, robotics and molecular cell biology, while bioinformatics uses computational algorithms to explain biological processes. Based on the sequences of genome-derived molecules and their interactions.

From the previous definitions of bioinformatics, it can be concluded that bioinformatics is the science of life that contains a set of knowledge and information in multiple areas that have been reached and combines biology, computer software, medicine, computational molecular biology, systems biology, and computational algorithms, and then it can be included in the content of the book. Biology .

### ***The Bioinformatics goals :***

The bioinformatics generally aims to understand the cell and how it functions at the molecular level, by analyzing raw molecular sequences and structural information, then bioinformatics research can generate new insights and provide a global perspective of the cell (Xiong, 2006, 19).

Bioinformatics seeks to find modern applications in genetics and molecular biology in order to achieve the following goals:

- Develop tools and resources that seek to analyze information resulting from developments in biology.
- Arranging information in a way that is easy for researchers and students to obtain, and the ability to enter modern data related to biology and its branches and return to it at any time.
- Using these tools to analyze information, translate results and benefit from them in biological, medical and environmental aspects.
- Dissemination of biological, medical, environmental and behavioral information by obtaining, organizing, analyzing, archiving and archiving information using available tools.  
(Masa'a and Al-Amri, 2015: 22)
- The researchers believe that bioinformatics has goals related to the development and discovery of tools and computer programs necessary to deal with biological phenomena and problems and the interpretation of results related to new discoveries related to biology and its branches.

- **The Bioinformatics areas:**

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#### **The Bioinformatics Areas:**

Bioinformatics includes the following areas:

- 1) Molecular medicine: that is, using the computer to search for genes responsible for a particular disease, which helps in developing new therapeutic targets, individual therapy, gene therapy, and microbial genomes.
- 2) Environmental field: where vital information helps in disposing of waste, changing climatic conditions, and developing alternative sources of energy.
- 3) The field of insect resistance: by transferring genes to plants that have insect resistance qualities, which leads to less use of pesticides harmful to human health.
- 4) The field of agriculture: in the sense of using vital information to improve the quantity and quality of agricultural products that are resistant to diseases and insects.
- 5) Biotechnology: By searching for enzymes used in the food industry.
- 6) The field of antibiotic resistance: that is, the search for the reasons that led to the transformation of some types of bacteria into a type that causes a serious disease infection.
- 7) The field of evolution of living organisms: comparison by using biological information between the genetic sequences of living organisms in order to know the similarity between living things.
- 8) The field of biological weapons: This is by using vital information in the manufacture of certain viruses by technical methods, which indicates the reality of the production of biological weapons.  
(Harney, Langman, Marino, & Taylor, 2008: 67)

### ***The second axis: previous studies***

#### ***First: Arafat's study (2010)***

It aimed at an evaluation study of biology curricula at the secondary stage in the light of bioinformatics applications. After calculating the relative weights of the answers, the results showed that all the applications in question are important in terms of including the content of biology curricula at the secondary stage, from the point of view of those working in the field of science teaching, and that the most comprehensive book dealing with applications is the biology book for the second grade, first semester. Hence, the study concluded that biology textbooks for secondary school students in Saudi Arabia do not include bioinformatics related applications to the appropriate extent, and the process of including these applications is not at the required level.

#### ***Second: Al-Qarni Study (2020)***

The main objective of the study is to know the effectiveness of using a proposed electronic enrichment program in biology based on bioinformatics and its applications to develop awareness of bioethical issues among secondary school students. The research tools represented in: the cognitive aspect achievement test and the emotional aspect scale of awareness of pre and ethical issues, before and after, were applied to the research group with the aim of identifying the differences between the results of the two

applications, before and after, and the results proved that there is a statistically significant difference between the mean scores of the research group students in the two applications, pre and post in favor of The post application of each of the cognitive achievement test and the measure of the emotional side of awareness of bioethical issues, with a high impact size, and the results also indicated that there is a positive, statistically significant correlation between the total score of the students of the research group in the post application of the achievement test of the cognitive side and the measure of the emotional side of awareness of the related moral and ethical issues in the fields of bioinformatics. (Al-Qarni, 2020, 372)

### III. THE RESEARCH'S PROCEDURES

The method of content analysis was followed to achieve the goal of the study, because it is characterized by the characteristics of systematic scientific research of objectivity, regularity, and ability to generalize the results that have been reached. (Meyer, 1990, 198) The current study included the content of the biology book for the third intermediate grade in Iraq for the academic year 2020/2021.

In order to achieve the goal of the research and reach the results, this requires building a tool to analyze the content of the biology book for the third intermediate grade in Iraq according to the vital information and to indicate the extent to which it observes those requirements and as follows:

A- The literature and previous studies related to the topic of pilot projects in building curricula and teaching methods were reviewed, as well as studies of book analysis and building analysis tools.

An open questionnaire was directed to a number of experts and specialists in the field of education, psychology and life sciences Annex (1) about the most important requirements of vital information, which must be included in the content of biology books for the third intermediate grade.

In light of the answers of experts and specialists and a review of the literature and previous studies on the subject, the tool was built in its first form.

B - The tool was presented to a group of experts and specialists in the field of education, psychology and life sciences to express their views on the most important issues of the tool and the elements contained in each paragraph of the tool, and after taking into consideration the observations they made, the tool became ready in the final version of Appendix (2), where It consisted of (50) paragraphs, after which the researchers took the steps of the analysis process:

A- The explicit idea was adopted as a tool for analysis because it has enough capacity to give it meaning and is small, which reduces the possibility of its classification for several concepts (Al-Salman, 1987, 19), and also that the biology books for the middle stage in Iraq are a scientific book and its phrases are often clear and explicit.

b- Repetition is adopted as a unit of enumeration.

T - Reading the topic in general, as reading contributes to identifying the topic that contains thought.

D - Reading each paragraph to form a clear picture in the mind of the analyst to know the basic thought.

C - Specifically the paragraphs that contain an idea.

H - Specifically the type of thought in the phrases in light of the classification developed by the researcher.

g- Emptying the results of the analysis into the analysis table, by giving one repetition for each phrase that carries a specific idea. (Al-Khazraji, 2008, 32)

The validity of the analysis

To ensure the validity of the analysis, a sample of the analyzed material was presented to a group of experts (Ferguson, 1981, P., 104) from the field of life sciences teaching methods, and they agreed on the validity and validity of the analysis. (Duran, 1985, p. 370) Supplement (1)

Analysis stability

To ensure the stability of the analysis, stability was calculated in two ways:

- stability over time

Consistency among analysts

A topic from the middle first biology book was analyzed four times by researchers and an analyst once, each separately. And again, after a period of time of two weeks for the researcher (Nelson, 1978, p.11) (Al-Salman, 20, 1987), and after applying the correlation coefficient equation, the following results were obtained:

Table (1)of stability results

stability over time	Between the two researchers and themselves two weeks later	0.89
	Between the two researchers and the first observer	0.86
stability over time	Between the two researchers and the second observer	0.85
	Between the first observer and the second	0.91

	observer	
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**The Statistical means :**

1 - Holstey's equation to find the stability of the analysis.  $R=(2(C1+2))/(C1+C2)$   
(Sami, 2000, p. 259), (Wajeih, 2002, p. 165).

2- Percentage in processing results. (Al-Qurashi, 2007,127)  
the fourth chapter

View and discuss results

After the analysis, the researchers reached the following conclusions:

The results showed that the book included in its content vital information.

He got (43) recurrences, and the table (1) shows this:

Table (2)

Frequency and percentage included in the biology academic book for the third intermediate grade in Iraq :

No.	Idea	Frequency	%	Grade
1	The use of digital technology and technology in the analysis of biological data	8	18.604	second
2	Protein and its chains and structures	22	51.162	first
3	The importance of using the Internet to access databases	0	0	Sixth
4	Classification of bacteria and viruses in an automatic way by comparing the structure of a new protein with a previous protein (comparing the genes of some viruses with other viruses)	0	0	Sixth
5	DNA coding and protein sequence extraction	0	0	Sixth
6	The discovery of the genetic codes was hidden in the 1960s	0	0	Sixth
7	The four nucleotides make up 64 genetic codes	3	7.142	fourth
8	genetic codes	0	0	Sixth
9	MB = KP1000(Mega base )	0	0	Sixth
10	Kb = 1000bp (Kilo base )	0	0	Sixth
11	A DNA molecule with a length of 400 nucleotides actually contains twice as many bases (800) bases	0	0	Sixth
12	A gene is made up of a number of bases.	0	0	Sixth
13	double nucleotides	0	0	Sixth
14	The difference between DNA and RNA sequences	2	4.651	fourth
15	The ribosomal RNA, rRNA, is included in the synthesis of the ribosome	0	0	Sixth
16	The messenger RNA, mRNA, which results from the direct translation of genes	0	0	Sixth
17	RNA traces	0	0	Sixth
18	Intervalent bond with a water molecule (H2O) coming out	0	0	Sixth
19	The presence of an amino (NH2) and a carboxylic (COOH) side.	0	0	Sixth
20	The additional seven amino codes	0	0	Sixth
21	Protein sequences	0	0	Sixth
22	amino acids	6	13.953	third
23	In silico term: It is conducting experiments theoretically on a computer before conducting them on biological systems or in laboratories	0	0	Sixth
24	In vitro: conducting experiments in the laboratory	0	0	Sixth
25	In vivo: conducting experiments on a living organism directly	0	0	Sixth
26	The broad definition of biological information (it is the analysis of a large amount of biological information, whether genetic or other sequences, through the computer	0	0	Sixth

27	Modern bioinformatics (a science that includes a comparative study of different genomes, DNA, analysis of genome functions, analysis of the complete protein groups of the genome, in addition to medical information)	0	0	Sixth
28	Classical bioinformatics (a science primarily used to analyze protein or genomic sequences)	0	0	Sixth
29	Different means of displaying small sequences (such as protein sequences that do not exceed a few thousand letters).	0	0	Sixth
30	Qualitative visualization and design methods for small sequences Design	0	0	Sixth
31	Program for determining kinship and phylogeny	0	0	Sixth
32	Program for finding similarities between sequences BLAST		0	Sixth
33	Hemphilus influezae, the first complete genome sequence, is the influenza virus	2	4.651	Fifth
34	The Sanger method for determining the sequence of DNA	0	0	Sixth
35	Predicting genetic change	0	0	Sixth
36	Introns (non-coding sequences)	0	0	Sixth
37	Computing programs within bioinformatics applications that work to discover unencrypted areas	0	0	Sixth
38	Non coding DNA regions	0	0	Sixth
39	Small RNA molecules and their role in regulating the activity of some genes	0	0	Sixth
40	Modeling of genetic evolution	0	0	Sixth
41	BLAST program to search for strings similar to the string you wish to search for in various other objects	0	0	Sixth
42	coding the human genome	0	0	Sixth
43	Exons (coded sequences)	0	0	Sixth
45	Bioinformatics (Computer Biology) web opedia	0	0	Sixth
46	sequential alignment	0	0	Sixth
47	Finding legacies	0	0	Sixth
48	human genome project	0	0	Sixth
49	Protein structure alignment	0	0	Sixth

When looking at Table (2), we notice that the content analysis of the biology book for the third intermediate grade collected (43) recurrences distributed in different proportions, including the first rank (22) recurrence and at a rate of (51,162) for the paragraph (protein, its chains and structures), and the paragraph obtained the use of digital technology and technology in The analysis of biological data included (8) repetitions with a percentage of (18,604) and in the second place, while the amino acids paragraph got (6) repeats and at a rate of (13,953) and in the third place, while the four nucleotides paragraph got 64 genetic codes that got (3) repeats and at a rate of (7,142) In the fourth place, as for the two paragraphs (the difference between DNA and RNA sequences and the sequence of the first complete genome sequence (Hemphilus influezae)) got (2) repetitions for each of them at a rate of (4,651), while the rest of the paragraphs of the tool did not get any repetition.

Conclusions:

The biology book for the third intermediate grade does not include bioinformatics to the extent appropriate, and the process of including this information is not at the required level.

#### IV. THE RECOMMENDATIONS:

On the basis of the findings of the current study, it recommends the following:

- 1) Take advantage of the analysis tool prepared to analyze other biology books in the later stages in the light of vital information.
- 2) Employing the results of this study in developing and improving the biology books for the third intermediate school in Iraq.
- 3) To benefit from the results of this study in developing the programs of continuing education courses for biology teachers at the secondary level.

#### Suggestions:

- 1) Conducting a similar study of biology books in the preparatory stage in the light of biological information (bioformation).
- 2) Comparing the content of biology books in Iraq with the content of the corresponding biology books in developed countries.

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